Outpatient Oncology Settings
The role of the built environment in fostering patient sense of support

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Abstract

This thesis explores the role that the architectural design of oncology care facilities plays in empowering and supporting patients undergoing intravenous anti-cancer treatment within outpatient settings. The study investigated the significance and meanings patients' attribute to their experiences in these settings and the impact of such impressions on their satisfaction and wellbeing. A mixed-methods approach, including qualitative (in-depth) interviews and the development and testing of a survey tool to measure patient perception of healthcare built spaces guided the conduct of this research. For the interview phase, twenty-four patients undergoing infusion-based treatment, including a number of former patients, were recruited from outpatient cancer care facilities across two contexts, Australia and Egypt. General discussions with six architects expert in the design of such spaces were also conducted. In the survey phase, the utilised tool was first devised following established principles for developing valid and reliable measurement scales in the field of health sciences and then used to empirically quantify and characterise patients' perception of the built environment. Two-hundred and seven patients participated in this phase across four healthcare settings in Victoria, Australia. Basic descriptive and inferential analytical techniques were implemented to explore architectural aspects leading patients' overall experience. Following synthesis of the collected data out of the two methods employed, the study highlights the architectural qualities that elevate patients' sense of a supportive environment and point to a refined, and more comprehensive, conceptual understanding of the way the built environment may promote wellbeing. The study further demonstrates how such a level of support may contribute to experiencing a climate of patient-centred care. Drawing on the latent signification of the interviews' outcome at the investigated Australian and Egyptian sites, the thesis further highlights the distinctive effect of design in balancing the unavoidable presence in the hospital, contributing to incidences of positivity, and encouraging reasons to return – potentially enhancing compliance with treatment.

Declaration

This is to certify that the thesis comprises only my original work towards the PhD except where indicated in the Preface or due acknowledgement has been made in the text to all other material used. The thesis is fewer than 100 000 words in length, exclusive of tables, figures, bibliographies and appendices.

Ahmed Hassem Sadek
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Preface

Portions of this thesis have appeared in print, or in the process, with more than 75% of the contribution of the candidate:

Communicating outcomes of Chapter 2:

- Sadek, A. H. & Willis, J. (2020). Ways to harness the built environment of ambulatory cancer facilities for comprehensive patient support: A review of the literature. *International Journal of Nursing Studies. 101,* 103356. https://doi.org/10.1016/j.ijnurstu.2019.05.004

Communicating outcomes of Chapter 3:

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Communicating outcomes of Chapter 5:

- Proposed title: Forms of environmental support: The different roles that healthcare built environments play in shaping patient experience within outpatient oncology settings. *Written and in the process of submission.*

Communicating outcomes of Chapter 7:

- Proposed title: The extent to which healthcare built environments may influence cancer patient experience and wellbeing. *Written and in the process of submission.*

Two additional articles are planned to communicate the outcomes of chapters 8 and 9.

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Table of contents

List of tables

List of figures

Chapter 1

Thesis overview

1.1 Introduction

Cancer is one of the most significant healthcare challenges in the world; in many instances, it is a life-threatening disease that causes patients to encounter both physical and emotional hardships (Mehnert et al., 2012; Wessels et al., 2009). The burden of this disease and its treatment is onerous as it may disrupt patients' day-to-day activities and self-independence, as well as family, social, financial and work life, among other factors (Department of Health and Human Services, 2011a). It may leave patients uncertain of their future and force them to make serious decisions that may have long-term implications. As a result, patients can become overwhelmed with various emotional and psychological distresses, including fear, anxiety and depression, which has been reported to account for up to 30% of the problems associated with a cancer diagnosis (Department of Health and Human Services, 2016).

The different treatment modalities for cancer impose other physical and psychological challenges, where patients are likely to lose aspects of good health. For instance, patients receiving chemotherapy for the treatment of cancer may develop physical symptoms of nausea, dizziness, vomiting (Chirico et al., 2016), pain (Kwekkeboom, Bumpus, Wanta, & Serlin, 2008), and fatigue (Ancoli-Israel et al., 2012) due to administration of the intravenous medication that may last for a couple of hours (Shepley, Rybkowski, Aliber, & Lange, 2012). Other symptoms associated with chemotherapy include hair loss, feeling 'down' or depressed, difficulty concentrating and diminished physical mobility (Schneider, Prince-Paul, Allen, Silverman, & Talaba, 2004). Patients become prone to feeling cold, develop sensitivity to smell and taste, and require frequent use of toilets (Browall, Koinberg, Falk, & Wijk, 2013). In addition to the consideration of treatment-related challenges, patients receiving chemotherapy may spend a relatively long time waiting for the preparation, processing and administration of the treatment (Schneider et al., 2004). These, besides the potential crowding of patients in the treatment room and relative noise levels, may constitute further situational sources of discomfort for patients (Cheater, Preston, Wynn, Hearnshaw, & Baker, 1999; Kleeberg et al., 2005).

The Victorian Cancer Plan (2016-2020), by the Department of Health and Human Services (DHHS) Australia, places significant emphasis on creating better experience for cancer patients and their carers. The concept of patient-centred care (PCC) is increasingly seen as an indicator of best quality care and as an essential aspect of healthcare organizations' mission (Carmel-Gilfilen & Portillo, 2016; Edvardsson, Fetherstonhaugh, Nay, & Gibson, 2010). Its core principles advocate for a comprehensive patient support that considers the patient as person and places their needs and expectations at the centre of care. Cancer patient experience of care and the support they receive for their physical, emotional, social, information and spiritual concerns are consequently receiving increased international attention (Department of Health and Human Services, 2016).

In this realm, the built environment is increasingly being identified as a key component of the caring system and patient experience (Todres, Galvin, & Holloway, 2009), as well as contributor to the overall practice of patient-centred care (Bromley, 2012; Liberati et al., 2015; Sjögren, Lindkvist, Sandman, Zingmark, & Edvardsson, 2015). In their review of the emerging transitions in PCC, Liberati et al. (2015) highlighted two main directions, including a traditional and a more comprehensive approach to PCC. The traditional stream addresses PCC at a micro-level and incorporates essential aspects, such as the type of communication between patients and care providers; whereas the comprehensive level considers the overall healthcare context that runs at a macro-level and is the one that is gaining growing interest. Facilitators of this comprehensive view include leadership commitment to PCC, information and education support, and improvements to the healthcare built environment.

Today's hospitals are designed in a way to offer remedy for the impersonal environments that characterised healthcare facilities from the later twentieth century that may trigger feelings of inhibition and being processed (Golembiewski, 2012; Van der Linden, Annemans, & Heylighen, 2016). A growing body of research attests that the healthcare built environment can affect patient satisfaction and wellbeing, and may have a positive impact on a variety of health-related outcomes such as length of stay, analgesic intake, stress, and mood (Huisman, Morales, van Hoof, & Kort, 2012; Timmermann, Uhrenfeldt, Høybye, & Birkelund, 2015; Ulrich et al., 2008). Despite the relatively high investments made in humanizing new hospital settings and making them more welcoming, few attempts, such as research studies or post occupancy evaluations, are sought to assess their performance and incorporate users' feedback in a reliable manner (Alvaro, Wilkinson, Gallant, Kostovski, & Gardner, 2016; Buffoli et al., 2014; Leaman, Stevenson, & Bordass, 2010). Exploring the significance and meanings that patients attribute to their experience in such contemporary settings is even rarer for specialized and sensitive healthcare settings such as cancer care environments, and in particular, curative settings such as outpatient facilities (Shepley et al., 2012; Timmermann, Uhrenfeldt, & Birkelund, 2013; Mackereth, Campbell, Maycock, Hennings, & Breckons, 2008; Wang & Pukszta 2017). Exploring user feedback about such settings is important, not only to support patient experience and ensure efficiency and optimal performance but also to determine the potential added value and allow a degree of accountability for the investments of public money (Raj, Hes, Padovani, & Jensen, 2011).

1.2 Therapeutic and healing-promoting environments – background

The role of the hospital built environment in supporting patients' experience of wellbeing and positive emotions is increasingly considered important in healthcare facility design and research (Biddiss et al., 2014; Timmermann & Uhrenfeldt, 2015). The emotional experience of a space, which is continuously shaped by the impressions of its signals and components (Belver & Ullan, 2010), is believed to influence individuals' immediate mood and how they feel (Annemans, Van Audenhove, Vermolen, & Heylighen, 2012; Timmermann et al., 2013). It is also considered a factor that may ease the anxieties and stresses associated with being in hospital and consequently contribute to patient health and well-being (Belver & Ullan, 2010). In a study conducted in the Barbara Ann Karmanos Cancer Institute in the United Sates comparing two inpatient units that underwent architectural renovation, the researchers reported that patient used 16% less pain medication, satisfaction increased by 18%, and medical errors decreased by 30% in the new unit compared to the old one. Simple interventions like soothing colours, comfortable furniture, internet access, control over noise and rearrangements of medication supplies had the capacity to influence these records (The Center for Health Design, 2001).

On the other side, negative perception of the built environment may act as a potential source of additional stress that may ultimately intensify the inherent tensions that are generally associated with illness and being in a hospital (Golembiewski, 2010; Varni, Burwinkle, Dickinson, Sherman, Dixon, 2004). This role of perceptions is outlined in Lazarus and Folkman's theory of stress and coping which implies that a stressful event in itself might not be the reason for the observed adverse effects on health and well-being, however, an individual's perception and appraisal of such event is the one responsible for explaining the potential harmful effects of stress (Lazarus & Folkman, 1984).

A number of previous studies has investigated this mediating role of perception of the built environment. Sherman, Shepley, and Varni (2005) conceptualized patient's subjective appraisal of the built environment as mediator, explaining, in part, the variation in outcomes such as the level of perceived stress and health-related quality of life during hospitalization. Sherman-Bien, Malcarne, Roesch, Varni, and Katz (2011) further examined the hypothesis in a cross-sectional study within an oncology paediatric hospital. The aim was to explore the role played by the perception of the built environment in affecting self-reported physical and psychological functioning of paediatric patients and their parents. The outcomes partially supported the mediation hypothesis, revealing a strong correlation between parents' appraisal of the built environment and satisfaction with their child's treatment and medical providers. In a more controlled study, Andrade and Devlin (2015) and Andrade, Devlin, Pereira, and Lima (2017) demonstrated the mediating role of perception of the physical environment on wellbeing and stress levels. They found that individuals' perception of the hospital room, defined by the perceptual degree of positive distraction and social support facilitated by the setting, acted as a mediator explaining the less stressful experience that accompanied the presence of extra, favourable amenities, in the same room.

1.2.1 Historical traces

The importance of the perceptual function of a building can be traced back to the times of ancient Greece and Rome, where aspects of nature, music, and art were used to emphasize the restorative power of temples and to promote healing for sick people (Schweitzer, Gilpin, & Frampton, 2004). Roman architect, Marcus Vitruvius, identified Commodity (functionality), Firmness (build quality), and Delight (impact) as essential qualities of architecture, highlighting, through the third attribute, the role of buildings in raising people's spirits and rendering a cheerful atmosphere (Phiri, 2014). This notion continued to dominate healthcare settings until the remarkable shift that accompanied the advent of science-based medicine during the 19th and 20th centuries (Sloane, 1994). The systematic and more successful way in understanding disease improved treatment regimens and had therefore switched the design focus to accommodate the clinical needs that facilitated, at that time, phenomenal improvements in patient recovery rates (Whitehouse, et al. 2001).

Clinical processes, medical technology, and caregivers' needs became the essential drivers for designing hospitals, while patient experiences were largely marginalized (Elf, Fröst, Lindahl, & Wijk, 2015; Phiri, 2014). Such a utilitarian and orderly approach to design turned healthcare settings into more formal and bureaucratic environments, dominated by an alienating clinical atmosphere (Phiri, 2014; Sloane, 1994) where patients were seen as passive bodies to be diagnosed and put right (Phiri, 2014). With the emergence of the concept of patient-focused medicine later in the 20th century, patient experience gained renewed attention and the built environment started once again to be considered important for achieving a more patient-oriented service (Phiri, 2014). A supportive and more welcoming atmosphere is sought not only to shift the prevalent negative impressions and make the hospital visit more normal, but also to inspire wellness and support healing (Adams, 2017). This contemporary, or revived, concept of supportive and healing-promoting environments is distinguished from its precedents' anecdotal beliefs by a growing body of scientific knowledge that integrates research-based evidence into hospital design following the rigorous standards of hard science (Phiri, 2014).

1.2.2 Evidence-based design

Similar to evidence-based medicine, the concept of evidence-based design (EBD) is a field of study that addresses whether, and how, the design and operation of buildings positively support health outcomes through a growing collection of solutions informed by research and practical knowledge. This research area expands to include "evaluations and systematically analysed experiences from existing environments" (Elf et al., 2015) in order to inform future designs and ensure that design decisions are taken with the guidance of credible research results. The Center for Health Design (CHD) in the United States defines EBD as "the process of basing decisions about the built environment on credible research to achieve the best possible outcomes" (Sadler et al., 2011). The approach has become popular in healthcare architectural design in an effort to improve patient and staff wellbeing, aid the patient healing process, reduce stress and contribute to safety (Fouts & Gabay, 2008; Shepley, Baum, & Rostenberg, 2009). This has resulted in an ongoing and increasing body of knowledge that attests, through empirical findings, the capacity of the hospital built environment to affect several factors related to patient health and wellbeing such as satisfaction, quality of life, treatment times, sleep patterns, and compliance with treatment, among many other issues (Phiri, 2014).

1.3 Research motivations

1.3.1 Why ambulatory settings

Continuous advances in cancer treatment, alongside improvements in survival rates, has prompted a trend towards delivering treatment in outpatient settings (Bloom, Markovitz, Silverman, & Yost, 2015; Groff, Carlson, Tsang, & Potter, 2008; Mehnert et al., 2012), yet few studies have attempted to investigate patient experiences and needs in such physical environments (Shepley et al., 2012; Timmermann et al., 2013; Ullán et al., 2012; Wang & Pukszta, 2017). This shift toward outpatient facilities is also a focus of the Victorian Cancer Plan (2016-2020) as a way to increase accessibility and improve existing disparities between metropolitan and regional areas (Department of Health and Human Services, 2016). Studies point to patients' preference for such settings, as they contribute to a more convenient service given their planned, relatively close-to-home, locations (Pace et al., 2009).

Patients attend ambulatory cancer care facilities, also known as outpatient care, for various same-day services including infusion therapy (e.g. chemotherapy), radiotherapy, rehabilitation, and follow-up care (Brédart et al., 2015). These visits might extend over many months (Brédart et al., 2015), which may explain why patients refer to their lives as revolving around treatment (Mcilfatrick, Sullivan, & McKenna, 2003), with some patients reporting attending ambulatory settings over 150 times in a year (L. Joubert, personal communication, November 29, 2016). It further suggests that such treatment settings become part of patients' lives and therefore have a unique opportunity to contribute to their treatment experience (Groff et al., 2008).

1.3.2 Why infusion-based settings

Intravenous anti-cancer treatment, particularly chemotherapy, is a commonly used therapy that constitutes an integral component of cancer treatment with studies reporting a steady rise in its demand (Farrugia, Ingledew, Dawes, & Moss, 2006; Pace et al., 2009). This therapy can be administered for various reasons and at different stages of the treatment course. Reasons for administration range from curative purposes to controlling disease and/or palliative care (relieving disease symptoms). It is also increasingly used in conjunction with other therapies such as surgery, radiotherapy and hormone therapy, either before intervention to reduce tumour size (neoadjuvant-based chemotherapy) or after removal of the primary cancer to control and eliminate the risk of microscopic disease and metastatic invasion (adjuvant chemotherapy) (Kearney & Richardson, 2006). This implies an increasing possibility for patients to encounter such therapy at some point of their treatment course.

Chemotherapy, besides its aforementioned physical and psychological challenges, has unique procedures that may increase both waiting and treatment time to remarkable levels. In a typical patient pathway, blood samples are first drawn for review by clinical staff to assess patient fitness to receive the scheduled chemotherapy. Following confirmation, a specialized pharmacy unit commences in preparing the chemotherapy dose and, once ready, delivers it to the clinic for administration by nursing staff (Farrugia et al., 2006). This process can differ based on each individual treatment, however in such a typical pathway the whole process can take hours, and sometimes the whole day, in which patients are confronted with substantial amounts of waiting. With the unique challenges and consequences of chemotherapy and the ubiquitous reliance on such treatment (Farrugia et al., 2006; Pace et al., 2009), in addition to the scarce of studies exploring patient experience of the architectural environment of ambulatory treatment spaces, a focus on supportive design for infusion-based outpatient services becomes timely and warranted.

1.3.3 Limitations in healthcare built environmental studies

The factors that make a supportive or healing-promoting environment have been the topic of multiple investigations, where scholars have proposed and refined different theories aiming at capturing its basic concepts. A view of the available literature in the field of healthcare facility design and research points to limitations in the existing theoretical propositions to adequately capture the contemporary basic concepts of a supportive healthcare environment and the various environmental aspects that patient consider important – a view supported by Devlin, Andrade, and Carvalho (2016) and Elf, Nordin, Wijk, and McKee (2017). Further in-depth investigation of patients' experiences, thoughts and the meanings they attribute to the built environment, particularly in contexts characterised by such vulnerable situation such as oncology settings, is therefore needed.

Investigation into and documenting the meaning and significance of patient experience is also important to allow professional architects to make effective, evidence-based decisions to achieve the best design within the budget constraints that healthcare construction or renovation commonly faces (Becker & Douglass, 2008). Such in-depth understanding is also important to support architects in the process of communicating the importance of experience-related design decisions to clients and stakeholders – an area, in which architects report facing diverse challenges (Annemans, Van Audenhove, Vermolen, & Heylighen, 2014; C. Lyon, personal communication, March 4, 2016; Kirkeby, 2009).

The scarcity of studies in this context is further coupled with lack of validated measurement instruments (survey tools) to evaluate the performance of such buildings through patients' eyes (Mullaney et al., 2016; Richardson, Medina, Brown, & Sitzia, 2007). The need for measurable outcomes of such perceptual attributes of the built environment is likewise important to help guide experience-related design decisions and support negotiating research findings for future projects (Alvaro et al., 2016; Annemans, et al., 2014; Kirkeby, 2009). Arriving at standardized tools is also critical for providing a valid and reliable platform for evidence-based studies that aim to empirically investigate the impact of the built environment on patients' health-related outcomes as well as compare building qualities across different sites (Vischer, 2002). Through these tools, the role of holistic building design in improving patient experience can be addressed, allowing opportunities to overcome the existing gap in the majority of previous studies that have mainly focused on investigating the effect of single design features (e.g. noise, daylight) on patient health outcomes (Annemans et al., 2012; Montacchini & Tedesco, 2015; Mourshed & Zhao, 2012). This is an approach that has faced various challenges to demonstrate statistically significant results, due to the multiple factors that influence the expression of patients' emotions and perceptions (Mullaney et al., 2016).

1.4 Aim and objectives

This study explores the role that the architectural design of ambulatory care facilities plays in empowering and supporting cancer patients undergoing intravenous anti-cancer treatment (e.g. chemotherapy). The study will investigate patient experience of the built environment and the impact of such impressions on their satisfaction and wellbeing. The study will also determine the architectural design features that contribute most to patients' sense of support and how such support may contribute to experiencing a climate of patient-centred care. The following objectives outline the general aims of the study:

- Identify the architectural design features that patients perceive as important in their care.
- Determine the role that the built environment of ambulatory cancer care facilities plays in patient experience and wellbeing.

This will be investigated through the understanding and description of the thoughts and meanings patients attribute to their experience in such settings.

- Explore the distinctive contribution of the built environment to patient indices of satisfaction, wellbeing and other health-related outcomes.
  This will be investigated through the interpretation of the implicit 'latent' signification of patients' experiences.
- Determine the extent to which cancer patients perceive the ambulatory built environment to be supportive.
  In order to maintain reliable outcomes and as no previous tools were found to fulfil this objective, the study will develop and validate a dedicated survey tool to quantify and characterise patient experience of the ambulatory built environment.
- Explore the relationship between patient perception of the built environment and their experience of care-centeredness.
  This will be investigated through the interpretation of the implicit 'latent' signification of patients' experiences as well as statistical analysis of the survey tool.

1.5 Research questions

The following research questions are proposed to help accomplish the research aim and objectives:

1) What are the roles that the built environment of ambulatory cancer facilities play in patient experience?
2) What impacts do different healthcare environmental conditions have on patients' satisfaction, wellbeing and other health-related outcomes?
3) What are the salient architectural design features that elevate cancer patient perceptions of a supportive environment and what others may hinder that?
4) To what extent do cancer patients perceive the built environment of ambulatory treatment and support spaces to be supportive of their needs?
5) To what extent is the physical environment in outpatient cancer facilities conducive to a climate of patient-centred care?

1.6 Study Design

In order to fulfil the aims of this research, a mixed-methods approach research design was adopted including qualitative (in-depth) interviews and the development and testing of a survey tool, to measure patient perception of healthcare built spaces and the extent to which the built environment of ambulatory care facilities possesses the qualities that contribute to the creation of a supportive or healing-promoting environment. A two-phase field research approach was sought as follows:

The first stage was a series of face-to-face interviews with patients and former patients, across two contexts, in order to gain in-depth understanding of patients' particular views of the healthcare built environment and unravel the potential meanings and significance people attribute to such experiences. A phenomenological approach was regarded as relevant in providing the methodological grounds for and guiding the overall design of this investigation. Through a semi-structured framework, guided by a combination of content mapping and content mining questions, the interviews were designed to elicit detailed information about patients' insight to the built environment and its effect on their wellbeing and perception of patient care. To further support this phase, a limited number of additional interviews with experts, including architects involved in the design of cancer treatment spaces were undertaken. Expert participants were questioned on their perception of good and poor design qualities and what they observe as beneficial design practices for patient experience. Data was analysed following established analytical methods of qualitative research methodologies, including coding and thematic analysis techniques (with the assistance of NVivo) in order to search for themes or patterns within the data and pinpoint potential explicit and latent aspects of it. In total, twenty-four patients or former patients participated in this phase in addition to general discussion with six architects.

The second stage was a further quantitative investigation through the development and testing of a survey tool following the principles of developing subjective measurement scales in the field of health sciences in order to establish valid and reliable properties of such a tool. This included techniques such as face and content validity, as well as usability and readability tests, followed by psychometric testing techniques including factor and principal component analysis in addition to internal consistently reliability, convergent-discriminant validity, concurrent and predictive validity. The tool was also used to empirically quantify and characterise patients' perception of the built environment within number of hospital settings in Victoria, Australia and across wider sample of the population. Analytical techniques in this stage included basic descriptive analysis reporting on the mean and standard deviation of the questionnaire items while exploring potential differences relevant to age, gender, and type and familiarity with the investigated hospital settings. The other layer of analysis was essentially inferential through techniques such as correlational analysis using subscales of the survey to further explore the potential link between patient satisfaction with the built environment and their overall wellbeing and experience of care-centeredness. Two-hundred and seven patients participated in this phase across four healthcare settings in Victoria, Australia.

1.6.1 Study context

Exploring the experiences of patients attending contemporary healthcare settings was fundamental in order to understand the role that such settings (that are developed following established principles of supportive and healing-promotive environments) play in shaping cancer patient experience and wellbeing. Although essential, consideration of patient views within less developed settings was additionally important to maintain a degree of comparability and account for the potential impact that different building conditions may have on patients satisfaction and wellbeing. Accordingly, patients undergoing intravenous anti-cancer treatment were enrolled from outpatient cancer care facilities in a number of major treatment centres in Victoria, Australia, in addition to one centre in Egypt.

Australia was chosen as representative of contemporary healthcare settings that strive to implement aspects of evidence-based design and healing-focused environments in its new hospital facilities and in which other older settings also exist – enabling a first level of comparison. Egypt, on the other hand, is a context that faces various economic challenges and in which public hospitals are generally in poorer physical condition, which facilitates further consideration of the potentially extreme impact that debilitated building conditions may have on patient experience and wellbeing. Little has been done in terms of comparing patient perspectives in different contexts (Andrade & Devlin, 2015; Martin, 2000; Sherman-Bien et al., 2011), yet it is a critical and important aspect to examine (Timmermann et al., 2015). Furthermore, healthcare in developing countries such as Egypt is rarely considered within such research. Although the inclusion of the Egyptian context was limited to the interview phase, it extended the level of diversity in the sample and facilitated exploration of wider perspectives.

For the interview phase, data was collected in both the Australian and Egyptian contexts. Two contemporary healthcare sites in Victoria, Australia, were selected including the Victorian Comprehensive Cancer Centre (VCCC), housing Peter MacCallum Cancer Centre (PMCC), as large-scale hospital that provide outpatient services in metropolitan Melbourne and the Ballarat Regional Integrated Cancer Centre (BRICC), as smaller-scale building offering similar services in a regional context. Two focus groups were also conducted with former patients through consumer groups in Victoria including the Grampians Integrated Cancer Services (GICS) (regional) and the North Eastern Melbourne Integrated Cancer Service (NEMIC) (metropolitan) in which patients had attended mainly older hospital settings. In the Egyptian context, the South Egypt Cancer Institute (SECI) in Assiut was selected serving as a further representation of traditional (older) hospital settings while increasing the diversity of the sample by introducing cross-cultural perspectives. Some of the Egyptian participants had also had experience of treatment in newer facilities.

In the survey phase, PMCC and BRICC continued to be study sites in addition to the inclusion of two extra hospitals in Victoria to enable broader coverage of existing conditions including Olivia Newton-John Cancer Wellness & Research Centre (ONJ), representing other contemporary design with a different treatment area setup, and Alfred Health (ALFRED) representing the traditional category as an older building design. Both of these hospitals are located in metropolitan Melbourne. Figure 1.1 depicts the sites participated in this thesis with representation of the two field phases (interview and survey).

Different types of data collection have been selected to best effect research triangulation by using multiple sources of evidence to reach sound conclusions. This research approach acknowledges that any assessment of the built environment is subjective and that the findings will necessarily have limitations as a result, so the inclusion of multiple data sources is important to understand generic, rather than specific, effective design elements within healthcare settings. The research is intended to support design and maintenance decision-making in ambulatory cancer care centres to provide the best possible environment for patients.

1.6.2 Ethics

Ethical approval for this study was obtained from both the researcher’s academic institution (the University of Melbourne) in Australia as well as the ethics committee within each of the participating hospitals. The process was sequential starting with the University of Melbourne and followed by each of the participating health institutions. Agreement was also established with the Egyptian hospital through their own ethics department. The following indicates the reference number of each ethical approval.

- University of Melbourne Ethics ID: 1647952.
- SECI: ID not provided
- PMCC: HREC Reference No: LNR/17/PMCC/134, Project No: 17/107L.
- BRICC: HREC Reference Number: LNR/18/BHSSJOG/35.
- ALFRED: required authorisation following addition to PMCC application.
- ONJ (represented in Austin Health): required authorisation following addition to PMCC application.

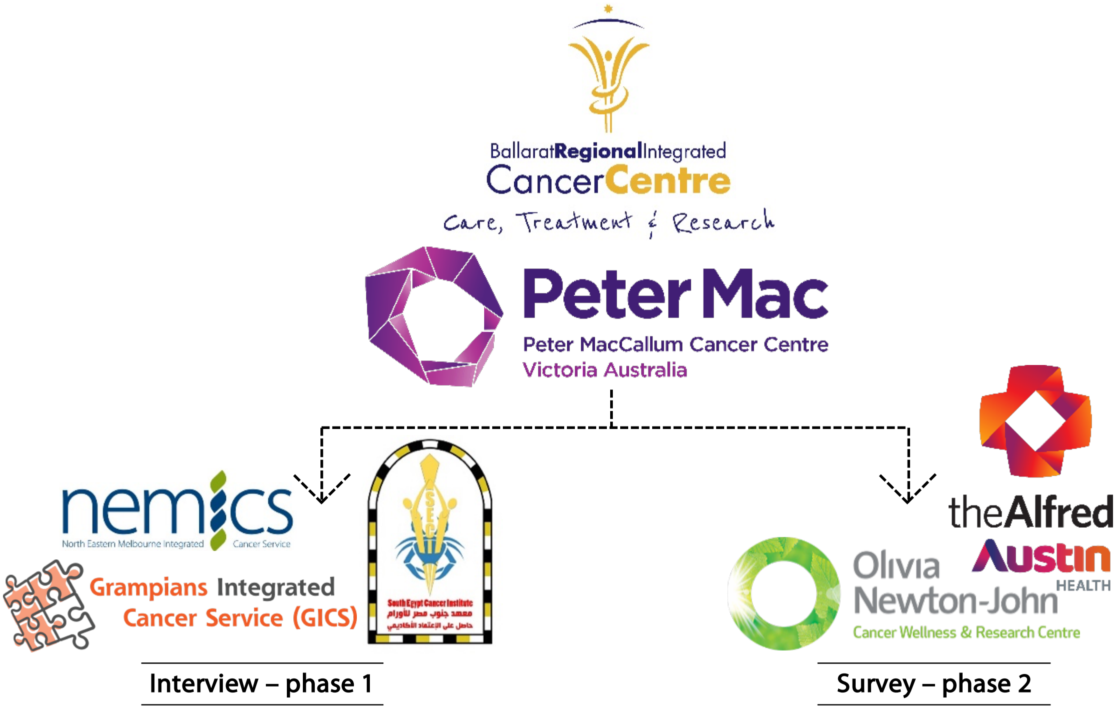


Figure 1.1 Healthcare organizations participating in this thesis.

In the following chapters, the thesis begins by reviewing preceding attempts to explore the architectural design qualities conducive to patient support in the planning and delivery of oncology settings in order to furnish the conceptual grounds for the investigation. The literature review continues by exploring previous attempts to develop tools to measure patient perception of the healthcare built environment, with a particular reflection on the extent to which established criteria for reliability and validity have been applied to such tools. The study then elaborates on the conducted field work combined by the methodological framework and subsequent results and discussions. A flow chart of the thesis structure is presented in Table 1.1 alongside highlights of the sections where each of the thesis research questions was addressed.

Table 1.1 Thesis structure

Thesis structure	Content	*Research questions addressed* 1	2	3	4	5
Chapter 1	*Thesis overview:* states the research problem, context and motivations. Research scope and methods are briefly outlined.					
Chapter 2	*Literature review of preceding qualitative research:* Comprehensive review of the theoretical basis of a supportive or healing-promoting environment. Attempt to synthesize the main, wellbeing-related, architectural design qualities that contribute to such a concept in the planning of oncology settings.			▨		
Chapter 3	*Literature review of available survey tools:* Review of tools developed to measure patient perception of the healthcare built environment. Discussion of the attempts made to establish valid and reliable properties of such tools and their potential shortcomings.					▨
Chapter 4	*A Qualitative inquiry – Methodological framework:* Outlining the methodological orientation, data collection methods and the analytical framework for the interview phase.					
Chapter 5	*Interview results – Australian context:* Drawing on key aspects of the built space that shape patients' experience. Four key themes are synthesized conceptualizing the main explicit roles that supportive healthcare design play in cancer patients' experience. The chapter contributes to a refined, and more comprehensive, conceptual understanding of the way the built environment may promote wellbeing.	▨		▨		
Chapter 6	*Interview results – Egyptian context:* Elaborating further on the impact that different building conditions may have on patients' satisfaction and wellbeing.	▨	▨	▨		
Chapter 7	*Discussion of the interviews:* Analysis of the implicit signification of the interviews' outcomes. Highlighting the distinctive effect of the built environment and elaborating on the extent to which the built space may affect patient wellbeing and other health-related outcomes. Further discussion of the role of the hospital built environment in complementing the notion of patient-centred care and comprehensive support is considered.	▨	▨	▨		▨
Chapter 8	*Survey tool development:* Outlining the development of a survey tool tailored to measure (quantify and characterise) patients' perception of ambulatory cancer facilities. Reflection on the initial steps to establish credible properties of the tool's content.				▨	
Chapter 9	*Survey tool testing and field study results:* Examining the tool's psychometric properties to establish further levels of reliability and validity of the tool's construct. Reporting on the empirical findings of measuring patients' perception of the built environment through relevant descriptive and inferential analytical techniques of the collected data.			▨	▨	▨
Chapter 10	*Conclusion:* Highlighting main outcomes, thesis contribution to the field, limitations and future work.	▨	▨	▨	▨	▨

Chapter 2

Literature review of preceding qualitative research

2.1 The theoretical background of healthcare supportive or healing-promoting environments

As indicated in the introduction of Chapter 1, the factors that make supportive or healing-promoting environments have been the topic of multiple investigations, where scholars have proposed and refined different theories to capture its basic concepts. The Theory of Affordance (Gibson, 2014), Biophilic design (Kellert, 2008), Environmental Enrichment (Janssen et al., 2014), Attention Restoration Theory (Kaplan & Kaplan, 1989), and Restorative Environmental Design (Derr & Kellert, 2013) are examples of such attempts to consider various aspects of the built environment. One of the earliest theories concerning healthcare environments in particular was that developed by Florence Nightingale during the nineteenth century. In this theory, the importance of noise, lighting, ventilation and crowding was noted as a factor in the uneven survival rates that Nightingale observed within different healthcare facilities that possessed different environmental qualities (Nightingale,1863).

Roger Ulrich, in his seminal studies on healing environments, postulated three main factors as contributing to stress reduction and promoting wellbeing in healthcare contexts (Ulrich, 1991). His theory of Supportive Design highlights the importance of providing environments that: i) foster user control over their surroundings, ii) facilitate access to sources of positive distraction, particularly nature, and ii) provide resources to facilitate social interaction with family, fellow patients, and/or staff. Like Ulrich's work, the theory of Salutogenic Environments (Heerwagen, Haubach, Montgomery, & Weimer, 1995), based on Aaron Antonovsky's salutogenic framework (Antonovsky, 1987), emphasizes aspects of social cohesion, personal control, and restoration/relaxation in supporting human health and wellbeing.

A more comprehensive approach was established by Stokols (1992) in his conceptualization of Health-Promotive Environments across a wide perspective of community settings. Three dimensions of health were identified as foundation of salutogenic environments, namely:

physical; mental and emotional well-being; and social cohesion. In additional to the essential qualities of personal control, social support and environmental aesthetic, the framework highlighted other aspects related to physical health, such as the ergonomic, safety and comfort dimensions of design.

2.1.1 Updated conceptual considerations

Despite the significant contribution of these theories to the field, they do not fully capture the various environmental aspects that patients consider important. Devlin et al.'s (2016) study, in which the most important features that patients' value for their hospital room were qualitatively explored, reported that Ulrich's theory of supportive design accounted for around 65% of patients' overall comments regarding the built environment. However, other features mentioned (e.g. room layout, spaciousness, cleanliness, furniture) did not fit within the scope of Ulrich's theory. This is further supported by Elf et al.'s (2017) review, in which the authors pointed to the need for more contemporary theoretical foundations when developing assessment tools to effectively account for patient wide experiences.

Contemporary directions for optimal cancer care point to further environmental considerations that may shape a more comprehensive conceptualization. Studies point to environments that: support a welcoming atmosphere (Timmermann et al., 2015; Van der Linden, Annemans, & Heylighen, 2015); maintain feelings of being in safe hands (caring for the environment symbolizes caring for people) (Edvardsson, Sandman, & Rasmussen, 2006); and support patients' level of understanding (libraries, advocacy spaces, print materials, etc.) (Edvardsson, Sandman, & Rasmussen, 2005). These directions are in line with the concept of wellness centres for cancer patients, such as the Maggie's centres in the UK (Van der Linden et al., 2015), Copenhagen Centre for Cancer and Health in Denmark, and the Wellspring and Gilda's Club in Canada (English, Wilson, & Keller-Olaman, 2008). Maggie's, for instance, is a UK charity that strives to provide psychosocial support to cancer patients, and their families and friends in a homely environment away from the context of traditional hospitals. These are places that aim to empower patients by providing aspects of professional, social, informational and emotional support within exceptional architectural settings that maintain these operations and offer the potential to support the healing experience (Maggie's, 2011; Van der Linden et al., 2016). These approaches are gaining increasing attention and are gradually being integrated back in contemporary healthcare settings, such as in the Victorian Comprehensive Cancer Centre and the Olivia Newton-John Cancer & Wellness Centre in

Melbourne, Australia (both study sites for this thesis), which contribute to further transformation of healthcare settings and their role in supporting patient experience.

2.2 Aim of the review

In the process of updating the conceptual understanding of a supportive or healing-promoting environment, this chapter reviews existing literature in order to provide a comprehensive overview of the architectural design qualities that have the potential to support the healing process with a determined reflection on patients undergoing intravenous anti-cancer treatment (e.g. chemotherapy) within ambulatory settings. Here we define architectural design qualities as aspects of the designed built environment, including fixed or relatively permanent aspects (e.g. walls, windows, spatial layout, size and shape of rooms), interior design features or the less permanent aspects (e.g. furniture, colours, interior plants, artwork) and ambient features such as lighting, noise levels, odours, and temperature. Through integration of insights from qualitative studies conducted to reveal the meaning and significance of patient experience within oncology care context and other established evidence of what constitutes a supportive environment, the chapter proposes a comprehensive framework as a first step to facilitate further investigations into cancer patient experiences of their treatment environments.

2.3 Methods

The focus of this review was prompted by the limitations noted in the theoretical propositions developed to capture the contemporary basic concepts of supportive healthcare environments. Qualitative studies are critical for such conceptual investigation, and hence are the focus of this review, because they illuminate the complexity, depth and range of patients' experiences relevant to the design of built facilities (Todres et al., 2009), allowing for wide range of perceptions to be considered (Streiner, Norman, & Cairney, 2015). Studies that quantify the impact of hospital settings on patients' health-related outcomes (e.g. quality of life measures), albeit critical, are therefore outside of this chapter's scope. Quantitative studies in such contexts are also relatively rare and hence has potential for future exploration.

An initial literature search confirmed the paucity of studies addressing patient experiences of the built environment in ambulatory cancer facilities. The scope was therefore expanded to cover research in other cancer settings, such as inpatient and palliative settings. Several databases were explored including Ovid MEDLINE, CINAHL, PubMed, and Embase. The search was conducted in October 2016 and updated in July 2017 following assistance of a medical librarian at the University of Melbourne. Controlled vocabularies and natural keywords were used to search for terms describing hospital-built environment combined by patient satisfaction/experience in cancer settings as described in Table 2.1. No time limit was applied and the language was restricted to English. The search results were scanned for relevance at the title and abstract levels and selection was made following the criteria described in Table 2.2. A similar search using a relevant architectural database, the Avery Index, was followed and retrieved three articles outside of the study scope – an outcome that supported the focus on health-related databases. Although the scope of the reviewed studies is different from common studies in the health sector exploring complex phenomena related to patient's health and treatment, the guidelines of the Centre for Reviews and Dissemination (CRD, 2009) and the PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist (Moher et al., 2009) have been carefully checked in the searching and reporting of the essential matters relevant to this review.

Table 2.1 Search strategy summary

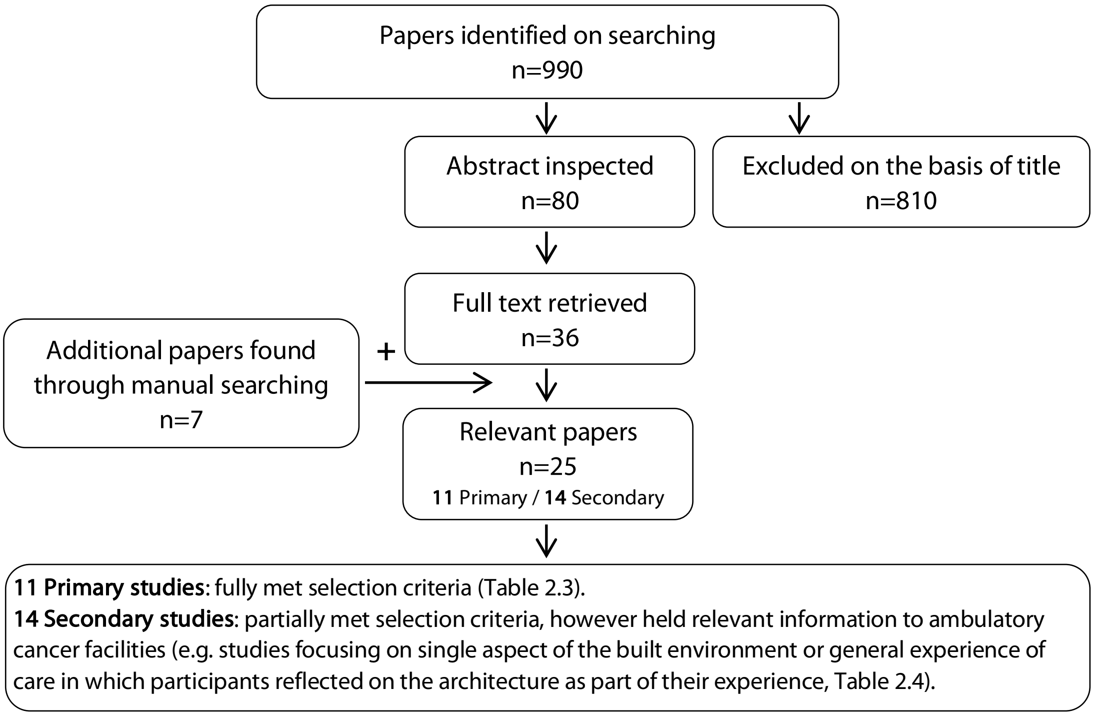
Key Words **(MeSH) headings*	Hospital Design and Construction* OR Interior Design and Furnishings* OR Health Facilities* OR Ambulatory Care Facilities* OR built environment OR building design OR architecture OR physical environment **AND/OR** (healing OR supportive OR salutogenic OR wholesome OR health promoting) environments **AND** Patient Satisfaction* OR experience OR perception OR attitude OR impression OR views OR preference OR perspectives OR opinions **AND** measure OR assess OR evaluate OR appraise **AND** Neoplasms* OR Medical Oncology* OR cancer

Table 2.2 Selection criteria for the reviewed articles

- Original research papers exploring patient-reported experiences from a place/spatial-centred design perspective (experience with: the architecture, interior design, furnishing etc.).
- Studies targeting adult cancer patients (aged 18 years or older) in both outpatient and inpatient settings.
- Studies with a qualitative and explorative basis.

2.4 Results

After removing duplicates, 990 records where identified, of which 80 studies were selected based on title screening. The full text was sought for 36 peer-reviewed articles following an abstract review. Using Google Scholar, an additional 7 studies were located based on manual "snowballing" searching of reference sections and other publications that had cited the 36 identified studies. Methodological quality of the selected studies was assessed individually by the PhD researcher and his thesis supervisor. Articles considered poor were subsequently excluded. Out of the 43 examined studies, twenty-five were identified as relevant and were classified as described in Figure 2.1.



11 Primary studies: fully met selection criteria (Table 2.3).
14 Secondary studies: partially met selection criteria, however held relevant information to ambulatory cancer facilities (e.g. studies focusing on single aspect of the built environment or general experience of care in which participants reflected on the architecture as part of their experience, Table 2.4).

Figure 2.1 Flowchart of search strategy and selection process.

2.5 Analysis

In order to identify the main constituents of a supportive or healing-promoting environment, a narrative synthesis strategy (Rasmussen & Edvardsson, 2007; Saunders, Carter, Jordan, Duffield, & Bichel-Findlay, 2016) was used to systematically gather evidence and explain the findings of the reviewed articles. Extraction of data was performed using the following steps: i) major dimensions of a supportive built environment were conceptualized by extracting and combining the themes developed across the primary included studies in an excel file; ii) patient experiential narratives were drawn and synthesized to inform and illustrate those major dimensions; iii) where appropriate, studies defined as a 'secondary source' (Figure 2.1) were used to support the synthesized themes. This provided five philosophically informed dimensions or major architectural-related themes, which together, form a conceptual framework that constitutes a thorough overview of the wellbeing-related design qualities that contribute to the development of supportive healthcare environments.

Table 2.3 Primary studies

	Reference	Research Design	Setting	Country
1	Timmermann, Uhrenfeldt, and Birkelund (2013)	Qualitative interviews; exploring patient sensory impressions of the hospital built environment.	Inpatient oncology ward in a general hospital	Denmark
2	Edvardsson, Sandman, and Rasmussen (2006)	Qualitative interviews; exploring patient views of the hospital built environment.	Outpatient Oncology centre with a focus on patient undergoing radiotherapy	Sweden
3	Edvardsson, Sandman, and Rasmussen (2005)	Qualitative interviews and observations; exploring the basic architectural qualities and social interaction contributing to supportive care settings.	Data collected across different settings including hospice, geriatric and acute wards	Sweden
4	Timmermann, Uhrenfeldt, Høybye and Birkelund (2015)	Qualitative interviews and observations; exploring meanings that patients assign to the hospital built environment.	Inpatient palliative ward in a teaching hospital	Denmark
5	Van der Linden, Annemans, and Heylighen (2015)	Qualitative interviews; focusing on patient perception of the built environment.	Outpatient wellness centre (Maggie's centre)	United Kingdom
6	Høybye (2013)	Qualitative interviews and observations; focusing on patient perception of the built environment.	Inpatient oncology ward	Denmark
7	Rowlands and Noble (2008)	Qualitative interviews; exploring patient experience of the built environment.	Inpatient oncology ward in a regional cancer centre	United Kingdom
8	Moore, Carter, Hunt, and Sheikh (2013)	Qualitative interviews and photo-elicitation; exploring patient experience of the built environment.	Hospice day-care centre for Terminally ill patients	United Kingdom
9	Browall, Koinberg, Falk, and Wijk (2013)	Qualitative interview; exploring patient perception of the important factors of the healthcare environment.	Inpatient oncology ward at a university hospital	Sweden
10	Wang, Pukszta, Petzoldt, and Cayton (2011); Wang and Pukszta (2017)	Mixed methods including surveys and qualitative interviews; investigating patient perception of different aspects of the built environment.	Outpatient/Ambulatory infusion centres	United States
11	Niedzielski, Rodin, Emmerson, Rutgers, and Sellen (2016)	Qualitative interview; exploring patient experience of a hospice built environment.	Inpatient hospice centre	Canada

Table 2.4 Secondary studies

	Reference	Research Design	Setting	Country
1	George, de Boer, and Green (2017)	Qualitative interviews; focusing on the influence of a choice of artwork.	Inpatient oncology ward.	United States
2	Hanson, Schroeter, Hanson, Asmus, and Grossman (2013)	Quantitative survey incorporating qualitative questions; exploring cancer patients' preference for photographic art.	Inpatient oncology unit in an academic hospital setting	United States
3	Larsen, Larsen, and Birkelund (2014)	Qualitative interviews and observations; exploring the impact of the hospital built environment on patient interaction.	Inpatient oncology ward	Denmark
4	Pease and Finlay (2002)	Quantitative survey; investigating patients' preference of single vs shared treatment rooms.	Inpatient oncology ward	United Kingdom
5	Howard, Gleeson, and Higgins (2014)	Quantitative survey; investigating patients' preference of single vs shared treatment rooms.	Inpatient hospice ward	Ireland
6	Sitzia and Wood (1998)	Quantitative survey; investigating satisfaction with nursing care in addition to comments on preferences of single vs shared treatment room.	Outpatient day-chemo	United Kingdom
7	Bisschop et al. (2017)	Qualitative interviews; investigating general experience of patient-centred care	Oncology outpatient clinic	Netherlands
8	Mackereth, Campbell, Maycock, Hennings, and Breckons (2008)	Patient evaluation of a chair massage in the waiting area. Measuring wellbeing through the "Feeling Good Thermometer."	Oncology outpatient clinic	United Kingdom
9	Farrugia, Ingledew, Dawes, and Moss (2006)	Questionnaire-based evaluation of using electronic pagers in waiting areas	Outpatient day chemo	United Kingdom
10	Young, C. (2015)	Specialized report by Steelcase Furniture company commenting on patients needs in chemotherapy infusion suites from a practice point of view.	Outpatient day chemo	United States
11	Kleeberg et al. (2005)	Quantitative survey measuring general satisfaction with care.	Outpatient oncology centre	Germany
12	Mcilfatrick, Sullivan, and McKenna (2003)	Qualitative interviews exploring patient general experience in day hospital chemotherapy service.	Outpatient day chemotherapy unit	United Kingdom / Northern Ireland
13	Karvinen, Carr, and Stevinson (2013)	Quantitative survey examining the extent to which physical activity services exist within USA cancer centres with focus on survivor patients.	75 cancer centre representatives	United States
14	Block, Block, and Gyllenhaal, (2004)	Discussing optimal healing environment for cancer patients based on authors' clinical experience. Part of the discussion focused on the built environment.	Integrative medicine settings	United States

2.6 Discussion

This section discusses the refined conceptual proposition of this thesis following the interpretation and synthesis of the wide variety of concepts and patient-narrated experiences of the built environment. In order to differentiate between the identified contexts of inpatient and outpatient services, the outcomes of each synthesized theme are reported in the order of patient experiences in general oncology settings (e.g. inpatients), followed by specific experiences within outpatient facilities as appropriate. Each context is further stated within the reported data as well as in Table 2.3 and Table 2.4. Demographic data is also noted alongside patients' excerpts, if reported in the original study, in the following format [gender, age, cancer type]. Themes drawn from the reviewed studies are incorporated in *italics* whereas patient excerpts are included between quotation marks.

2.6.1 Stimulating and homely environments

2.6.1.1 Visual appearance and distraction

The built environment can be the patient's first impression of a healthcare service. The architectural aesthetics of the space is regularly reported as a contributor to patient satisfaction and perception of the quality of care, beyond its potential distractive role (Becker & Douglass, 2008; Belver & Ullan, 2010). This latter attribute of some environmental features that can attract patient attention and facilitate a shift of focus receive greater appreciation by cancer patients and are recognized as *a source of support during their hospital attendance* (Edvardsson et al., 2006). It is further highlighted, in a study of cancer hospital wards, as critical for *promoting positive thoughts and feelings* (Timmermann et al., 2013).

Colours, paintings, artwork and handcrafted furniture are examples of different design features that were reported to facilitate *positive sensory impressions* (Edvardsson et al., 2005). Such visual qualities were described as sources for patients to engage with, giving them opportunities to escape potentially anxious situations and think of something else than their illness (Edvardsson et al., 2006) – *adding meaning and hope for tomorrow* as reported by Edvardsson et al. (2005). One participant in a study involving inpatients in a palliative setting referred to the role of artwork in *generating positive moods* by the following: "… a painting in the patient room could lift the room as a whole… Art and colors lift one's spirit and induce a positive mood—you simply become more positive…" (Timmermann et al., 2015). In another study within inpatient units, presence of framed art in patients' room *evoked aesthetic and symbolic values, distracted patients, and contributed to* *a more humanized environment*, leading to notable improvements in patient perception of the space (George, de Boer, & Green, 2017). Artwork needs to be carefully selected, as particular types may evoke negative feelings as described by another participant in the same study referring to the painting presented in her room by the following: "Used to make me mad… I wish I could've said to somebody, 'Can you take that painting down?" General guidelines were suggested by Hanson, Schroeter, Hanson, Asmus, and Grossman (2013) who documented patient tendencies to choose photographic arts that include landscape and water features.

In Edvardsson et al.'s (2006) study that involved cancer patients attending an ambulatory clinic for radiotherapy treatment in Sweden, patients commented further on the *stimulating effects* of other visual features such as a fish tank in the waiting area: "That's very stimulating, to sit and watch, it calms you down… by that you can forget that you are in a hospital, it slips from your mind…" Positively attuning patients' emotions were also reported to evoke *a sense of empowerment and strength*. Another patient in Timmermann et al.'s (2015) study stated: "pleasant and cozy surroundings mean a lot to me because I am ill and I have to keep my spirits up. It is all about feeling powerful, and pleasant surroundings bring me extra strength in a situation with a strong focus on my illness."

Architectural form and spaciousness are also highlighted areas under the visual impression's domain. Patients referred to spaces that avoid narrowness and tightness, describing them as sources for *maintaining positive thoughts* (Timmermann et al., 2013). Spaciousness is seen as a component of a room's physical attractiveness (Pruyn & Smidts, 1998), where lack of such has been linked to perceived crowding and potential environmental stress (Stamps III, 2007). In a study involving patients attending one of the Maggie's wellness centres in the United Kingdom, one patient said: "there's something about having space above your head (…) It's almost like your thoughts feel less in your head. It's almost like they expand out. So physically that's something, I think, that makes you feel better" (Van der Linden et al., 2015). In this study, patients referred further to the role of architectural form in stimulating their mind. Unique and unconventional forms were perceived as an *inspirational and thought-provoking source*: "allowing new discoveries from every different angle"; "It's fascinating. It fascinates me anyway. And if it starts to fascinate you, it stimulates your brain. And if it stimulates your brain, it stimulates other thing that you want to get on with" (Van der Linden et al., 2015).

Another integral part of the visual or aesthetic appearance of a space is the connection to the outside world, particularly nature and therapeutic landscaping (Ulrich et al., 2008). Outcomes related to reduced stress, perception of pain, analgesic use, and length of stay, have been frequently linked with a view to natural elements and its associated daylighting in general hospital settings (Ulrich et al., 2010; Vincent, Battisto, Grimes, & McCubbin, 2010), rendering it as a prominent attribute for creating a supportive healthcare environment. The reviewed articles highlight the importance of views as a *source of distraction, relaxation and control of negative thoughts*. This was clear in patients' excerpts such as "I like it here [sitting by a window]– it is relaxing. When I sit here, it is as if I can escape it all for a little while…" (Timmermann et al., 2013). The importance of both views to natural elements as well as outdoor life was equally stressed within patients' narratives: "… I am also watching what is going on outside… a car in the street or some boats in the marina are sailing by… Perhaps something going on at the harbor…" (Timmermann et al., 2013); "well, it may not be a whole lot you can see, but just the view of a treetop makes a world of difference to me" [Male, 46, leukemia] (Høybye, 2013).

Design can also play a role in promoting the presence of local fauna and flora within outdoor spaces. Watching fauna (e.g. bird) behaviour was noted as valuable stimuli for patients (Høybye, 2013; Timmermann et al., 2015): "last time I was in [for treatment] was this couple of pigeons in the tree outside the window. I spent hours watching them from my bed…" [Male, 46, leukemia] (Høybye, 2013). Thoughtful attention to the inclusion of outdoor gardens allow also patients to physically access and enjoy time outdoors, an opportunity preferred by hospitalized cancer patients and regarded as beneficial to their experience (Moore et al., 2013; Rowlands & Noble, 2008).

2.6.1.2 Visual appearance and homely environments

In addition to positive distraction, aesthetically pleasing environments contribute to a friendly and welcoming setting, evoking *feelings of knowing the surroundings* and thereby *a sense of homeliness* (Moore et al., 2013; Timmermann et al., 2013; Timmermann et al., 2015). Patients' narratives establish this link between visual impressions and homely atmosphere. One patient in Timmermann et al.'s (2015) study stated: "the warm colour of the floor makes the room friendly and welcoming. Had the floor been more hospital like, one might get a sense of distance. It does something positive to the room if you can make it at little more homelike. I would use the word 'coziness.' Some medical equipment is of course necessary, but if you get a sense of homeliness, the clinical impressions become less dominant."

Another patient established this notion further by referring to his room as follows: "the atmosphere of this room is not positive. Everything is white and clinical. I would not want my living room to look like this room." This feeling of 'at-homeness' is critical as it may contribute to less alienating settings and provide a degree of security and comfort, allowing patients to navigate the environment at ease (Todres et al., 2009). In contrast, clinical and drab spaces are perceived as institutional settings and reported to *trigger negative feelings and thoughts* (Timmermann et al., 2015). One patient in Timmermann et al.'s (2013) study commented about her grey coloured room stating: "I actually became very depressed spending time in that room."

Outside views were also reported from another perspective than the distraction benefits. One patient saw it as a source of *maintaining feelings of being at home* stating: "I live in the countryside where I can go out whenever I want to, and where there is plenty of space and fresh air around me. This means a lot to me . . . and here I am able to watch the same things around me as I do at home. You do not feel uneasy about being here . . . in a way it feels like being at home…" (Timmermann et al., 2013). This has been further documented by Moore et al. (2013) where one patient continued to address the outdoor garden as follows: "In a way it's a bit like home from home when I'm on my own you know and just chill out and relax." This idea of creating a home away from home, if facilitated within ambulatory care settings, may encourage patients to treat the day care unit as an extension of their dwelling, allowing a further sense of at-ease to flourish. A view to outside nature was further regarded as a *source of strength* as well as a *source for recalling good memories and personal life stories*. One patient stated, "I think it is healing to be in such a place. Water makes me feel calm and happy – and in my younger days I spent a lot of time at the marina. It brings back [red. sitting by the window] good memories from the past… and I remember all the good things from back then" (Timmermann et al., 2013).

2.6.2 Flexibility and environmental enrichment

Admission to a hospital implies submission and diminished independence (Andrade & Devlin, 2015). Patients, besides the disease challenges, may be forced to adhere to various clinical routines (e.g. limited activities, sleeping and eating schedule) that detract from their control over basic aspects of their daily lives and may yield feelings of helplessness (Browall et al., 2013). The enforced company of others, excessive noise and temperature conditions are other examples of environmental stressors that may amplify an inherently stressful situation (Trujillo, Aviñó, & Millán, 2017) and ultimately affect patients' satisfaction and wellbeing (Andrade & Devlin, 2015). A flexible environment that provides opportunities to choose and modify aspects of the surrounding setting may play a critical role in empowering patients with a degree of control (Huang, Robertson, & Chang, 2004) and ameliorating stressful conditions (Browall et al., 2013). A sense of empowerment is particularly important for cancer patients whose disease and treatment impose challenges that make them prone to feeling out of control and vulnerable (Edvardsson et al., 2006; Høybye, 2013). Vaartio, Kiviniemi, and Suominen (2003) reported that a sense of control over basic aspects of the surrounding hospital environment had the capacity to promote cancer patients' ability to cope with the treatment demands.

2.6.2.1 Environmental options and privacy

Single vs shared treatment spaces

Providing options to choose between single and shared treatment spaces was reported as a source for *negotiating privacy* (Høybye, 2013) and *maintaining a balance of community and withdrawal* (Edvardsson et al., 2006). A lack of such options was referred to by one patient describing the shared treatment area as "…being on a bus during rush hour" stating that "the only room that offers any privacy around here is the bathroom" (Browall et al., 2013). Research has shown that patient might withhold information or decline examination if they felt concern about being overheard – a reaction that may contribute to adverse health consequences (Larsen, Larsen, & Birkelund, 2014; Ulrich et al., 2008). Protecting patient confidentiality and speech privacy is promoted by the HIPAA (Health Insurance Portability and Accountability Act) and regarded as a contributor to a climate of patient-centred care in cancer settings (McCormack et al., 2011). Providing alternate spaces for private conversation (e.g. consultation rooms) is another way to overcome the potential lack of single treatment options (Ulrich et al., 2008). Such an option can be of benefit in accommodating other professions such as psychologists or social workers, who were reported to meet with cancer patients in public waiting areas within outpatient departments as a consequence of lack of dedicated office spaces (Department of Health and Human Services, 2011b).

Despite growing evidence that supports individualized treatment spaces (Chaudhury, Mahmood, & Valente, 2005; Ulrich et al., 2008), studies pertaining to cancer patients' experiences reveal an entwined point of view. In the reviewed articles, hospitalized patients indicated tendency to appreciate the company of fellow patients as a way to *combat feelings* *of isolation/boredom*, as well as an opportunity to *share experiences with like-minded people* (Larsen et al., 2014; Pease & Finlay, 2002). In that, double rooms were preferred over triple or more bedrooms due to their capacity to balance the needed company, with an enhanced degree of personal interaction, while allowing for easier withdrawal and reduced noise levels (Larsen et al., 2014). This popularity was not the case in Howard, Gleeson, and Higgins's (2014) study in which patient preference was equal for single and shared room options. The treatment stage adds a further level of entanglement, where new patients were noted with tendency toward shared rooms as a potential source for encountering additional information, while returning patients had preference for private treatment options (Larsen et al., 2014). Rowlands and Noble (2008) pointed to patient preference for a choice depending on their health status and ability to interact. One patient stated: "if you're ill and just want quiet a cubicle is great but if your brain is active and alive you want a room where you can have a conversation."

Fewer studies exist to inform the design of outpatient cancer environments. Patient preference of single vs shared treatment spaces was investigated in a study targeting patient satisfaction with nursing care of a day-chemo unit in the United Kingdom (Sitzia & Wood, 1998). Most respondents preferred shared spaces (67%) over curtained cubicles (7%) referring to being with other patients as *supportive* and contributing to more *pleasant environment*. The only study found with a focus on ambulatory built environments reported further on the intricate needs of cancer patients revealing an even preference for a choice of single, semi-open (shared space with retractable screens) and open treatment spaces (Wang, Pukszta, Petzoldt, & Cayton, 2011; Wang & Pukszta, 2017). This diverse inclination appeared also when analysing patients' comments; patients expressed their opinion of shared treatment areas loaded with facing recliners by expressions such as: "don't put us in a big fishbowl." Another patient pointed to the importance of fellow patient interaction: "I really felt good about helping a patient sitting next to me" (Wang et al., 2011).

In Wang and Pukszta's (2017) study, reasons for a private treatment space ranged from a desire of a quiet environment to take a nap or work on computer or phone, to a chance to maintain privacy in situations where the infusion port happened to be within intimate parts of patient's body (e.g. thigh, hip or under arm). On the other side, preferences for shared treatment spaces were related to increased level of social interaction, enhanced visual access to nurses, and a degree of distraction by the surrounding activities (Wang & Pukszta, 2017). The study reported also on the differences in patient perspective based on the location and scale of the facility with over 60% of patients preferring single rooms in large scale centres and the other way around in community, relatively small scale, centres (Wang et al., 2011).

Cancer treatment is based on individualized treatment protocols that are developed to meet every patient's particular case. Hence, patients may experience different physical and emotional consequences at different points along their treatment path (Young, 2015). This may explain patients' variable desires and supports the need for flexible environments that provide options to choose and adjust the surroundings based on preferences on the treatment day. Given the scarcity of such studies and the limited number of interviewed patients, further research is warranted to explore broader contexts with larger sample size and with reference to differing diagnoses, disease stage, social background and facility scale (metropolitan vs regional) (Rowlands & Noble, 2008; Wang & Pukszta, 2017).

Privacy in waiting areas

Facilitating privacy options extends to other areas such as the waiting space. In Browall et al.'s (2013) study, patients referred to the importance of privacy in these transitional spaces stating: "when I'm here for my chemo, I want some privacy. It doesn't matter if I'm in the lounge watching TV or somewhere else." Typical healthcare waiting rooms with arrays of chairs can discourage privacy and communication (Geboy, 2007). In a study exploring patient experience of patient-centred care at a Head and Neck Oncology outpatient clinic in the Netherlands, one patient commented on the importance of privacy in waiting areas stating: "look, all people in that room have cancer. From simple, to really severe and complex cases. I can feel that. And because you sit there with six in a row, it would be helpful to have a bit more space" [Male, 63, carcinoma in situ from the glottic area] (Bisschop et al., 2017). Another patient referred to changing desires based on how patients feel on the treatment day stating: "the waiting room has to be more separated. I think there are people who do not like to be seen there at all. Myself, I sometimes have that feeling, especially when you are very sick" [Male, 70, acinic cell carcinoma of the parotid gland].

2.6.2.2 Environmental options and personalization

Other aspects that may support patients sense of control appeared in providing opportunities to arrange private belongings. Light-weight movable furniture, lockable cabinets with handy access, side shelves and boards that allow placing photos or objects of personal value are examples of such features. These setups were documented to facilitate a level of *personalization to the treatment space* (Niedzielski, Rodin, Emmerson, Rutgers, &

Sellen, 2016; Timmermann et al., 2015), *rendering a sense of homeliness and control* (Høybye, 2013). A study in an outpatient context noted a tendency to place patients' belongings on the floor, beside their recliner, or in an empty guest chair (Wang & Pukszta, 2017). Facilitating options to turn the built environment into a familiar space, where patient can settle and dwell at ease, even for a short period of time, may add to *one's sense of self and identity*, provoking feelings of *at-homeness* as described by Timmermann et al. (2015). This repeated reference to the importance of a homely environment (welcoming, friendly, aesthetically pleasing, easy to reconfigure and personalise) is plausible given that homes are generally representative of safe places that associate with notions of rest, relaxation, and recovery from stresses (Coyle, 2004).

2.6.2.3 Environmental options and following one's own rhythm

The built environment has the capacity to increase patient sense of control far beyond merely facilitating personal privacy. Chemotherapy may last for hours (Shepley et al., 2012), during which patient might desire to engage in various activities. Easy-to-reconfigure furniture and provision of room setups (e.g. chairs, tables, power outlets, etc.) that eases engaging in daily activities of interest such as watching television, knitting, reading, using personal devices etc., was appreciated by patients receiving palliative care in inpatient settings and considered as facilitator to *following one's own rhythm* and *preserve a sense of self* (Timmermann et al., 2015) – "It makes me feel more like myself; the more I can continue to do what I used to do, the more I feel like myself."

Considering settings to facilitate patient engagement extends also to other spaces beyond the treatment zone. Patients in a hospice environment found communal spaces that allowed for simple activities like sharing drinks or food with visiting friends important for maintaining a sense of *normalcy* (Niedzielski et al., 2016). The waiting spaces, where patients might again spend a long time waiting for the preparation and processing of the treatment (Schneider et al., 2004), are also spaces where new and ordinary activities can be promoted. Besides the provision of adjustable seating options and work surfaces, the waiting area can integrate information technologies that add to the level of choice while assisting in wide range of productive activities such as self-check-ins, pre-screening and access to instructional and educational information (Carmichael & Agre, 2002).

Technology can liberate patients further from being in the waiting area in the first place. In a study evaluating the use of automated queue management and calling system (using pagers) within a day-chemo clinic in the UK, patients were reported to leave the waiting area with *a peace of mind*, allowing them to avoid *the boredom of waiting* while leveraging a *sense of control* over their time (Farrugia et al., 2006). Considering spaces for complementary activities, like massage, may also contribute to enriching the waiting experience with further engagement options. In a study evaluating the integration of a chair massage that provides short, seated, clothed treatments within an outpatient oncology waiting area in the UK, patients reported improved perception of waiting time in addition to enhanced wellbeing, relaxation, and reduction in anxiety after using the service (Mackereth et al., 2008). A dedicated room was suggested though to maintain privacy and encourage patients to participate.

Enriching the built environment with such variety of options and supporting settings appears critical as it recognizes patient individuality and may help promote a personalized treatment journey. Providing a level of choice and flexibility to modify the surrounding environment may play an important role in reducing environmental stressors and facilitate an individual sense of mastery over the built environment. With further options for engagement, a visit to a day-care unit may reach far beyond merely delivering treatment to a level of *maintaining personal interests and encouraging patients to move forward* as described by Moore et al.'s (2013) study, in which patients considered attending a day-care unit with different facilities for engagement as an opportunity to "get out and about" and *venture forward*. However, further investigations of the particular needs and desires of cancer patients, in a less explored setting like ambulatory care, is warranted to facilitate a determined design approach among such various ideas.

2.6.3 Social support

2.6.3.1 Maintaining existing contacts

Another area that has been widely highlighted within the reviewed studies is the social domain. The company of a family member or friend is considered an important factor for improving patient experience (Shepley et al., 2012) as well as reducing stress and anxiety (Andrade & Devlin, 2015). Presence of a companion provides instant monitoring of patient conditions besides reassurance that help is immediately available if needed, increasing *patient safety and security* (Young, 2015). Although this experience is shaped mainly by humanistic aspects, the built environment can play a pivotal role in accommodating and maintaining seamless presence of those capable of providing social support.

Ample spaces, for instance, were regarded as important to allow companions an opportunity to *sit/converse without disturbing other patients* (Browall et al., 2013). Considering flexible policies for family presence without proper attention to the physical setting may encourage *negative feelings to patients* as if their companions are "in the way" (Browall et al., 2013; Edvardsson et al., 2005). Planning appropriate size for the treatment spaces require therefore thoughtful attention to the number of guests typically accompanying patients (Wang & Pukszta, 2017) – an area that warrants further attention to appropriately inform the design of ambulatory cancer settings. Comfort is another important aspect for companions who might be stressed at keeping pace with their life demands while taking care of their loved ones. Providing comfortable seats, resting areas with easy access to storage, power, data and work surfaces may allow companions to manage the potentially long treatment sessions and *encourage their stay* as reported by Browall et al. (2013).

2.6.3.2 Developing new contacts

The built environment, while maintaining social relations among acquaintances, has the capacity to influence the creation of new contacts. Proximity to fellow patients within patients' rooms was seen as a chance for *interaction and social exchange of experiences* (Edvardsson et al., 2005; Høybye, 2013). One patient stated: "being here you meet a lot of other people in similar circumstances, and that takes your mind off things… just imagine if I was in this room all alone, then I could spend the whole day lying here feeling sorry for myself" [Male, 73, leukemia] (Høybye, 2013). Other patients experienced sharing a room *as a source of constant noise, disturbance, and unappreciated presence* [Female, 47, leukemia] (Høybye, 2013). This also appeared in Browall et al.'s (2013) study, where elderly patients indicated inconvenience in being forced to meet young people with cancer or socialize with emaciated patients. Patients general experience of a day-chemo unit in Northern Ireland highlights the significance of *developing companionship and sharing experience with fellow patients:* "you're exchanging experiences, it's great therapy, it's like a support group in its own, once you do that you don't need to talk about it outside anymore" (Mcilfatrick et al., 2003). This highlights once more patients differentiated perspectives, thereby indicating the importance of flexible environmental options.

Other possibilities for the built environment to support patients' social network include waiting spaces. Furniture arrangements in flexible, yet small groupings, is increasingly recognized as a rich source for balancing relative privacy and social engagement compared to the conventional repetitive arrangement that usually conveys an institutional atmosphere

(Evans, 1999). Providing alternate communal spaces (e.g. dining, roof garden, lounges) were further regarded important for allowing *natural and spontaneous opportunities to meet and interact with fellow patients* (Larsen et al., 2014). Allowing such opportunities promotes not only *options to exchange experiences*, but also act as a *source of distraction* (Høybye, 2013; Shepley et al., 2012) and *emotional support* (Browall et al., 2013).

2.6.4 Complementary support and engagement

Other emergent factors that shape the contemporary design of cancer care facilities is the increasing integration of complementary supportive care services. These services are generally introduced with a wellness-based intention, aiming at enhancing patient experience of relief and control of their suffering (Timmermann et al., 2015). Facilitating opportunities, such as patient access to specialist counselling, cancer support groups and education support, are examples of such endeavours (Annemans et al., 2012; Edvardsson et al., 2005). Other attempts provide opportunities to explore beneficial lifestyle programs such as massage, art therapy, yoga, tai chi, nutrition and diet training, among other services, have the potential to complement the healing experience.

Beyond supporting patient experience of relief, studies point to further benefits of these services such as facilitating opportunities to *maintain existing rituals* in addition to *encouraging patients' aspiration and engagement*. In Niedzielski et al.'s (2016) hospice study, one family member commented on the benefit of massage therapy as extension to her mother's regular habit: "massage for my mom was always a treat to herself. She would always go for a massage once a month." Engaging in such therapies and/or learning new things like art and crafts, were further reported as opportunities for patients to *reach beyond their sheltering to return to a world from which some of them had felt alienated* (Moore et al., 2013). Other opportunities were reported in providing facilities for physical activity within the treatment centres. Exercise can be of unique benefit to cancer patients undergoing chemotherapy. According to a study reporting clinical observation and experiences with cancer patients, Block, Block, and Gyllenhaal (2004) pointed to the potential role of mild exercise before treatment in relieving chemotherapy-induced nausea. Studies concerning cancer survivors point further to patient preferences for finding such facilities within cancer settings rather than in community-based centres (Karvinen, Carr, & Stevinson, 2013).

The value of these supportive care services implies particular consideration in the design of the physical space. Thoughtful attention to features such as exercise rooms, walking paths, outdoor spaces, adaptable community rooms for programs/social activities, individual and group space offering series of nonpharmacological care activities, and even nutrient spaces with options for cooking demonstration, among others, becomes therefore essential in order to arrive at a design that seamlessly supports and maintains the functional program of these services.

Information and education support are further fundamentals for maintaining this wellness-based caring approach. Besides information communicated by doctors/nurses, studies point to environments that supports patient level of understanding through the presence of facilities such as libraries, advocacy spaces, print materials, etc. (Edvardsson et al., 2005; Groff et al., 2008). Technological solutions can also provide further information opportunities: check in kiosks and/or wall monitors, besides assisting with queue management, can provide a platform for watching videos that provide targeted information to meet individual patient and visitor needs while contributing to efficient use of time (Keirnan, Murphy, Pedell, & Marcello, 2016). Facilitating such options to seek information has been reported by Larsen et al. (2014) as a further *source of control* to cancer patients. Further investigation is warranted to explore the factors that promote or hinder the effective use of such resources as well as patient preferences and experiences of such services.

2.6.5 Physical and sensory support

Amongst the potential symptoms of infusion-based cancer treatment are heightened sensory receptors, which may lead cancer patients to experience the built environment differently from other patients (Mazuch, 2017). Patients receiving chemotherapy may develop physical symptoms of nausea, dizziness, and fatigue (Ancoli-Israel et al., 2012; Chirico et al., 2016) in addition to potential experience of mobility and cognitive (e.g. concentration) difficulties (Janelsins, Kesler, Ahles, & Morrow, 2014; Schneider et al., 2004). Patients are prone to feeling cold, develop sensitivity to smell and taste, and require frequent use of toilets (Browall et al., 2013). Designing the built environment with careful attention to those physical and sensory demands may help patients better tolerate the treatment challenges.

2.6.5.1 Thermal comfort

Facilitating a degree of temperature control was ranked as a top environmental priority by cancer patients participating in Wang et al.'s (2011) study. A control system that allows individual options to adjust temperature may help meet the differing needs of users (patients, family members and staff). Among the spatial strategies that can facilitate such control are division of the treatment area into multiple HVAC (Heating, ventilation, and air conditioning) control zones, supplying each treatment station with over-hanging radiant heaters, providing options for infusion recliners with heated-seats, and/or allocating storages for blankets close-at-hand (Wang et al., 2011).

2.6.5.2 Aural comfort

Previous research demonstrates that noise can have critical consequences on patients' physiological and psychological health. Excessive noise may disrupt patients sleep (Timmermann & Uhrenfeldt, 2015), increase stress levels (Ulrich et al., 2010), affect speech intelligibility and render a state of annoyance (Iyendo, Uwajeh, & Ikenna, 2016). Further consequences may manifest physiologically such as high blood pressure, high heart rate, and low oxygen saturation (Ulrich et al., 2010). A quiet environment on the other side may improve perception of pain, reduce use of analgesic medication (Ulrich et al., 2010), and contribute to patients' general wellbeing (Browall et al., 2013).

In ambulatory cancer settings, Kleeberg et al. (2005) documented noise and crowding of patients in the treatment room as highly problematic issues expressed by patients. Basic design strategies, such as noise reducing finishes (ceilings and flooring materials) and use of noiseless paging systems, were reported as a contributor to hospitalized cancer patients' experience of being *able to follow their own rhythm* (Edvardsson et al., 2005) while *enhancing a general sense of wellbeing* (Browall et al., 2013). Facilitating further options to play pleasant sounds (e.g. soothing music) may help achieving more pleasant acoustics while *occupying patients' minds* (Block et al., 2004). Studies in general healthcare settings demonstrated that music simulating natural sounds (e.g. moving water/ songbirds) has the potential to mitigate stress and pain (Iyendo et al., 2016) and encourage relaxation and wellbeing (Ulrich et al., 2010). For patients undergoing chemotherapy, music was reported as an effective intervention contributing to alleviation of nausea and emesis (Schweitzer et al., 2004). Music is recommended by the American Pain Society and National Comprehensive Cancer Network as a complementary approach for managing and maximizing pain relief in conjunction with analgesic medication (Kwekkeboom, Bumpus, Wanta, & Serlin, 2008). Providing access to necessary supplies that facilitate the integration of music therapy within treatment environments is critical though to give patients such an additional option for environmental support.

2.6.5.3 Olfactory comfort (hospital air quality and ventilation)

Changes in taste and smell are other examples of chemotherapy treatment consequences (Bernhardson, Tishelman, & Rutqvist, 2009; Duffy, Fast, Lucchina, & Bartoshuk, 2002). In addition to general discomfort, the fluctuating olfactory senses may lead to nausea (Mazuch, 2017). This change in smell, in addition to taste, was reported as the second most frequent problem associated with cancer chemotherapy treatment (Wagland et al., 2016). Hospitalized cancer patients expressed the chance to open a window, a source for fresh outdoor smell, as critical for *their wellbeing* (Browall et al., 2013; Rowlands & Noble, 2008). A freshly ventilated environment was also seen as *indicator of cleanliness* – a critical aspect of *safety* (Browall et al., 2013).

Besides comfort aspects, improving air quality is an essential component for delivering a healthy indoor environment (Joseph et al., 2014; Zimring, Joseph, & Choudhary, 2004) as poor air quality may lead to adverse health effects (Stokols, 1992), increase chances of nosocomial infections, and lower patient satisfaction (Leung & Chan, 2006). Design attributes that incorporate higher rates of air change per hour has the potential to dilute odour concentration and other possible volatile organic compounds (VOC) (Mourshed & Zhao, 2012). Air filtering is another attribute for maintaining indoor air quality. Adopting technologies such as high-efficiency particulate air (HEPA) filters has been documented as contributor to a lower rate of infection incidences among hospitalized patients with immunocompromised conditions (Ulrich et al., 2004).

2.6.5.4 Physical comfort

Ergonomic comfort

Another notable side effect of chemotherapy is fatigue with Wagland et al. (2016) highlighting it as the most prevalent problem reported by patients undergoing chemotherapy. A thoughtful design of a simple piece of furniture like the treatment bed/chair can provide different levels of support, ranging from a sense of control, independence and safety to a state of physical and emotional comfort and feelings of being valued (Williams et al., 2008). For instance, adjustable treatment recliners with controllers at both sides may allow *flexibility to meet changes in physical comfort* and allow patients *a degree of control over their posture* (Young, 2015). Usability of these controllers needs to be further considered (straightforward with less reliance on dexterity and strength) in order to account for patients' potential physical weaknesses (Young, 2015).

Accessibility (Mobility and Wayfinding)

Easy to find and accessible design is an additional important feature when delivering cancer care facilities to combat not only potential fatigue but also mobility problems that patients may experience. Considering travel distance between services and allowing for assistive devices such as walkers, wheelchairs, and/or transfer boards may be required to maximize patients' mobility. Another complex area of accessibility is wayfinding. Difficulties in finding the way may hinder circulation (Abu-Obeid, 1998), result in missed appointments, and frustrate patients and their families leading to increased levels of anxiety (Ulrich et al., 2010). It may also distract staff time by giving directions incurring extra cost to the system (Zimring,1990).

Improving wayfinding is a complex task that cannot be resolved by relying on single design solutions such as signage or coloured lines on the floor (Geboy, 2007). Abu-Ghazzeh (1996) and O'Neill (1991) observed that it was not sufficient to rely solely on signage systems when the physical layout did not attain basic levels of configurational legibility. Likewise, Baskaya, Wilson, and Özcan (2004) highlighted the importance of other features, like landmarks and spatial differentiation, for acquiring environmental knowledge. Improving wayfinding requires consideration of different design aspects such as layout configuration (e.g. spatial arrangement, visibility connections), visual features (e.g. landmarks, colours), and environmental information (e.g. signs, you-are-here maps) in order to achieve a coordinated system that has the capacity to inform navigation (Sadek, 2015).

Technological advancements can provide an additional level to the traditional wayfinding systems. High-definition displays, touch-screen kiosks, and online information are becoming prevalent, and location-aware apps, available in smartphones, guide people navigation through showing the shortest path to a desired destination (Goldiez, 2004). It should be noted though that human differences may play a variable role in how people perceive and perform in a space (Geboy, 2007). Other factors need not be neglected, including organizational policies and practices (Sadek, 2015). These arrangements can aid navigation by interventions such as setting up appointment reminder with orientation information, providing convenient websites, and training personnel to efficiently handle direction requests.

2.6.5.5 Cleanliness and sense of safety

With patients more susceptible to infection, as for cancer patients due to the immunosuppressed condition caused by treatment, paying exceptional attention to the environmental cleanliness becomes imperative, not only for their safety (Young, 2015) but also for their satisfaction and wellbeing (Mourshed & Zhao, 2012). Browall et al. (2013) indicated that a clean and tidy environment may increase patients *sense of security* by conveying messages of *being in safe hands* and communicating *positive impressions of the quality of the provided care*. Patient expressions in Edvardsson et al.'s (2006) study supports this further: "if it is unclean I get feelings like how clean are they when they treat me? It's like a symbol of the care in a way."

Different environmental aspects can be utilised to maintain a clean environment and mitigate infection risk. Materials with antibacterial properties and surfaces that are easy to clean have been documented as a contributor to lowering hospital-acquired infection rates (Lenfestey, Denham, Hall, & Kamerow, 2013; Ulrich et al., 2010). Applying contamination-resistant materials like copper to high-touch surfaces such as door handles, bed rails, and toilet seats, has been observed to greatly reduce incidence of surface contamination with common pathogens (Salgado et al., 2013). Curtains are other common architectural features in healthcare settings that may contribute to transmission of pathogens (Steinberg et al., 2013). They are usually used to provide a degree of flexibility and privacy for patients sharing the same space. Frequent contact with such surfaces may contribute to transmission of infections. Similarly, curtains with antimicrobial materials or coatings, in addition to a practice of regular cleaning and replacement, were reported to help eliminate the outbreak of multidrug-resistant organisms (Steinberg et al., 2013). Considering alternative movable partitions that minimize or eliminate contact with such surfaces may add to that level of infection protection. Switchable privacy glass, windows with built-in blinds, or retractable screens that feature touchless technological control may further reduce contamination risk (Steinberg et al., 2013).

Other environmental interventions that may help in controlling infection risk are related to hand hygiene. Hospital acquired infections are greatly influenced by staff hands hygiene (Pittet et al., 2000). Careful design and placement of sinks and alcohol hand rub dispensers is reported to promote hand hygiene compliance (Mourshed & Zhao, 2012; Steinberg et al., 2013; Ulrich et al., 2010). Considering design attributes such as height, clear visibility while examining patients, and placement in standard locations may contribute to convenient utilization of such facilities (Steinberg et al., 2013).

Apart from ensuring infection control and the use of safe equipment, the built environment can play an additional role in elevating patients' sense of safety. Chemotherapy patients, specifically new patients, report concerns regarding the potential side effects and how their body might react to the medication. Assuring patients that nurses are nearby and easy to reach, by facilitating visual connection (e.g. clear sight lines) or means to call them (e.g. calling button), was reported as contributor to *feelings of security and safety* (Young, 2015). One patient stated: "… you're taking serious medicine through a serious needle and you can't really move, so it makes me feel a little more secure when I can see one of my nurses." This is also critical for staff who need to be able to observe their patients for any life-threatening reactions to the medication or potential falls.

Decentralized nursing stations are reported to facilitate close interaction between patients and staff (Ulrich et al., 2004), contribute to reductions in patient falls (Ulrich et al., 2010), as well as reducing walking distances and staff fatigue (Zborowsky, Bunker-Hellmich, Morelli, & O'Neill, 2010). However, employing such design features needs to be carefully considered as it may disrupt staff collaboration. In a study by Tyson, Lambert, and Beattie (2002), nurses reported feelings of isolation and loss of social support in such decentralized settings. A hybrid approach that introduces central meeting spaces in addition to the decentralized working station might overcome such shortcomings and arrive at an acceptable balance (Zborowsky et al., 2010).

2.7 Concluding remarks

This chapter explored the architectural design qualities conducive to patient support in the planning and delivery of oncology settings. Following a systematic review of the literature, core elements of supportive or healing-promoting environments were identified and conceptualized based on a careful synthesis of patient experiential narratives across the reviewed studies. Five major themes were determined through this review and their role in delivering supportive healthcare environments was discussed. Environments that facilitate comfort, safety and provide features to promote relaxation and stimulation for patients were examples of such supporting attributes. They constituted a core dimension that formed Todres et al.'s (2009) framework of humanized care – promoting positive thoughts and contributing to a sense of empowerment. The discussion also highlighted how challenging it may be to arrive at designs that meet the various, and sometimes conflicting, needs of cancer patients (e.g. changing preference for private vs shared treatment spaces). A step toward managing such potential differences lies in providing flexible settings that give people a greater choice and a degree of control over their surrounding environment. This may play a role in reducing environmental stressors as well as rendering a sense of normalcy for patients to occupy at ease a potentially alienating environment.

A prominent notion of a supportive care stems from the recognition of patient vulnerability and potential lack of control imposed by cancer and its treatment (Department of Health & Human Services, 2011a). Empowering patients with options in the treatment space, including: where to receive the treatment (private or shared spaces; indoor or outdoor), capacity to control ambient and furniture conditions, and facilities for visual and aural privacy during treatment, may augment patient support and play a role in balancing such potential feelings of lack of control. The built environment might also manage some of the specific treatment-related adverse effects by facilitating the ability to control thermal comfort as a way to regulate patients' potential sensitivity to temperature; considering travel distance between services and provide ergonomically sound design to assure physical comfort for potentially fatigued and mobility-hindered patients; and ensuring an abundance of fresh air to compensate patient sensitivity to smell, potentially reducing nausea in patients.

A further, and rarely considered, notion of a supportive environment appeared in its potential to transform patient visit from just a place to see a doctor to a place that encourages venturing and moving forward – a place that supports patients beyond just diagnosis and treatment, but also focuses on hope, wellness and activities of complementary support. Although this view was highlighted in only two of the reviewed articles and with different types of targeted patients to this study (inpatient hospice centre and a hospice day-care centre for terminally ill patients), it is a theme that supports the findings of this thesis. A summary of the five themes and the discussed design qualities are provided in Table 2.5. Aspects of the framework dimensions may overlap in some respects, however each underline an overarching domain that extends and complements the previous attempts to describe supportive environments. Continuous development of this approach paves the way for planning and assessing design commitments to provide patients with appropriate levels of environmental support.

It should be noted that most of the identified studies in this chapter were conducted in general oncology contexts (e.g. inpatient, palliative care) with only one study (among the primary category, Wang & Pukszta, 2017) focusing particularly on the built space of outpatient infusion centres in the United States. Other sources that helped elicit relevant information to day-oncology settings, besides the established evidence of what constitutes a supportive environment in general healthcare facilities, were studies that had other research focus within the same context (e.g. exploring patient opinion of the overall care in which patients reflected on the built space as part of their experience; or other quantitative-based studies as outlined in Table 2.3 and Table 2.4). Accordingly, the developed framework needs to be considered as a tentative proposition that warrants future investigations in outpatient settings to support or refute.

Table 2.5 A supportive or healing-promoting environment needs to facilitate

Positive Distraction & Positive Mood through **STIMULATING & HOMELY ENVIRONMENTS**		1 ***Aesthetic appearance*** “arriving at a less institutionalized design” ○ (e.g. colours, paints, artwork, finishing materials, furniture, aquarium)
		2 ***Architecture form & spaciousness*** (Unique and unconventional forms)
		3 ***Connection to nature*** “all aspects of nature outdoor & indoor” ○ (e.g. outdoor strategies: views to the outside/ furnishing to sit by window/ physical access to outdoor gardens/ water features/ designs that trigger the presence of outdoor living creatures (nest boxes, selection of plants that trigger butterflies, bees, birds etc.). ○ (e.g. indoor strategies: indoor plants/ artwork displaying nature scenes/ natural materials such as wood, stone, wool, leather, etc.)
		4 ***Provision of engaging amenities/resources*** ○ (e.g. private screen, internet, music)
Control & Sense of “normalcy” through **FLEXIBILITY AND ENVIRONMENTAL ENRICHMENT**		5 ***Choice to negotiate visual and aural privacy*** ○ (e.g. single, semi-shared, & shared treatment spaces) ○ (e.g. privacy in waiting spaces through seating groups, layout design, etc.)
		6 ***Environmental options and personalization*** ○ Arrangement of private belongings (e.g. movable furniture, lockable cabinets, side shelves, etc.)
		7 ***Environmental options and following one’s own rhythm*** ○ (e.g. setups to support using personal devices, reading, getting work done, etc.) ○ (e.g. facilities to engage in other activities like learning through communication and information technologies, communal spaces, etc.) ○ (e.g. integration of technology to allow freedom of where to wait)
		8 ***Contact with staff*** “easy & confidential if needed” ○ (e.g. private meeting rooms)
		9 ***Controlled ambient environment*** ○ options to adjust temperature (e.g. HVAC control zones, heated seats, etc.) ○ controlling noise (e.g. noise reducing finishes, sound masking, etc.) ○ olfactory comfort (e.g. options for fresh air)
PHYSICAL & SENSORY SUPPORT through	**Comfort**	10 ***Furniture comfort*** “general ergonomic comfort/ adjustability and usability”
	Accessibility	11 ***Wayfinding & navigation*** ○ layout spatial configuration (e.g. spatial arrangement, visibility connections), ○ visual features (e.g. landmarks, colours), ○ environmental information (e.g. signs, you-are-here maps), and technologies (e.g. touch-screens, location-aware apps)
		12 ***Mobility*** “Proximity & adjacency” ○ design that reduces the distances that patients need to travel ○ consideration of special needs (older population, disabilities)
	Safety	13 ***Cleanliness, neatness, infection control and nearby staff members*** ○ (e.g. antibacterial materials and easy to clean surfaces) ○ (e.g. design and placement of hand washing station; alcohol hand rub dispensers) ○ (e.g. air filtering, air change per hour, odour neutralisers) ○ (e.g. visual access to staff and/or means to call them)
SOCIAL SUPPORT		14 ***Maintaining existing contacts*** “Family inclusion” ○ (e.g. adequate space and comfortable furniture at treatment and overall setting)
		15 ***Developing new contacts*** “Social interaction with others” ○ (e.g. flexible furniture arrangements; exchange of experiences with fellow patients) ○ (e.g. alternate communal spaces; dining, roof garden, lounges)
Engagement through **COMPLE-MENTARY SUPPORT**	**Complementary therapies & services**	16 ***Optional complementary therapies*** “various & adequate spaces” ○ (e.g. rooms for services like massage, acupuncture, etc.) ○ (e.g. community rooms for group activities like art therapy, yoga, journaling, drumming, nutrition and diet training, etc.)
		17 ***General resources*** “relevant & adequate” ○ (e.g. exercise spaces, aesthetic boutiques, practice religious, etc.)
	Information support	18 ***Finding information*** ○ (e.g. places and materials to search information (library/pamphlet racks); access to technologies (check in kiosks/ databases/ recorded survivor narratives) ○ (e.g. access to educational settings (e.g. conference/seminar rooms)

Chapter 3

Literature review of available survey tools

3.1 Introduction

As noted from Chapter 2, the built environment has the capacity to play an important role in shaping cancer patient experience. Despite the increasing recognition of such a role (Groff et al., 2008; Petersen, Knudsen & Vinter, 2015), there have been few attempts to develop tools to assess cancer patient perception of the quality of the built environment, either as part of a general tool that encompasses other dimensions of care quality or as a stand-alone tool. Such tools are important to support both research purposes and strategic improvements of existing or planned healthcare facilities. However, rigorous consideration of the development of these tools is important, so to ensure and maintain accurate and reliable description of patient experiences being tested. Accordingly, and in order to attain an up-to-date record of the existing measurement scales, this chapter endeavours to review previous attempts to develop tools to measure patients' perception or experience of the healthcare built environment, with particular reflection on attempts relevant to cancer care settings as well as consideration of the efforts made to establish valid and reliable properties of such tools. The focus includes both tools developed specifically for cancer contexts or other tools within general healthcare settings.

3.2 Background

3.2.1 Cancer specific tools

3.2.1.1 General tools comprising questions covering the built environment

Measuring patient satisfaction with the quality of healthcare systems has been the topic of numerous studies. Within these studies, different facets of hospital services, such as technical performance and personnel conduct, are defined as variables contributing, cumulatively, to patients' subjective assessments of the care experience (Zineldin, 2006). The increasing recognition of the built environment as one of the factors affecting consumers' evaluation of a service (Gotlieb, 2000; Mohammed et al., 2016) has resulted in several attempts to represent the hospital setting within the structure of the tools utilised for such evaluation. The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) and

Press Ganey patient satisfaction surveys are examples of these tools, in which a number of items representing the subdomain of the built environment are considered (Siddiqui, Zuccarelli, Durkin, Wu, & Brotman, 2015; Trochelman, Albert, Spence, Murray, & Slifcak, 2012).

With respect to cancer settings, several tools followed similar paths to assess patient satisfaction or experience of service quality (Gesell & Gregory, 2004; Roberge, Tremblay, Turgeon, & Berbiche, 2013; Wessels et al., 2009). Richardson et al. (2007) conducted a systematic review exploring tools used within clinical settings to assess patients' needs regarding cancer and its treatment-related problems (e.g. health, social needs, psychological functioning). The built environment was represented in two out of the fifteen included tools and was covered by few items pertaining to cleanliness and overall design of the treatment space. Another review by Saunders et al. (2016) focused on cancer patient experience and/or satisfaction with care quality with no restriction to a specific setting or type of cancer. The identified twenty-six survey tools covered different domains of care quality (e.g. continuity of care, patient-staff relationship) with only one tool addressing the built environment with four items. A further focus on ambulatory cancer settings by Brédart et al. (2015) identified fourteen tools assessing patient satisfaction with service quality. Here too the built environment was underrepresented, with only one study (Kleeberg et al., 2005) elaborating on a relatively wide spectrum of the built environmental qualities compared to the aforesaid cleanliness and overall space examples.

The underrepresentation of the built environmental aspects within these tools limits the equitable detection of the potential role of the built environment in supporting patient experiences of care and hinders the credibility of these tools to precisely inform service development with respect to the architectural design of healthcare spaces. This perspective is further supported by a systematic review conducted by Petersen et al. (2015) to investigate cancer patients' preferences of care. The study reviewed eleven tools pertaining to patient explicit preference of care – studies determining preferences based on patients' satisfaction or experience were excluded. The analysis of the most important items across the included studies revealed that the built environment, in addition to other critical dimensions like psychosocial support and waiting time, was not among the dimensions that patients consider most important. However, they noted that the relatively less representation of these dimensions in the tools could have caused these results. The built environment, for instance, was represented in three studies with only six out of the 598 items gathered across the investigated tools. Hence, built environment aspects were rarely evaluated by patients and therefore the probability of them to appear in the quartile of the most important aspects, as per the applied method of the review, decreases.

3.2.1.2 Stand-alone tools measuring cancer settings

In regard to tools developed or applied specifically to measure cancer patients' perception of ambulatory built environments, the search did not locate any. Only one study was found in a context similar to intravenous anti-cancer treatment environments, where the researchers compared patient perception of a rheumatology outpatient infusion room before and after an architectural renovation (Bukh, Tommerup, & Madsen, 2014). The study mentioned that **no usable questionnaires** were found in the literature to cover the principal components of evidence-based healthcare design (EBD) and accordingly introduced a 25-item questionnaire based on the architectural intervention, patient input, and available EBD literature. No further validation or reliability measures were conducted for this tool. Another attempt carried out in a chemotherapy infusion clinic, sought to assess the effectiveness of a new facility in delivering the intended design objectives: support social interaction, privacy and visual access to nature (Shepley et al., 2012). The implemented questions were limited, customized and purposefully devised to represent only those three design goals, and hence lack inclusiveness and generalizability.

3.3 Aim of the review

In order to explore possibilities for a reliable account of cancer patient experience of the healthcare built environment, this chapter reviews previous studies to i) identify survey tools developed to measure patient experience or perception of the healthcare built environment, ii) describe the attempts made to establish valid and reliable properties of these tools, iii) discuss the consequences of applying scientifically rigorous methods (psychometric testing) on the effectiveness of the developed tools to comprehensively cover the architectural scope of the healthcare setting, and iv) evaluate the extent to which these tools align with the scope required to assess patient perception of ambulatory cancer facilities based on the conceptual framework developed in the Chapter 2.

3.4 Methods

A systematic literature review was performed using databases including Ovid MEDLINE, CINAHL, PubMed, Embase, and ScienceDirect. Given the lack of tools tailored to capture cancer patients' perception of the hospital built environment, the study expanded the search to cover tools developed for other healthcare settings. The search was conducted early 2017 following assistance of a medical librarian at the University of Melbourne. A Boolean search, using both subject headings and natural language keywords, was implemented combining terms describing the built environment (e.g. hospital design and construction) and patient satisfaction/experience supplemented by its potential synonyms (e.g. perception, attitude), as well as terms equivalent to evaluation (measure, assess, appraise, tools, etc.). No time limit was applied and language was restricted to English. Additional publications were located using manual searches of reference sections and citations of the selected articles using Google Scholar.

3.4.1 Selection criteria

Four essential factors were considered in selecting studies for this review including:

- Original research papers developing or applying tools developed to measure user-reported experiences or perceptions of the design of the healthcare setting. Tools assessing one design aspect of the built environment (e.g. single vs shared treatment spaces, lighting) were excluded.
- Studies targeting occupants in both outpatient and inpatient settings.
- Tools developed following a “cognitive” strategy:
  The detected tools were developed predominantly following either a “cognitive” or “affective” strategy. Studies pertaining to user assessment of the built environment define these two strategies as the basic means through which persons’ attribute meaning to an environment (Dijkstra, 2009). The affective component expresses individual feelings and attitudes toward an object (e.g. lively, boring, disgusting, relaxing), while the cognitive one entails the notion of perceiving and judging the object quality – how things are perceived and cognized (e.g. quiet, noisy; hot, cold; clean, dirty) (Russell, Ward, & Pratt, 1981; Zineldin, 2006). Although these two approaches are highly interrelated, it is believed that a response to an environment develops in the order of an initial emotional impact followed by perceptual judgment of the situation (Russell & Pratt, 1980). Attempts to develop tools to emotively describe the built environment and address the feelings that users associate with a setting are out of the scope of this review, however examples can be found in precedents such as the Perceived Environmental Quality Index (PEQI) (Fisher, 1974) and the Environmental Assessment Scale (EAS) (Rohles Jr & Milliken, 1981). These measures were developed to depict the affective

characteristics of generic built environments, however number of studies applied them within healthcare settings such as Leather, Beale, Santos, Watts, and Lee, 2003 and Park and Mattson (2009). The prevailing strategy for devising the questions of such tools relies on representing the potential emotions using pairs of adjectives set in semantic differential scales connoting on one side positive and on the other side negative affective qualities of the place (e.g. cheerful – depressing). The tools considered for this review were mainly ones taking on a cognitive approach as a guiding framework. Such tools were selected due to their capacity to represent wide range of the built environmental qualities as well as point to specific design features that need consideration – A critical way to objectively inform improvements plans.

- Tools were selected if they exhibited one or more of the measurement properties endorsed by COSMIN checklist – the Consensus based standards for selection of health measurement instruments (Mokkink et al., 2010) as well as guidelines by Streiner et al. (2015) for the development and use of health measurement scales. Although these resources were followed to evaluate the methodological quality of the selected studies, it was expected that most of the tools would lack satisfactory psychometric procedures, as reported by Elf et al. (2017) who noted low levels of validation work carried out for tools with a similar scope. Accordingly, studies that reported basic validation measurements (e.g. face/content validity) were considered as far as they were published in peer-reviewed venues.

3.4.2 Analysis

Following COSMIN and Streiner et al.'s (2015) guidelines, each of the detected tools was discussed individually to highlight: i) basic information such as name, source, intended context, number of items and subscales, etc.; ii) reported measurement properties for establishing the validity and reliability of each tool; and iii) potential shortcomings relevant to the tools' scope, content, and the consequences of applying psychometric testing methods for tools developed to measure non-health related aspects (architectural qualities in this case). A further synthesis of the common shortcomings of the detected tools, their methodological quality, and the extent to which they cover the architectural domain of ambulatory cancer facilities is presented, highlighting areas for future attention.

3.5 Results

After removing duplicates, 1219 records were identified, of which, 55 studies were selected based on title screening. Following an abstract review, the full text was sought for thirteen peer-reviewed articles. An additional six studies were located based on manual "snowballing" by searching the reference sections and citations of the selected articles using Google Scholar (Figure 3.1). In total, twelve tools were identified exhibiting two models, one with standardization intent and others with non-standardization intent. In the following, the content of the detected tools alongside their strengths and weaknesses to comprehensively capture patient perceptual appraisal of the healthcare built environment in a valid and reliable manner are discussed.

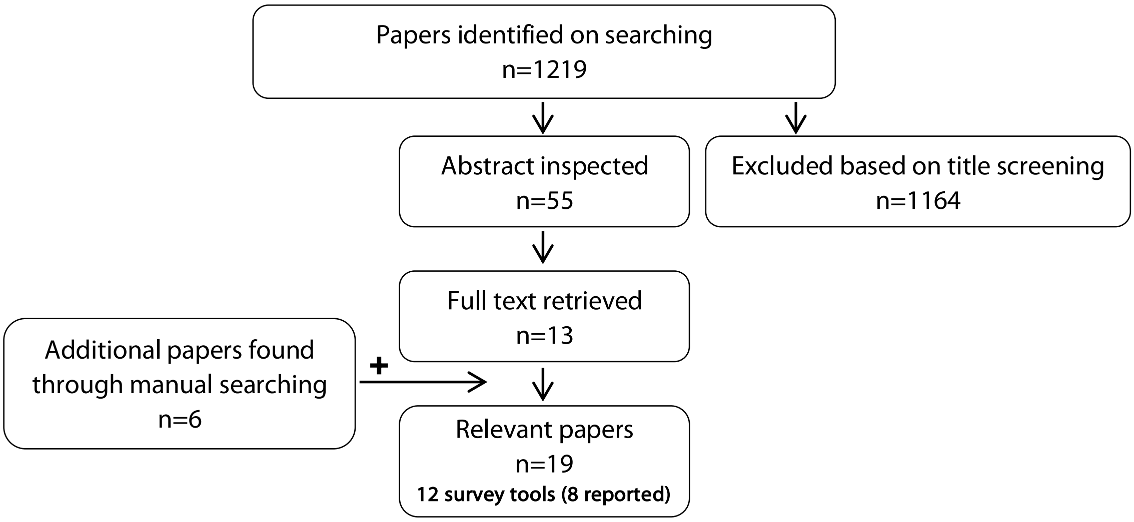


Figure 3.1 Flowchart of search strategy and selection process.

3.5.1 Tools with standardization intent

These studies sought to develop tools that can fit different research questions and hence capture comparable data across buildings of similar types (Council & National Research Council, 2002). The detected tools represented general types of healthcare settings (e.g. inpatient units, ambulatory settings, etc.) with a determined consideration to establish sound psychometric properties in their construction and validation. Six tools were detected and discussed as follows:

3.5.1.1 Perceived hospital environment quality indicators (PHEQIs)

The PHEQIs is a tool developed by Fornara, Bonaiutob and Bonnes (2006) to assess users' perception of the quality of healthcare built environments. The tool focuses mainly on the spatial/physical characteristics of the environment through three scales, covering external spaces and appearance of the hospital, the overall care unit, and the inpatient area. A fourth scale is included representing user perception of the social dimension of care, capturing humanistic aspects such as patient-caregivers' relationship, organizational conduct, and privacy behaviours. Another version tailored to outpatient waiting areas is also provided with some wording changes to relate to the outpatient setting.

The tool was tested within orthopaedic units of three different hospitals in Rome, Italy. Principal component analysis (PCA), which is essentially a variable reduction technique (Suhr, 2005), was applied to each of the tool's four scales with the aim of eliminating redundant items and establishing preliminary reliability of the scale's factorial components. Twelve principal components (accounting for 72 items) were revealed with overall good inter-item reliability (Cronbach's alpha ranging from 0.64 to 0.91). Although the application of the tool has been within orthopaedic settings, it was generally developed to represent different types of healthcare specialties. A recent edition of the tool combined the second and third scales into one scale named "care unit and in/out-patient area" after noting number of overlaps between items of the original two scales (Fornara & Andrade, 2012).

Andrade, Lima, Fornara and Bonaiuto (2012) sought further validation of the tool's components within four Portuguese orthopaedic units that possessed different environmental qualities. The study carried confirmatory factor analysis to complement the exploratory approach conducted by the original study. After eliminating large number of repetitive and poorly fitting items, the analysis reached good to acceptable indices of factorial validity. Reliability measures, in terms of internal consistency between scales and subscale items, were also supported with values above and slightly below 0.7. Other validation testings were sought as per the following. A question evaluating the global quality of the built environment was introduced and correlated with participants responses to the different scales, as a support of concurrent criterion validity of the PHEQIs. Expert evaluation of the investigated hospitals was also used as an objective scale to test for predictive and congruence validity. Higher correlation between experts and patients' evaluations of the built environment was postulated as evidence of congruence validity and an indicator of the tool's ability to predict the hospital environmental quality. Additionally, the results showed sensitivity to detect differences between patients' perception of different conditions (old and new facilities) which was considered as a further support to the tool's predictive validity.

Despite the supportive statistical results to the PHEQIs' construct, a number of shortcomings can still be noted. Double-barrelled questions, such as "Corridors' walls and floors have nice colours" in the original tool and "Walls, floors and ceilings have nice colours" in the modified version, may confuse respondents by mixing the judgment of different elements in one question. This also appears in Andrade et al.'s (2012) own reflection on questions like "In the external hospital area there is a lack of well-kept green spaces" which may mix the judgment of green spaces adequacy with the good maintenance of these spaces. Repetitive and very similar questions might also contribute to respondent confusion and do not seem to reveal additional distinct characteristics of the measured dimension. Questions such as "You can easily find information points" and "Information points are badly located" in the original tool does not seem to cover distinct features apart from the location of the information point. This also appears in the updated version in questions like "Furnishings are in good condition", "Furnishings are in poor condition" and "The quality of furnishings is good". Although repetition of items, in slightly different formats, may have been devised to detect respondents' level of engagement with the questionnaire, they raise potential to increase questionnaire length, particularly in the latter example where a single environmental feature was questioned three times in a row.

One of the main issues noted in this tool, and in number of the other explored tools, is the limitation of the introduced items to inclusively cover the content of the architectural dimensions that they intend to represent. Questionnaires' items varied in their level of detail and usually covered a mix of general environmental qualities (e.g. access to nature, adequate illumination, comfortable furniture) and other detailed design elements (e.g. the availability of sign posts for aiding wayfinding, provision of side tables). This mixed, and more specifically, 'detailed approach' yielded difficulties in covering the various features of the built environment in a thorough way. For instance, the PHEQIs introduced number of questions targeting the quality of signposts and information points as contributors to wayfinding. Determining the focus on specific design features opens possibilities to override other features that may aid wayfinding as well, like colours, landmarks, and even wayfinding technologies (e.g. interactive displays). Similarly, devoting some questions to the pleasantness of walls and floors' colours covers one aspect of the environmental aesthetic and omits evaluating many others like paints, materials, art objects, etc. This limitation was similarly noted by Andrade et al. (2012), although from a statistical point of view. They noted that some dimensions were not fully represented by the introduced items, such as the quietness factor which was solely represented by two questions pertaining to outside noise. This was further associated with slightly low internal consistency, thereby raising credibility concerns about the proper capture of the conceptual domain of this dimension.

The refinements carried by Andrade et al. (2012), in order to establish further confirmatory validity of the PHEQIs' constructs, forced the reduction of large number of items (36 remaining out of 72 items). This again raises concerns about the credibility of the resultant tool to inclusively cover the various components of the built environment under investigation. For instance, confirmatory analysis forced the elimination of items pertaining to cleanliness of the unit, temperature, and air quality, with no other items compensating for their elimination. Other eliminated items were related to privacy aspects like controlling or adjusting people's own space and finding places to hold private conversation with staff.

3.5.1.2 A Staff and Patient Environment Calibration Tool (ASPECT)

ASPECT is another tool developed in 2004 by the University of Sheffield, School of Architecture, Health Care Research Group, and co-founded by the Department of Health Estates and Facilities in the UK (Phiri, 2014). The focus is on general healthcare settings with seven scales covering different spatial aspects related to patients and one extra scale dedicated to staff spaces. Forty-seven items were generated from an extensive review of more than 600 articles related to healthcare facility design and research (Steinke, 2015) covering the following eight domains as summarised in Table 3.3: privacy, company and dignity (5 items), views (5 items), nature and outdoors (3 items), comfort and control (6 items), legibility of place (6 items), interior appearance (8 items), facilities (8 items), and staff (6 items).

Double-barrelled items also appear in this tool, in questions like "The interior has provision for art, plants and flowers." It also extends to triple-barrelled questions and, in some cases, even more such as "There is a variety of artificial lighting patterns appropriate for day and night and for summer and winter". As mentioned earlier, this approach encourages confusion and might affect the convergent validity of the constructed domains (Andrade et al., 2012). Similar to PHEQIs, the formulation of ASPECT's items used a mix of general environmental qualities and other detailed design features which may limit the inclusiveness of the tool's scope.

A further concern appears in relation to the dimensionality of the introduced scales. A step toward structuring valid scales is to embrace a criterion of uni-dimensionality, which implies that the constructed scale is measuring one thing or rather one attribute (Streiner et al., 2015). Introducing items, in one scale, that tap different dimensions increases chances of measurement errors and hinders the establishment of sound psychometric properties of the tool's constructs (Streiner et al., 2015). ASPECT's items were either classified to represent perceptual attributes that the environment might convey (e.g. comfort, privacy, legibility of place) or the presence of a group of spatial/architectural elements (e.g. facilities, views) – and the latter imposes some of the observed shortcomings. For instances, the "Facilities" scale contains items like "There are easy chairs, tables and desks in the patients' spaces", "There are facilities for patients' relatives/friends to stay overnight" and "Patients have facilities to make drinks". Although they all may be considered general facilities, they appear to tap different attributes like control, comfort and social support. Other scales that represent perceptual attributes combine, in the first place, multidimensional constructs like "Privacy, Company and Dignity" and "Comfort and Control" scales. As a result, they included items that represent different dimensions but were combined under one construct/scale with a tailored name to represent those different components.

Although the structure of ASPECT may denote an instrument developed to assess the built environment from a third-party perspective (e.g. direct observations by a researcher or architect), it has been applied by Steinke (2015) and Ghazali and Abbas (2012) to directly assess user (staff or patient) satisfaction with the place. Steinke (2015) applied ASPECT in a study of emergency departments in Canada with the aim of exploring nurses' perception of the built environment in relation to the service quality. Factor analysis, which is a common technique to explore the underlying constructs of a tool and test for uni-dimensionality (Streiner et al., 2015), was used to explore the tool's main components. The analysis produced six scales with Eigenvalues over 1.00 and internal consistency ranging from 0.61 to 0.86. No other validity measures were included and total number of items was reduced to twenty-four. Steinke (2015) did not present the modified version of the tool. However, according to the illustrated examples in the article, major changes to the formulation of some items can be noted. In addition to this, the revealed six scales were substantially different from the tool's original eight scales. This may support the observed multi-dimensionality of the original scales which might have resulted in the difficulty to reproduce or confirm the initial classification of the tool's constructs.

3.5.1.3 Perception of Healing Environment Assessment Tool (P-HEAT)

Another attempt by Tak, Woo, Kim and You (2015) targeted the development of P-HEAT to assess the extent to which a hospital built environment can be labelled as healing. The tool is devised for nurses to observe and assess the presence of specific architecture qualities embedded in patients and staff areas. A mix of literature review (details were not provided), complemented by interviews with experts, were conducted to devise the 30 items of the questionnaire. This was followed by a content validity measure to test for item-relevance to the intended scope. The study did not report the number of experts nor the basis of evaluation, however, an item-relevance ratio of 85% to 100% was reported and considered indicative of consensus agreement on the appropriateness of all the introduced items. PCA was then conducted revealing six scales (sub-categories) accounting for slightly over 65% of the data variance with internal consistency ranging from 0.749 to 0.917. The revealed scales were then named to represent the items that had the greatest factor loading. The collected data was divided into two groups, with the second one dedicated to conduct further confirmatory factor analysis. The authors reported on outcomes related to chi-square, the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), root mean square residual (RMR), the normal fit index (NFI), and the non-normal fit index (NNFI) as indicators of confirmatory factor validation. Values were all considered satisfactory indicating good adjustment to the data.

P-HEAT, like previous studies, was not developed using a theoretical background that aims to conceptualize the underlying constructs of the tool: an approach that may result, as seen in the previous tools, in the inconsistent inclusion of items within the statistically-derived scales. Observing the results of P-HEAT marks some of these inconsistencies. For instance, the constructed scale “Social support and interaction” contains three items: two of them point directly to aspects of social support, while the third, referring to the non-institutional look of the built environment, seems to tap attributes related more to the aesthetic/visual appearance of the environment. The content of two other scales named “Individual personalized service” and “Privacy” point to another issue. Items included in these two scales touch upon overlapping scope, yet are separated into two scales. The item named “Use single patient rooms with comfortable beds and bedding” indicates attributes that relate primarily to privacy and comfort, yet still falls logically under personalized service. This rational overlapping (multidimensional nature) might also manifest statistically in the form of item multiple loadings on different scales. The detailed loadings were not reported and therefore the decision behind the classifications of the items remains undisclosed.

Another shortcoming of not relying on a comprehensive theoretical background is the probability to overlook critical qualities that contribute to the concept under investigation (creating a healing environment). For instance, P-HEAT did not include items representing qualities like spaciousness of the built environment, provision of choices to allow for visual privacy, facilities to adjust people's own spaces, proximity of destinations, and more that can be tracked in the upcoming Table 3.2. Besides shortcomings similar to the previous tools (e.g. double-barrelled and repetitive items), P-HEAT introduces items that deviate from its original purpose of evaluating the built environment and covers other organizational facets such as provision of patient group therapies and other family programs.

3.5.1.4 Supportive Hospital Environment Design Scale (SHEDS)

In a quite different approach, Andrade and Devlin (2015) envisioned a tool to measure patient perception of their hospital room, embarking from the hypothetical basis of Ulrich's theory of Supportive Design. The theory conceptualizes three main attributes through which the hospital built environment has the potential to support patient satisfaction and wellbeing (Ulrich, 1991). Andrade and Devlin noted that no previous attempts were carried out to empirically test this notion and thereby proposed the development of SHEDS. Twenty-one questions were devised to capture the three latent variables of positive distraction, social support, and perceived control by drawing on items from previously developed scales and formulating others as required. Confirmatory factor analysis (CFA) was applied to inspect the validity of the conceived scales. Sixteen items were retained across the three defined factors and the model demonstrated good adjustment to the data explaining 65.76% of the variance. Cronbach's alpha produced acceptable results as well with values above 0.9 and in a subsequent study above 0.8 (Andrade et al., 2017).

The significance of this tool, besides the theoretical basis, is the formulation of its questions to capture the experience conveyed by the built environment rather than satisfaction with mere architectural components or elements (e.g. In this room my attention is drawn to interesting things). This approach may overcome the limitations observed in previous studies when attempting to capture patient perceptions based on satisfaction with single elements of the built space – an approach that faces significant challenges to produce extensive and inclusive list of items to represent the wide range of potential architectural variables.

Nevertheless, the dedicated focus on capturing perceptions of hospital rooms limits the application of the tool to wider contexts, specifically if the experience of the whole hospital building is the objective under investigation. Furthermore, the observed limitations of Ulrich's theory in capturing the various aspects of the healthcare built environment, as indicated by Devlin et al. (2016), poses additional challenges to the inclusiveness of this tool. In that study, Devlin et al. (2016) qualitatively explored the most important environmental features that patients' value in their hospital room. Applying Ulrich's theory accounted for around 65% of patients' overall comments regarding the built environment. However, other features mentioned (e.g. room layout, spaciousness, cleanliness, and furniture) did not fit within the scope of Ulrich's theory. This was further supported by Elf et al.'s (2017) review, where the authors pointed to the need for more contemporary theoretical foundations when developing assessment tools to effectively account for patient wide experiences of the healthcare setting.

3.5.1.5 Listening to people to Cure people (LpCp)

Buffoli et al. (2014) noted also the scarcity of tools founded to measure patient perception of the quality of healthcare built environments and accordingly proposed the development of the LpCp tool with the aim of evaluating the perceived level of comfort and humanization within such settings. LpCp was developed as part of a broader tool that aim to assess and guide sustainability practice in hospitals during design and operation. Similar to other tools, the development went through basic steps of reviewing relevant literature, precedent tools and interviewing targeted users. The questionnaire was then tested in an acute care hospital in Milan, Italy and translated to other languages like French, Spanish, Chinese, and Arabic. No further validation strategies were reported.

Three versions exist of the tool, targeting the opinions of three user groups (patients/visitors; hospital team; and technicians). For the patient module, three themes were devised, including: Well-being, Social Aspects, and Safety & Security. The module is quite brief with only eight questions covering mixed attributes related to the physical and social qualities of the environment. The questions are also multidimensional, tapping satisfaction with different aspects in one question (e.g. satisfaction with comfort, privacy, colours), raising the potential for measurement errors.

3.5.1.6 Clinic Design Post-Occupancy Evaluation Toolkit (CDPOET)

Other tools within this standardized category were developed under the auspices of specialized organizations such as the Center for Health Design (CHD) in the United States (https://www.healthdesign.org/). These organizations pay considerate attention to ensure that the quality of healthcare environments is being met through means of research and development. Such tools are rarely documented through traditional modes of publications and require therefore manual-based searching, making it difficult to track (Elf et al., 2017). Ensuring comprehensive detection of relevant attempts becomes thereby challenging and this review provides the discussion of this tool merely as an example of the type.

The Clinic Design Post-Occupancy Evaluation Toolkit is a relatively recent attempt (2015) at providing an evaluative platform for ambulatory primary care settings (e.g. community health centres). Besides an audit checklist that provides extensive evaluation of the implemented design features following 14 design goals, the tool includes two further modules targeting patient and staff perception of the clinic design. The patient version consists of 26 questions tapping design qualities across waiting and diagnosis spaces. Content validity was sought and continuously improved through repeated cycles of literature reviews, experts' feedback, and usability tests. The development relied on practitioner-based standards with no apparent psychometric testing in the process of establishing the reliability of the tool. This approach was also reported in the CHD's development of a similar audit tool evaluating patient rooms which was, on the other hand, documented in a scientific venue (Quan, Joseph, & Nanda, 2017).

3.5.2 Tools with non-standardization intent

The tools in this category were purposely-developed to fit a specific research condition – a means to explore the research question under investigation. Authors of these studies mentioned in general that there were no previous tools that would address the range of information desired for their investigation and therefore devised number of tailored questions based (mostly) on their knowledge of the available literature. Other development methods included interviews and expert feedback, however, rarely went beyond that to establish further reliability and validity measures. Several attempts were detected in this category, specifically during the "snowballing" search. Affirming a comprehensive list of these tools is quite difficult, as developing these tools was not an aim of the studies and hence they were not referenced in the title (and in some cases the abstract), increasing the challenge to detect them through the systematic search. In total, six studies were located, four of them during the snowballing search, including: Guinther, Carll-White, and Real (2014); Kotzer, Zacharakis, Raynolds, and Buenning, (2011); Sadatsafavi, Walewski, and Shepley, (2015); and Schreuder et al. (2015). In the following, the remaining two studies are discussed as examples to highlight general limitations and point to potential refinements of such tools.

3.5.2.1 Healthcare providers' perception of design factors related to physical environments in hospitals (HPPDF)

Mourshed and Zhao (2012) developed a tool to explore healthcare providers' preferences of the design of two Chinese hospitals. Item generation went through number of stages including reviewing literature and industry guidelines, in addition to conducting interviews with staff members in the participating hospitals. Validation of the tool's content was then reviewed by four healthcare professionals followed by a pilot phase to test for items' clarity. Sixteen design factors translated into sixteen questions were obtained by this process.

Mathematical techniques, including PCA and Cronbach's alpha, were performed to examine validity and reliability aspects of the tool. The analysis revealed three main scales representing Spatial, Environmental and Maintenance qualities of the built environment with relatively strong internal reliability. Item classification into scales, following the mathematical outcomes, remains an issue that contradict, in some cases, the architectural logic of these items. For instance, the Maintenance scale included four items, two of them, "proximity to wards" and "spaciousness", do not seem to logically fit into that domain but rather under the Spatial Design one. In fact, this is supported to a degree by the items' mathematical loadings. The item "spaciousness of working areas" had loadings on both the Maintenance and Spatial scales with slightly higher loading on the Maintenance one, a result that point further to the potential multidimensional nature of such architectural features (Table 3.1).

Other items in the Spatial Design scale (e.g. art objects, colours, indoor plants) appear to tap an attribute related more to interior aesthetics. This view is consistent with Dijkstra's (2009) classification in which spatial elements that have relatively permanent character, such as the spatial layout of the building, size and shape of rooms, and placement of windows, were classified under the architectural spatial scale, while other less permanent components, that are of an appearance nature (e.g. colours, interior plants, artwork, furnishings etc.), were considered of relevance to the interior design scale.

Table 3.1 Classification of HPPDF following PCA

The highlighted items appear to (rationally) fit into the "spatial design" scale, while the rest of the "spatial design" items seem to tap a different dimension such as "aesthetics or visual appearance."

Maintenance	Environmental design	Spatial Design
Provision for hand hygiene	Adequate illumination	Indoor plants and interior/exterior landscaping
Proximity to wards	Availability of daylight	Furniture layout
Cleanliness and ease of maintenance	Thermal comfort	Exterior view from the space
Spaciousness	Noise level	Presence of coordinated art objects
	Air quality and freshness	Pleasant colour scheme
		Architectural design of the space
		Location and orientation of the space

3.5.2.2 Pediatric Quality of Life Inventory (PedsQL): Built Environment Modules for parents and staff

The intent of this tool developed by Varni et al. (2004) was to assess parents' and staff satisfaction with the built environment of an existing paediatric hospital. Bespoke principles for developing sound tools were followed by reviewing relevant literature and conducting focus groups with targeted population. The generated items were then conceptualized into scales based on the rational understanding of the existing literature. As per the tool's intent, two modules were produced tapping parent and staff perspectives. The parent module consisted of 18 items covering two main scales – Facility Structure and Aesthetic, while staff version included 50 items representing three scales– Facility Structure, Aesthetic, and Work Environment. Some overlap existed between items of the two modules, however, the apparent difference in the total number of items was mainly due to the greater concern showed by staff during the focus group interviews. Staff, as part of their job, spend regular and longer time in the facility compared to parents/patients and therefore are inclined to pay extra attention to details.

Internal consistency reliability measures using Cronbach's alpha were computed for the developed scales and showed supporting outcomes ranging from 0.82 to 0.97. Other measures concerning construct validity were thought by collecting data on parents' satisfaction with the healthcare services and staff satisfaction with their co-worker relationships. The study hypothesized that higher satisfaction with these aspects would correlate with parent and staff satisfaction with the built environment and would therefore act as an initial indicator of the tools' construct validity.

The small sample size limited the study from conducting further factor analysis in order to empirically support the structure of the conceptualized scales and therefore future research was recommended to further validate the tool's constructs. Other limitations appear with reference to the intent behind the tool development. The fact that this tool was developed for a specific purpose (evaluating an existing hospital building) and with insights relevant to the conditions of that building, may limit its application to other buildings of a similar type, something that can be noted in questions like “The availability of phones to make calls” and “The pool”. This detailed approach, although useful in determining particular areas that require attention, imposes challenges in terms of the ability of the tool to inclusively cover the wide range of architectural features that may exists in other healthcare buildings.

3.6 Comparison matrix

In order to highlight the scope of the reviewed tools relevant to ambulatory cancer settings, a comparison matrix (Table 3.2) was developed, in which items of the reviewed tools are marked against the conceptual framework that compiles the principal constituents of a supportive or healing-promoting environment. As outlined in Chapter 2, this framework was synthesized following a comprehensive review of qualitative literature exploring patients’ experiences of the healthcare built environment within oncology care contexts.

As can be noted, most of the tools lacked comprehensive cover of the framework’s design attributes. This is further evident in aspects pertaining to engagement in complementary and social support which were rarely addressed. As discussed in Chapter 2, the role of the built environment in facilitating engaging in wellness-based activities is increasingly documented as areas in which the built environment can provide complementary degrees of patient support alongside its researched roles of positive distraction and control (Peditto, Shepley, Sachs, Mendle, & Burrow, 2020). Settings providing different levels of complementary therapies, information support, lounges, community rooms with kitchen and dining spaces are examples of such environmental characteristics that affords engagement in various levels of casual and planned activities of interest, potentially promoting patients’ health and wellbeing (Peditto et al., 2020). That being said, some of the tools such as ASPECT and PHEQIs exhibit reasonable cover of the framework attributes, with PHEQIs demonstrating a stronger level of psychometric exploration, highlighting potential for future improvements.

Table 3.2 Visual map representing the scope of the discussed tools

				1	2	3	4	5	6	7	8
				PHEQIs	ASPECT	P-HEAT	SHEDS	LpCp	CDPOET	HPPDF	PedsQL
Positive Distraction through “STIMULATING & HOMELY ENVIRONMENTS”		1	Aesthetic appearance “arriving at a less institutionalized design”	*	**	*	**	*	**	*	*
		2	Architecture form & spaciousness	*	-	-	*	-	-	**	*
		3	Connection to nature “all aspects of nature outdoor & indoor”	**	**	**	*	**	-	**	*
		4	Provision of engaging amenities/resources (e.g. private screen, internet, music)	*	-	*	-	*	-	-	-
Control through “FLEXIBILITY AND ENVIRONMENTAL ENRICHMENT”		5	Choice to negotiate visual and aural privacy	*	**	-	**	-	**	-	*
		6	Environmental options and personalization	**	**	-	**	-	-	-	**
		7	Environmental options and following one’s own rhythm	-	**	-	*	-	-	-	-
		8	Contact with staff “easy & confidential if needed”	*	*	*	-	-	**	-	*
		9	Controlled ambient environment (e.g. noise, temperature)	*	**	**	**	-	*	**	*
“PHYSICAL & SENSORY SUPPORT” through	Comfort	10	Furniture comfort “general ergonomic comfort”	**	**	*	-	*	*	-	*
	Accessibility	11	Wayfinding & navigation	*	**	**	-	**	**	*	-
		12	Mobility “Proximity & adjacency”	-	-	-	-	-	-	*	*
	Safety	13	Cleanliness, neatness, infection control and nearby staff members	*	**	-	-	-	**	**	-
“SOCIAL SUPPORT”		14	Maintaining existing contacts “Family inclusion”	-	**	**	**	-	-	-	**
		15	Developing new contacts “Social interaction with others”	-	*	*	-	-	-	-	*
Engagement through “COMPLEMENTARY SUPPORT”	Complementary therapies & services	16	Optional complementary therapies “various & adequate spaces”	-	-	-	-	-	-	-	-
		17	General resources “relevant & adequate” (e.g. exercise spaces, aesthetic boutiques)	-	**	*	-	**	-	-	*
	Information support	18	Finding information (e.g. places and materials to search information)	-	-	-	-	-	-	-	-

**	The attribute/s are represented
*	The attribute/s are not adequately represented (the tool did not cover all aspects of the dimension; emphasized one aspect and neglected others; and/or critical items were deleted during the psychometric testing)
-	Not represented

3.7 Discussion

This review highlights the scarcity of tools developed to measure patient perception of the healthcare built environment in general and cancer facilities in particular. It also highlights a number of challenges if further levels of rigor are to be sought for such tools. Most of the detected tools followed basic levels of validation by systematically devising items based on literature reviews, interviews with targeted populations, and consultation with experts. A number of shortcomings with these tools were identified, such as double-barrelled questions and overlap between questionnaire items. The process of turning some of these tools into standardized measures, following different techniques of psychometric testing and relying on statistical analysis to dictate the factorial dimensions of the content of these tools, resulted in classification of the tool's items that can be described as imprecise, in addition to the elimination of architectural elements that are considered of general importance to the healthcare context. This raises concerns about the credibility of these tools to inclusively represent the various experiences of the built environment and raises further questions about the suitability of applying such testing techniques to the architectural domain.

Psychometrics is a field of study that addresses survey development and refers to the techniques used to establish the reliability and validity of an instrument (Streiner et al., 2015). These techniques have been applied to guide the development of tools within different fields related to psychology, health sciences, and education, just to name a few. Examples can be found in tools measuring attributes such as subjective states, attitudes, response to illness, personality traits, educational achievement, and more (Streiner et al., 2015).

A common character of surveys developed following these methods is the underpinning guidance of a theoretical framework. One of the bespoke steps is to envision the structure of the tool beforehand (e.g. classifying items into scales based on the theoretical background and/or researcher thinking) (Streiner et al., 2015). Factor analysis can then be used to compare the *a priori* structure against the pattern of the collected data in order to investigate the degree to which it corresponds with the hypothetical framework. Thus, items of the tool that load on "wrong or unintended" factors can be detected and accordingly thought through by means of rewriting or discarding specific items. Such an approach implies a strategy of devising items to hold a unidimensional character, contributing thereby to constructing scales able to measure one thing — one attribute.

Most of the reviewed tools lacked a clear conceptual basis and depended on statistically-derived classifications of their constructs. This approach might have contributed to the observed imprecise classification of items and further to the difficulties in reproducing and attaining consistent classification when some tools were reused (e.g. ASPECT). It is worth noting that following such an exploratory factor approach, as most of the reviewed tools used, is not discouraged in itself as it could be beneficial when exploring emerging phenomena and attempting to understand the underling logic or pattern of the data.

However, when the aim is to develop a standardized tool that has as one of its key characteristics to be reproducible (used several times across similar contexts), a confirmatory factor approach is considered critical (Streiner et al., 2015).

The challenge of this research area is that it lies on the border between science-based principles, where scientifically valid methodologies and mathematical proofs play a leading role, and other practitioner-based (architectural) disciplines where experiences and intuitive logic are considered of significant importance (Elf et al., 2017; Seamon, 2000). This does not mean that application of psychometric testing methods maybe entirely misleading, as several techniques, such as face and content validity, test-retest reliability, cognitive and usability tests, and more, have been applied to previous tools and showed promising outcomes (e.g. S-SCEAM tool) (Nordin, Elf, McKee, & Wijk, 2015). However, psychometric testing methods encourage further considerations of a solid conceptual foundation to precisely guide the initial, yet imperative step, towards developing reliable and valid tools.

Another related limitation was observed with reference to the formulation of the tools' items. Most of the reviewed tools relied on exploring patient satisfaction with specific elements of the built environment while attempting to classify them as contributors to a single latent experience (e.g. comfort, privacy, legibility of place). This not only hindered the ability to attain an inclusive list of the architectural components of the place or setting, but also may have contributed to the inconsistent results of the generated scales when attempting to reproduce the tools and confirming the initial classification of their latent constructs. Architectural elements can hold multidimensional attributes, highlighting possibilities for them to convey different experiences (Sadek & Willis, 2019), and make it challenging to conceptualize them as exclusive contributors to a unique latent experience. This might explain why some items of the reviewed tools exhibited multiple loadings on different scales. A potential alternate way to overcome this issue and maintain a unidimensional character of the tools' constructs is to structure the items to capture generic environmental qualities or experiences similar to the attempt of the SHEDS tool (Andrade & Devlin, 2015).

Lastly, the variation in hospital types covered by the reviewed tools led to other subtle differences in their components. Many of the tools were either context-specific or general tools which hinder their suitability to be used in settings that have special concerns like cancer facilities as shown in Table 3.2. Users' needs vary across different types of hospitals and different operational processes. As a consequence, tailored measurements that align with users’ particular needs become fundamental for the successful depiction of relevant experiences (Quan et al., 2017). This approach of tailoring questionnaire design to a targeted group of users is apparent in the development of some of the discussed tools, however further endeavours are warranted to ensure rigorous properties of such instruments.

The findings of this review align with, and extend the outcomes outlined by Elf et al. (2017), where tools developed to measure the quality of the healthcare built spaces were explored and summarized. Although the searching strategy was not targeted toward specific type of tools, most of the revealed studies were of observer-based type, in which assessment of the built environment is carried through a third-party evaluator (e.g. researcher, architect). The outcomes of the current review extend this view by focusing on tools developed to measure the quality of the healthcare built spaces through users, mostly patients, own perspective.

3.8 Concluding remarks

Patient satisfaction is a multi-factorial attitude shaped through the accumulation of multiple attributes associated with the care experience (Linder-Pelz, 1982; Mullaney et al., 2016). Considering the increasingly-recognized role of the built environment in contributing to patient experience and to the practice of patient-centred care (Bromley, 2012; Liberati et al., 2015; Sjögren et al., 2015), developing standardized tools to assess patient perception of such a domain, following scientifically valid methodologies, becomes paramount. Such tools constitute a further integral part to reliably investigate the nexus between the built environment and patient health-related outcomes, as well as assessing design commitments to provide patients with appropriate levels of environmental support across similar building typologies. Current attempts at such tools point to number of challenges following the application of specific psychometric testing techniques to evaluate the construct of these tools as well as unsatisfactory documentation of such properties. Further research is therefore warranted to develop tools stemming from rigorous and validated conceptual basis.

This concludes the literature review phase of this thesis and starting from the following chapter, the study will elaborate on the conducted fieldwork beginning with the qualitative inquiry of the interview phase and its associated methodological framework, results and discussion, and followed by the survey tool developed for this thesis and its field testing.

Table 3.3 Tools reviewed in this chapter

Tools	Aim, intended population and context	Items, domains/subscales	Reported reliability and validity aspects (measurement properties)
Tools with standardization intent			
PHEQIs Fornara, et al. (2006); Fornara and Andrade (2012); Andrade, et al. (2012)	Patient perception of the healthcare built environment. Covers different types of healthcare specialties (applied in orthopaedic units).	Original tool has 76 items (4 scales). The updated version includes 36 items (3 scales): - external space (4 sub-scales, 11 items), - care unit and in/out-patient area (4 sub-scales, 15 items), and - social-functional features (4 sub-scales, 10 items).	Original study: - principal component analysis (PCA) - internal consistency reliability (Cronbach's alpha ranging from 0.64 to 0.91) Subsequent study: - confirmatory factor analysis - concurrent criterion validity (correlation with a question asking patient to evaluate the global quality of the built environment) - predictive and congruence validity (correlation with experts' objective evaluation of the built space) - sensitivity to detect differences between old and new facilities (predictive validity)
ASPECT Phiri (2014); Ghazali and Abbas (2012); Steinke (2015)	Nurses' perception of the healthcare built environment. Different types of healthcare specialties (application in emergency department)	Original tool has 47 items (8 scales): - privacy, company and dignity (5 items), - views (5 items), - nature and outdoors (3 items), - comfort and control (6 items), - legibility of place (6 items), - interior appearance (8 items), - facilities (8 items), and - staff (6 items).	Items generated following extensive review of more than 600 articles. Subsequent study: - factor analysis (reduced number of items to 24 – 6 scales). - internal consistency for the generated 6 scales ranged from 0.61 to 0.86.
P-HEAT Tak, Woo, Kim and You (2015)	Nurses' perception of the healthcare built environment. Different types of healthcare specialties	30 items (6 scales): - stress restoration (8 items), - a sense of comfort (8 items), - ease of space perception (5 items), - privacy, (3 items), - social support & interaction, (3 items), - individual personalized service (3 items).	- literature review (details not provided) and interviews with experts. - CVI (item-relevance ratio ranged between 85% to 100%) - PCA (producing 6 scales accounting for slightly over 65% of the data variance) - internal consistency reliability between 0.749 to 0.917. - The authors reported on outcomes related to chi-square, the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), root mean square residual (RMR), the normal fit index (NFI), and the non-normal fit index (NNFI) as indicators of confirmatory factor validation. Values were all considered satisfactory.
SHEDS Andrade and Devlin (2015); Andrade et al. (2017)	Patient perception of the hospital room. General hospital settings.	16 items (3 scales): - perceived control (6 items), - positive distraction (6 items), - social support (4 items).	- Items generated from both previously developed tools and authors own formulation based on the theoretical basis of Ulrich's theory of supportive design (1991). - Confirmatory factor analysis (CFA)

			- The model demonstrated good adjustment to the data explaining 65.76% of the variance. Cronbach's alpha above 0.9 and in a subsequent study above 0.8 (Andrade et al., 2017).
LpCp Buffoli et al. (2014)	Patient perceived level of comfort and humanization of hospital settings. General hospitals/ acute care hospitals.	8 items (3 scales): - well-being, - social aspects, and - safety & security.	- Reviewing relevant literature, precedent tools and interviewing targeted users.
CDPOET The Center for Health Design, USA	Patient perception of the ambulatory primary care settings (e.g. community health centres).	26 items (two spatial-related scales: waiting and diagnosis spaces).	- The content was developed through repeated cycles of literature reviews, experts' feedback, and usability tests. - The development relied on practitioner-based standards with no apparent psychometric testing in the process for establishing the tool's reliability.
Tools with non-standardization intent			
HPPDF Mourshed and Zhao (2012)	Healthcare providers' perception of the design of two Chinese hospitals	16 items (3 scales): - spatial (7 items), - environmental (5 items), and - maintenance (4 items).	- Reviewing literature and industry guidelines - Interviews with staff members - Four healthcare professionals reviewing the tool's content. - Pilot testing for items' clarity. - PCA and Cronbach's alpha (0.74 to 0.86).
PedsQL Varni et al. (2004)	Parents' and staff satisfaction with the built environment of paediatric facilities	18 items (2 scales): - facility structure (14 items), and - facility aesthetics (4 items).	- Reviewing literature - Conducting focus groups with targeted population. - Conceptualizing items into scales based on rational understanding of the existing literature. - Internal consistency reliability measures using Cronbach's alpha (0.82 to 0.97). - Construct validity through correlation with other aspects of parents' satisfaction with the healthcare services. - No factor analysis

Chapter 4

A Qualitative inquiry – Methodological framework

4.1 Introduction

The investigation detailed in this section was prompted by the scarcity of studies concerning cancer patients' experiences and needs of the healthcare built environment, as well as the limitations this thesis noted in the existing theoretical propositions seeking to capture the basic concepts of a supportive healthcare environment. As discussed in Chapter 2, the factors that make a supportive or healing-promoting environment have been the topic of multiple investigations, where scholars have proposed and refined different theories aiming at capturing its basic concepts. However, existing propositions do not appear to fully capture the various environmental aspects that patients consider important – a view that has been also supported by Devlin et al. (2016) and Elf et al. (2017). Further investigation of patients' experiences, thoughts and the meanings they attribute to the environment during such vulnerable situations as cancer treatment was therefore deemed timely and warranted.

4.2 Study design – methodological orientation

To proceed with this conceptual investigation, a qualitative inquiry was necessary because of its ability to illuminate the complexity, depth and range of patients' experiences relevant to the design of built facilities (Todres et al., 2009) – allowing for wide range of perceptions to be considered (Streiner et al., 2015). In particular, a phenomenological approach was regarded as relevant in providing the methodological grounds for and guiding the overall design of this investigation. A central focus of phenomenology is the study of human experiences including describing and interpreting the thoughts and meanings people attribute to them (Tong, Sainsbury, & Craig, 2007). In common terms, it is "the interpretive study of human experience" (Seamon, 2000) "as they spontaneously occur in the course of daily life" (von Eckartsberg, 1998, p. 3).

Within environment-behaviour research, a phenomenological approach is founded on the notion that human beings are immersed in the material world as part of their day-to-day life, thus forming a significant contributor to their quality of life. Three central notions are considered in studying the person-environment relationship including “lifeworld, place and home” (Seamon, 2000). The lifeworld, in particular, revolves around the physical, spatial, and environmental aspects of human life with Seamon (2000) describing it as “the tacit context, tenor and pace of daily life to which normally people give no reflective attention. The lifeworld includes both the routine and the unusual, the mundane and the surprising.” Such experiences normally occur out of individuals’ sight and without conscious awareness of how they occur, yet they manifest in human behaviours, feelings, views, experiences and meanings they attribute to them; “… people are immersed in a world that normally unfolds automatically” (Seamon, 2000).

Several studies, including Edvardsson et al. (2005), Seamon (2000), Timmermann et al. (2013) and Timmermann et al. (2015), advocate the distinctive role that phenomenological research can play in understanding this relationship with the lifeworld and identifying its complex, multi-dimensioned structure. Phenomenological research is also considered key for bridging the gap between the rigid positivist science stance on one side and the practitioner-based (architectural) disciplines on the other, who tend to value intuition and experience above scientific proof (Elf et al., 2017; Seamon, 2000). It facilitates a platform for designers to empathise, intellectually and emotionally, with firsthand lived experiences (Seamon, 2000), potentially influencing their design concepts and decisions.

4.3 Data sources

4.3.1 Participants

Through in-depth, face-to-face interviews, this study proceeded to investigate the significance and meaning cancer patients attribute to the built environment of ambulatory care facilities. The study commenced with focus groups of former patients as a pilot, that were exploratory discussions with two consumer groups: the Grampians Integrated Cancer Services (GICS) and the North Eastern Melbourne Integrated Cancer Service (NEMIC). Individual interviews with patients across two healthcare sites in Victoria, Australia (the Peter MacCallum Cancer Centre – PMCC and the Ballarat Regional Integrated Cancer Centre – BRICC), as well as one site in Assiut, Egypt (South Egypt Cancer Institute – SECI) then followed. In total, 24 patients or former patients participated in this study, including three and two participants in the focus groups at GICS and NEMIC respectively, ten and three individual interviews at PMCC and BRICC respectively, and six individual interviews at the Egyptian site (Table 4.1).

The study also conducted interviews with architects who contribute to the design of such facilities. The discussion with the architects was aimed at gaining an overall understanding of the beneficial design practices for patients' experience in order to furnish the grounds to explore how this may reflect on patients lived experiences. Hence, the discussion was generic and was used to complement the interpretation of the results arising from interviewing patients. In total, six architects (three in Australia, one in the UK, and two in the United States) were approached and their thoughts were briefly discussed with the synthesis of patients' interview results.

4.3.2 Sampling strategy

Qualitative research, which is different from quantitative inquiry, uses a non-probability approach for sample selection, as the concern is not to achieve a statistical representation of the extent of a phenomenon within the wider population, but rather it is to examine and clarify salient characteristics of the phenomenon through participants, settings or other sampling units that hold the potential to highlight unique aspects of the phenomenon under investigation (Ritchie, Lewis, Nicholls, & Ormston, 2013). Another important criterion is to ensure diversity in the sample in order to allow for a wide range of factors and perspectives to be explored. With that in mind, a purposive sample was sought for selecting both study sites and participants.

The study's objective of updating the understating or conceptualization of the role of the built environment in patient experience entailed covering the experiences of patients attending relatively contemporary building designs. Metropolitan, as well as regional locations, were considered, in order to maintain a level of diversity. The Victorian Comprehensive Cancer Centre (VCCC), housing PMCC, was selected as an example of a large-scale hospital that provide outpatient services (opened June 2016), while the Ballarat Regional Integrated Cancer Centre (BRICC) served as smaller-scale building offering similar services (opened 2013). Although the chance to account for patient experience of older settings (which might be considered 'traditional' cancer care environments) was limited to the focus groups, the researcher was mindful to ask participants of these two contemporary settings about their potential (past) experience in older hospital settings through dedicated questions raised throughout the interviews. The Egyptian context served as a further representation of traditional hospitals while increasing the diversity of the sample by introducing cross-cultural perspectives. Some of the Egyptian participants had also had experience of treatment in contemporary settings (Table 4.1).

4.3.3 Recruitment method

Recruiting patients for the qualitative interviews was governed, predominantly, by a similar purposive approach. The targeted population was set to include adult cancer patients (18 and over), currently receiving intravenous treatment (e.g. chemotherapy) in an outpatient or day therapy unit. Former patients who had recently finished treatment were also considered in limited occasions (mainly for the initial focus groups) as per Table 4.1. Participants needed to be endorsed by their treating team to ensure their physical and mental capacity to participate (e.g. in a currently stable condition): patients who were considered terminally ill were therefore excluded. Patients were also endorsed for their capacity for verbal or written communication in the main language relevant to each context (English and Arabic). Demographic characteristics were tracked alongside the interviews to balance inclusion of potentially different perspective between age groups and genders (Ritchie et al., 2013).

In a purposive selection, the literature advocates recruiting participants who hold a particular interest in the study topic (Ritchie et al., 2013). Besides intentionally locating participants who have had the experience under investigation and are able to clearly and coherently express themselves in the spoken language, the literature advocates selecting participants who hold further spontaneous interest in the research topic (Ritchie et al., 2013; Seamon, 2000), as such personal interest may motivate or lead them to “provide the most thorough and accurate lived descriptions” (Seamon, 2000), thus optimising the chances of undertaking a detailed exploration and understanding of the topic under investigation. It is therefore considered a key aspect of ensuring the precision and rigour of a qualitative research sample (Ritchie et al., 2013).

4.3.4 Method of approach

Different strategies were sought to facilitate recruiting a sample set of patients with relative interest in the study. In the beginning, emails were sent to representatives of consumer groups within the Victorian region describing the study objectives and inquiring about potential participants for the initial, pilot focus groups. Former patients interested to participate expressed their willingness to the responsible team at each consumer centre and arrangements were made accordingly for the two focus groups that were conducted.

Within the hospital settings, the recruitment of patients followed number of strategies, including liaising with the nursing team and treating doctors, as well as individual attempts by the researcher. At PMCC, the researcher firstly attended one of the morning 'huddles' (staff meetings) in order to communicate the study objectives to the nursing team and inform staff members of his presence in the medical unit. Potential participants were then endorsed by nurses as part of their routine admission of patients. Through their knowledge of patients' background by virtue of their work, nurses were in a better position to determine potential participants who seemed to be more receptive and perceptive to better articulate their experience. Using a flyer (Appendix A.1) that invited patients to participate in the study, along with the Participant Information Statement (PIS, Appendix A.2), nurses briefly described the study to potential participants and sought their initial approval. Participants were then approached by the researcher who communicated further the study's intent and scope, emphasized the voluntary basis of participation, confidentiality and anonymity of the collected data, and discussed plans for conducting the interview (time and venue).

An alternative way for determining interested participants was through the study's Principal Investigator (PI) at each participating hospital. A resident PI for the study at each hospital was an essential requirement for ethics approval in the hospitals. The PIs practical experience and knowledge of the site's standards of care was considered critical to reliably guide the conduct of the research. The PIs at each site were themselves treating doctors which enabled them to further pinpoint suitable participants. Participants at BRICC, as well as SECI, were all endorsed by the PIs for the study. The third recruitment arrangement was through the researcher randomly approaching individual patients during their waiting time. This was limited to PMCC and in one case at the Egyptian site and was helpful in maintaining a level of diversity in the included sample. Some of the patients who were approached within the waiting space did not hold overt interest in the topic yet shared important experiences that contributed further breadth to the study in representing wider perspectives.

All patients at PMCC, except one, agreed to conduct the interview straight away (the same day as being approached and during their treatment session). Only one of the participants preferred to set another time, in which the interview was conducted in a meeting room at the hospital building. Interviews at BRICC were planned following the PI's introduction and were conducted in one of the building's meeting rooms. Similar planning occurred for participants at the Egyptian site however the interviews were carried within patients' treatment rooms (two of them in the waiting area). Only one patient refused to participate at the Egyptian site due to being very ill on the preceding day.

The participant information statement (Appendix A.2) and consent form (Appendix A.3) advised all participants that they could withdraw from the study at any time and that participation in the study would not affect their relationship with the organisation they were recruited through. The participant information statement also advised that if participants wished to withdraw after the interview has taken place, all they needed to do was to make this request and where data had already been provided, this would be removed from the records. No participants withdrew from the study.

4.4 Data collection

4.4.1 Interview framework

Interviews were guided by a semi-structured framework with questions relying mainly on exploring the feelings, opinions, reasons and significance of patient experience of the hospital built environment, as well as aspects or features of the built space that patients considered important for their wellbeing. The interview schedule was essentially planned to guide the interviews and ensure that key topics were covered. The discussion was organized by using open-ended questions exploring patient experiences across three key areas that patients were likely to encounter during their hospital presence: the treatment spaces; waiting areas; and the overall setting of the hospital. Some of these questions were devised following review of relevant literature, in which compatible questions were incorporated. Consultation with experts in qualitative research at the University of Melbourne, as well as a professional linguist, the ‘Health Literacy Manager’, at PMCC, were approached in order to refine the scope of the questions and ensure an appropriate level of plain language.

Having said that, conscious efforts were made to keep the interview structure flexible, interactive, and to allow participants to lead the discussion with topics, and in the order, most relevant to them. Questions were therefore formed, and consequently organized, to include a combination of general content mapping questions followed by detailed content mining questions to encourage patients to freely talk as well as to gain in-depth and comprehensive understanding of participants’ experiences (Ritchie et al., 2013). In that, open questions were deliberately used in the beginning to encourage spontaneity and identification of relevant topics of the research territory, the examples of which are as follows:

> *In the beginning, I am interested to learn about the points or issues that came to mind when you first heard about this study [that deals with the design of hospital buildings]? Anything relevant to the current hospital building and its design (either positive or negative) that you think are worth sharing as part of your experience with the building.*

Other opening questions were devised to induce participants to express and share particular insights from their overall experience with the building, such as:

> *Do you mind describing your experience when you first walked through the hospital building?*
>
> *Was there anything [architectural features or qualities] within the space which may have positively or negatively influenced your stay?*
>
> *Do you mind sharing your experience when you first walked through the treatment space?*

In order to unravel the potential meanings and significance people attribute to their experiences, different probing techniques using 'how, what, where, can you explain more' questions were incorporated as follow-up strategies to encourage further elaboration and gain in-depth understanding of the reasons, feelings, and opinions of participants and their experiences. It is worth noting that content mapping and content mining questions, alongside different probing techniques, were used interchangeably as the discussion permitted without following a rigid order (Ritchie et al., 2013). For example:

> *Can you tell me a little more about …?*
>
> *What gave you that impression?*
>
> *What features of the space do you think contributed to this feeling?*
>
> *Why do you think this is important?*
>
> *Was that helpful to you? In what sense, can you elaborate further?*

The interview framework included further 'prompt' questions to ensure comprehensive coverage and make sure that participants had a chance to reflect on most aspects or themes of the built space, as derived from the literature review in Chapter 2. These questions were not introduced unless participants did not reflect on key themes within the natural context of the discussion and were raised with light touch techniques such as “are there any other factors that would influence your experience? I'm thinking of things like…” Other strategies to stimulate further thoughts relied on sharing perspectives emerged from earlier interviews or suggested in the literature, which is defined by Ritchie et al. (2013) as “perspective-widening questions.”

> *Other patients talked about […]. How do you find that? how relevant would that be to your experience?*
>
> *You mentioned sometimes you might sit below the vents and my understanding is sometimes patients become sensitive to temperature or even smell, do you recall anytime where such things bothered you?*
>
> *So again, one of the requirements that you mentioned and stressed was finding toilets around and easily accessing them. Was there any other thing about the environment, in terms for instance, noise or temperature that influenced your stay positively or negatively?*

Some of the other guiding questions stem from the nature of the treatment itself, such as questions about how patients occupy their time during extended waiting and treatment sessions, as well as their preference for private versus shared treatment spaces. The interviews also included wrap-up questions asking to name features and elements of the space which are most important to patients and their wellbeing.

> *What do you think are the most important aspects to consider when designing such treatment spaces (a new hospital for instance)?*

4.4.2 Ensuring key requirements of a qualitative interviewer

As professional and personal qualities of the interviewer are essential means for a successful interview (Ritchie et al., 2013), the researcher, in addition to his past experiences in conducting research in healthcare settings as well as considerable familiarity with theoretical aspects of similar research, sought further ways to extend his fundamental skills in such data collection. This included individual consultation with Cancer Experiences Research staff members at PMCC, who provided critical guidance as to the conduct of interviews in such a context and with such population. Additional training and advice covering interview techniques were sought through academic members of the researcher's PhD Supervisory Committee, including a highly experienced qualitative researcher based at the University of Melbourne, Australia. Seminal and influential publications in the practice of qualitative research (such as Braun & Clarke, 2006; Mays & Pope, 1995; Ritchie et al., 2013; Tong et al.,

2007) were also subject to thorough study in order to follow established guidelines and ensure careful planning for both data collection and analysis.

This process induced the researcher's awareness to deliberately exercise fundamental skills during the interviews such as careful listening without interrupting participants' thoughts while being mindful of their articulations in order to facilitate further probing. Written notes were also used to distil essential points of participants' responses and facilitate formulating relevant probes and follow-up questions. On many occasions, this, alongside mental notes, helped in returning to specific points to seek further clarification without distracting the natural flow of the conversation. The researcher was also mindful of planning the interview in hierarchal stages, starting with general conversation as a way to put participants at ease while swiftly shifting to introduce the research topic and reaffirm participants rights for confidentiality and consent, which established the grounds to subsequently commence the interview. The end of the conversation was also sought following best practice recommendations by: i) signalling, 10 to 15 minutes before the end, with phrases such as “I have two more questions if your time allows…” or “the final topic…”; ii) allow participants to direct any questions to the interviewer; and iii) express warm gratitude for their contribution to the research. This alongside demonstrating interest, respect, and showing understanding and empathy when appropriate, helped establish a good rapport with participants.

4.4.3 Conduct of the interviews

All interviews were audio-recorded following participants’ written consent. Within the Egyptian context, informed consent was obtained verbally due to sensitivities around a person’s signature. In the Egyptian society, requesting signature following verbal agreement can be a sign of distrust of one’s word and can be considered quite offensive. In addition, signatures are commonly associated with significant financial and legal matters, hence sharing it for no compelling reason is perceived to be unsafe (Rashad, Phipps, & Haith-Cooper, 2004). Interviews ranged between 22 and 89 minutes with average of 40 minutes. Six participants in the individual interviews were accompanied by their family members, with three of these companions contributing occasionally to the discussion and their comments were reported as appropriate. Full information about participants and their contexts are provided in Table 4.1.

Table 4.1 Interview participants background

Interview type	Site	No.	Name	Gender	Age	Type of cancer	Interview Date (DD/MM/YY)	Interview length (min)	Interview location	Accompanying relatives	Method of approach	Receiving treatment at:	Attended other contemporary building
Focus group (former patients)	GICS, VIC Australia	1	Andrew	M	55	Not recorded	20/6/17	41	MR	0	Admin	TB	No
		2	Patrick	M	45	Not recorded				0		TB	yes
		3	Lynn	F	44	Not recorded				0		TB	No
	NEMIC, VIC Australia	4	Katie	F	45	Not recorded	15/2/18	70	MR	0	Admin	TB	No
		5	Pam	F	57	Not recorded				0		TB	No
Individual interviews (currently receiving treatment)	PMCC, VIC Australia	6	Richard	M	73	Bladder Cancer stage 4	21/3/18	63	TA	0	Researcher		-
		7	Sara	F	44	Ovarian Cancer stage 4	21/3/18	45	TA	1	Nurse		-
		8	David	M	58	Lung Cancer stage 4	27/3/18	29	TA	1	Researcher		-
		9	Cameron	M	41	Melanoma Cancer stage 3	27/3/18	22	TA	0	Researcher		-
		10	Kevin	M	70	Myelofibrosis/ Acute myeloid leukemia	29/3/18	30	TA	0	Nurse		-
		11	James	M	74	SCC Squamous Cell Carcinoma stage 4	29/3/18	46	TA	2	Researcher	CB, 2016	-
		12	Catherine	F	47	Acute myeloid leukemia (AML) stage 4	03/4/18	36	MR	0	Researcher		-
		13	Walter	M	48	Acute promyelocytic leukemia (APL)	23/4/18	72	TA	0	Nurse		-
		14	Imogen	F	39	Breast Cancer stage 2A	23/4/18	32	TA	1	Nurse		-
		15	Chris	M	69	(saturation interview)	12/6/18	29	TA	0	Nurse		-
	BRICC, VIC Australia	16	Diana	F	54	Not recorded	28/5/18	42	MR	0	PI		-
		17	Michelle	F	66	Ovarian cancer *(in complete remission)*	28/5/18	66	MR	0	PI	CB, 2013	-
		18	Margaret	F	59	Breast cancer	28/5/18	72	MR	0	PI		-
	SECI, Assiut Egypt	19	Samira	F	20	Non-Hodgkin lymphoma	02/7/18	48	TR	1	PI		Yes
		20	Mazen	M	20	Acute lymphoblastic leukemia	03/7/18	89	WA	0	PI		No
		21	Najat	F	48	Not recorded	08/7/18	22	WA	1	PI	TB	No
		22	Amal	F	27	Colon cancer	12/7/18	32	TR	1	PI		Yes
		23	Ali	M	30	Non-Hodgkin lymphoma	12/7/18	33	TR	0	PI		Yes
		24	Rahma	F	50	Not recorded	08/7/18	25	WA	1	Researcher		No

Key:
Interview Location: Meeting room (MR); Treatment area (TA); Waiting area (WA)
Receiving treatment at: Traditional building (TB) built before 2000; Contemporary building (CB)

4.5 Analytical framework

Considering the study objectives, Thematic Analysis (Attride-Stirling, 2001; Braun & Clarke, 2006; Hansen, 2006) was deemed relevant to search for themes or patterns within the data. By dividing the data into identifiable categories and working out the connections between them (Hansen, 2006), Thematic Analysis provides a systematic way to distil and describe the mass of textual data in rich detail, while furnishing the grounds to interpret and pinpoint potential explicit and latent aspects of it (Braun & Clarke, 2006).

Two objectives were sought at this stage of the research, including: gaining insights into patients' experience in a less-investigated context; as well as exploring potential updates to existing attempts to conceptualize the role that the built environment may play in patient experience. The study, therefore, did not aim to develop a new theory nor test an existing one. The intent was rather to explore patient experience in contemporary healthcare settings in order to formulate an updated proposition that may overcome existing shortcomings, as noted in the literature. With that in mind, the approach to data analysis needed to find a balance between strategies that aim to fit data entirely into a pre-existing conceptual framework and others that embrace 'data-driven analysis' approaches and set aside all preconceived theoretical ideas in order to permit themes to arise from the data, as in most inductivist approaches (Braun & Clarke, 2006). A middle ground was essential in order to build on existing attempts; either by finding **nuanced difference** or contribute to more **detailed accounts** of particular aspects that may match or resemble existing propositions in the literature.

Timmermans and Tavory's (2012) postulation of the Abductive approach resonated with that aim. Abductive analysis, which is different to inductivist approaches, advocates for extensive familiarity and engagement with scholarly literature and existing theories "at the outset and throughout every research step" (Timmermans & Tavory, 2012). Such in-depth engagement facilitates identifying missing and anomalous areas – stimulating insights for "innovative or original theoretical contributions" (Timmermans & Tavory, 2012). This further aligns with Tuckett's (2005) perspective which suggest that engagement with literature at early stages of analysis, helps sensitize researchers to more subtle features of the collected data. With that in mind, analysis of this study's data sought a middle ground by allowing themes to naturally emerge from the data (without imposing preconceived framework), while being mindful of existing theorization attempts in order to facilitate identifying other salient issues arising from the transcriptions.

A progressive approach was also considered for identifying themes at different levels by working inwards from a basic to global interpretation of the content. This allowed to first identify and describe potential explicit or semantic meanings of the data while shifting to more comprehensive interpretation by progressively focusing on developing conceptual ideas of the potential latent or implicit signification of the data (Attride-Stirling, 2001; Braun & Clarke, 2006). In the following section, this analytical process is discussed in further detail.

4.6 Data analysis – procedural methods

Data analysis was an ongoing process that started at early stages of data collection and was carried concurrently with the interview process in order to check for data saturation (Mays & Pope, 1995). Following the focus groups, as well as the first seven individual interviews within the Australian context, an initial attempt to comprehend the scope of the discussions was carried out by listening to the audio recordings and documenting general reflections on the data in a memo file. This was critical in guiding the point where data saturation appeared to be achieved and accordingly data collection stopped at the thirteenth individual interview following the two focus groups within the Australian context. In the Egyptian context, the same process was followed, and data collection was stopped at six interviews when similarities in responses became apparent.

Interviews were transcribed verbatim following the end of data collection. NVivo software was used to aid the analytical process. In the beginning, general features such as 'word frequency' and 'text search' queries were explored; however, these analytical techniques did not reveal significant outcomes (Figure 4.1). The analytical process was then followed by number of stages as follows:

Figure 4.1 Exploration of word frequency using NVivo.

4.6.1 Familiarization with the depth and breadth of data content

The first systematic step of data analysis was carried out through repeated reading of the transcripts alongside listening to the recordings. This provided a chance to check the transcripts for accuracy, grasp the overall scope of the interviews, and account for any emotional, non-verbal signals in participants' views (how things are said). Notes were actively taken in a memo file as an initial way to highlight interesting ideas in the data that may form the basis of a repeated pattern. Although time consuming, this process provided the foundation for the rest of the analysis and allowed a needed attention to the details of the data, aiding the upcoming interpretation.

4.6.2 Generating initial codes

Following this phase, a systematic coding process started in which data was broken into groups of interesting features by tagging and naming selections of text into identifiable codes using NVivo software (Hansen, 2006). Data, in this phase, were approached without pre-existing coding frame. The process aimed to highlight any potential patterns in the data as they evolve throughout the reading and without restriction to any analytic preconceptions. All data extracts matching each identified code were collated together and exported to separate Word files.

4.6.3 Searching for themes

Stemming from the thesis's first research question (what are the roles that the built environment of ambulatory cancer facilities play in patient experience?), the previously-generated codes, alongside their collated extracts, were printed and re-read with the aim to find connections and synthesise them into potential core headings or themes, that could combine different but relevant codes (Hansen, 2006), describing the potential role that the built environment may play in shaping patient experience. Sticky notes, in a form of mind-mapping arrangement, were used as a visual representation technique to aid the process of sorting different codes under overarching themes as well as provide the flexibility to rearrange and reposition them as needed into different theme piles (Figure 4.2). The generated thematic map was then digitalized into a Word file with all relevant text extracts collated below each of the candidate themes and sub-themes.

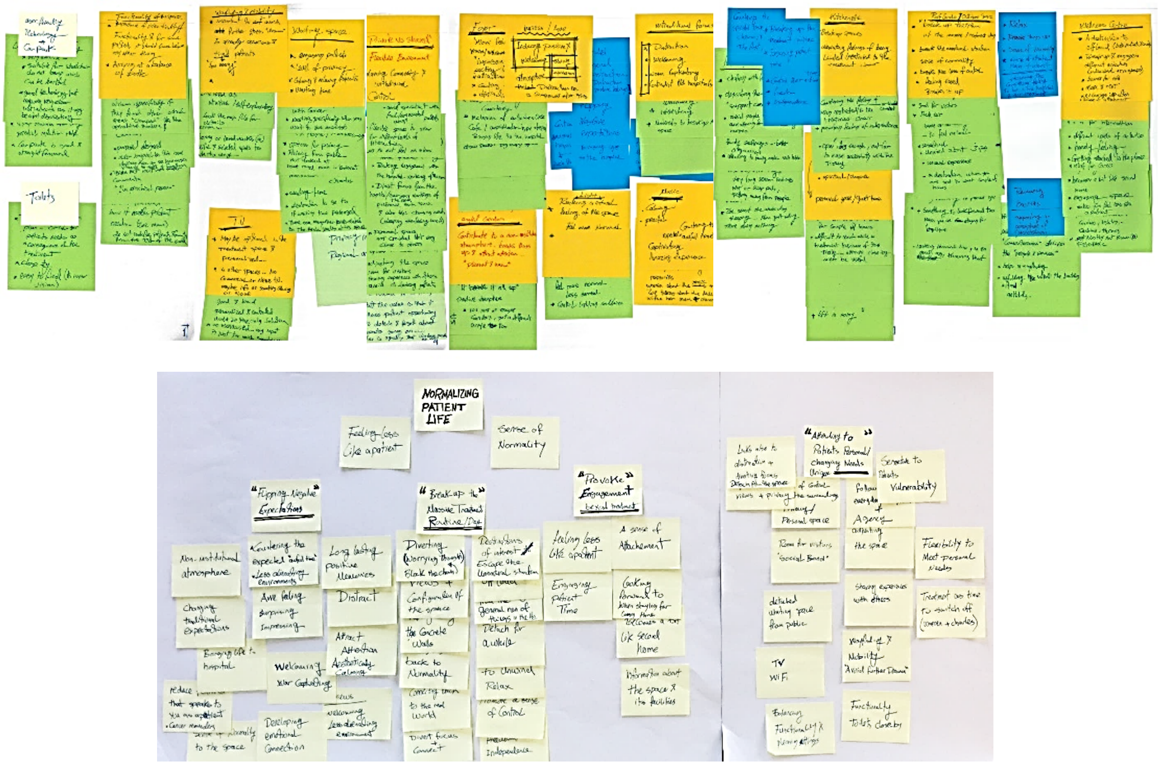


Figure 4.2 Example of the generated theme piles using sticky notes.

4.6.4 Reviewing themes

All data sets were then read one more time to check the extent to which the coded extracts related to the generated themes, which resulted in further refinement, repositioning and addition or removal of specific extracts (quotes). Alongside this process, attempts to refine the generated names of themes relevant to the essence of each theme content were considered. Careful attention was paid to formulate concise and effective names to immediately communicate the themes to the reader (Braun & Clarke, 2006). Before commencing the write-up phase, a further reading of all synthesized themes alongside their relevant participants' quotes were carried out, contributing to additional nuanced refinements. This either confirmed the themes, and participants' excerpts were used to support that, or themes were modified according to the revised understanding of the text.

4.6.5 Writing

Analysis is not a linear process, rather a more recursive one (Braun & Clarke, 2006). As noted in the description of this chapter, data analysis followed a constant, back-and-forth, feedback between the entire data set, coded extracts and thematic attempts, with writing forming a further complementary and integral part of the process. Writing was essential to fine-tune data propositions and the overall story that the analysis told. An important aspect of writing the results of qualitative interviews is to provide sufficient evidence of the generated themes by embedding a selection of illustrative data extracts within the researcher's own analytic narrative (Braun & Clarke, 2006).

In the process of writing the results chapters (Chapter 5 and 6), participants' excerpts were used and embedded within the analytical narrative in two ways. A selection of vivid and compelling quotes were integrated within the main textual paragraphs, while additional extracts were compiled following relevant paragraphs as a further demonstration of the theme's prevalence in the data. Once the initial draft was completed, a further synthesis was sought by printing and reading the whole text to assure that themes were internally coherent, consistent yet demonstrate well-organized and convincing distinction. This resulted in further refinement of the themes (from five to four) with the introduction of number of subthemes.

4.7 Merit and credibility of the analysis

Strategies to ensure rigour in qualitative research

The exploration of participants' experiences in this study and the way interviews were structured and subsequently documented and analysed, was parallel with Edvardsson et al.'s (2006) and Timmermann et al.'s (2015) adoption of Paul Ricoeur's (1979) phenomenological-hermeneutic theory of interpretation. In these studies, analysis and interpretation of the text followed progressive movement between three main levels of analysis including: naive overall reading of the texts as a whole to obtain initial understanding of meanings and potential patterns; followed by a structural analyses phase that systematically codes patterns in the data in order to validate the initial understanding; and ending with a final comprehensive understanding which is achieved through critical dialect between the first two phases to potentially lead to new insights in understanding and explaining the phenomena under investigation.

Furthermore, the very close alignment of the implemented analytical process with the framework postulated by Braun and Clarke (2006) that frames the recommended way for conducting credible thematic analysis, gives additional confidence of the credibility of the process followed by the researcher in this study. It is worth noting that the sequence of analysis was documented before being exposed to Braun and Clarke's (2006) article, which gives further reliability of the followed process. The text was hence arranged under similar subheadings to the one reported by Braun and Clarke (2006).

The integrity and rigour of qualitative research has been subject to several criticisms ranging from its susceptibility to researcher bias, to the potential difficulties to maintain reproducibility and generalizability of its findings (Mays & Pope, 1995). Scholars have therefore advocated for providing adequate description of the study design and all related processes, from data collection to the way researchers examined, perceived and reported the findings, as essential criteria to enhance the credibility of qualitative research (Mays & Pope, 1995; Ritchie et al., 2013).

This thesis has aimed, through this chapter, to communicate a detailed account and description of the methods followed and assumptions made in order to improve the credibility of the findings and minimize potential bias. Besides following well-established qualitative research guidelines in the planning and analysis of data (Mays & Pope, 1995; Ritchie et al., 2013; Tong et al., 2007), the study also followed established frameworks for reporting qualitative research as a further step to ensure that important aspects of the research (such as the team, study methods, context of the study, findings, analyses and interpretations) are appropriately reported. This was primarily through the “consolidated criteria for reporting qualitative research” (COREQ) checklist (Tong et al., 2007). COREQ provides a comprehensive 32-item checklist, synthesised from 76 items identified through systematic review of 22 existing checklists. This makes it one of the most comprehensive and widely recognized guidelines for reporting qualitative research. The 32 items are classified under three domains: i) research team and reflexivity, ii) study design and iii) data analysis and reporting. Table 4.2 provides record of the checklist items marked against the main aspects reported in this chapter, providing readers with an overall account to assess the quality of the research.

Table 4.2 Research aspects reported in Chapter 4 following COREQ checklist

		Reported
Domain 1: Research team and reflexivity		
Personal Characteristics (interviewer)		
1	Interviewer/facilitator	✓
2	Credentials	✓
3	Occupation	✓
4	Gender	✓
5	Experience and training	✓
Relationship with participants		
6	Relationship established	✓
7	Participant knowledge of the interviewer	✓
8	Interviewer characteristics	✓
Domain 2: study design		
Theoretical framework		
9	Methodological orientation and Theory	✓
Participant selection		
10	Sampling	✓
11	Method of approach	✓
12	Sample size	✓
13	Non-participation	✓
Setting		
14	Setting of data collection	✓
15	Presence of non-participants	✓
16	Description of sample	✓
Data collection		
17	Interview guide	✓
18	Repeat interviews	–
19	Audio/visual recording	✓
20	Field notes	✓
21	Duration	✓
22	Data saturation	✓
23	Transcripts returned	–
Domain 3: analysis and findings		
Data analysis		
24	Number of data coders	✓
25	Description of the coding tree	✓
26	Derivation of themes	✓
27	Software	✓
28	Participant checking	–
Reporting		
29	Quotations presented	✓
30	Data and findings consistent	✓
31	Clarity of major themes	✓
32	Clarity of minor themes	✓

Chapter 5

Interview results – Australian context

This chapter examines the qualitative data emerging from a series of in-depth, face-to-face, interviews and focus groups conducted as part of the research for this thesis across two healthcare sites, as well as two consumer groups, in Victoria, Australia. As reported in the previous methodological chapter, eighteen patients or former patients accompanied by three family members participated in this phase including: ten patients at Peter MacCallum Cancer Centre (PMCC) and three at Ballarat Regional Integrated Cancer Centre (BRICC), in addition to three former patients in a focus group at the Grampians Integrated Cancer Services (GICS) and two at the North Eastern Melbourne Integrated Cancer Service (NEMIC). Interviews were semi-structured with questions relying mainly on exploring the meaning and significance of patient experience of the hospital built environment, as well as aspects of the built space that patients consider important for their wellbeing, thereby responding the **first and third research questions** (what are the roles that the built environment of ambulatory cancer facilities play in patient experience?; and, what are the salient architectural design features that elevate cancer patient perceptions of a supportive environment and what others may hinder that?).

This chapter examines key aspects of the built space that shape the experience of patients undergoing intravenous anti-cancer treatment within outpatient settings. By synthesizing the interview outcomes, the chapter conceptualizes four key themes that highlight the main contribution of contemporary healthcare design to patients' experience and wellbeing. This ranges from the role of the built space in shifting negative expectations and inducing positive and calming impressions, to its role in breaking up the intensity of the treatment day at times of feeling overwhelmed as well as provoking engagement in activities beyond treatment and being sick. The discussion also highlights the role of the built space in attending to patient individual needs and treatment-related vulnerabilities. The outcome of this chapter expands the existing propositions of a supportive healthcare environment with further rich and in-depth understanding of its potential constituent elements. It points to a refined, and more comprehensive, conceptual understanding of the way the built environment may promote wellbeing. Participants' excerpts are used within the analytical narrative in two ways: a selection of pertinent quotes are integrated within the main textual paragraphs, while additional extracts are compiled following relevant paragraphs as a further demonstration of the theme's prevalence in the data.

5.1 Flipping negative expectations

5.1.1 Promoting unusual, non-hospital-like, experience: "surprising & impressing"

Initial encounters with the space

Traditional hospitals are often associated with a feel and smell that is frequently described as sterile (the smell of disinfectant, and hard, unadorned surfaces, both walls and floors), inducing an alien and unfamiliar atmosphere and associating hospital visits with negative experiences and expectations (Adams, 2017; Sloane, 1994). Reflecting on her view, Margaret pointed out that "there's a smell about a hospital and, a look about a hospital that is probably a 60s design. That sort of design, that immediately makes you think I'm in a hospital and it's full of sick people." Design attributes, such as multiple hallways where disorientation is the norm (Sara, Walter, PMCC; Diana, BRICC), cramped spaces (Richard, Kevin, PMCC) with narrow corridors and traditional green or grey colours (Imogen & her Mother, PMCC), were etched into patients' experiences as common characteristics of such hospital spaces. Participants described these settings with words such as dull, rundown, terrible and miserable buildings that contributed to some of them having awful experiences (Imogen, PMCC; Diana, BRICC; Lynn, GICS).

In her reflections on an older hospital setting where she used to undertake chemotherapy, Imogen described her experience of getting treatment in a basement room without windows as "horrible." Commenting further on the overall setting she stated, with emotion in her voice: "I hated going there… and as soon as we'd get there, we'd, like, walk through really fast" attributing that feeling to the rundown, depressing condition of the hospital spaces as she described them. In contrast, when walking through PMCC, Imogen portrayed the building as positive and uplifting. Being impressed was the general response that most of the interviewees had toward the building and its design. "I was just quite amazed about how beautiful the place is and how peaceful it was… It surprises me, it really surprises me coming in, a public space, that has been designed to give that sort of feeling" (Cameron, PMCC); "There is a big wow factor about the place. You think, Jesus, this is really nice in here" (David, PMCC).

> *Imogen, PMCC: I've always been impressed with this building [referring to PMCC], yeah. So different from (…) [an older hospital she named].*
>
> *Richard, PMCC: I was very impressed with the actual design and all the curving balconies from the atrium and all that.*
>
> *David, PMCC: But it's an upmarket hospital, you know what I mean. It's, it's got that level, like I've never been in another hospital like this before. You know what I mean? Like I said, it is an eye opener.*
>
> *James, PMCC: I have to say I am fully impressed with the whole thing.*
>
> *Diana, BRICC: The design of the building is lovely, you walk in and you kind of go wow… It has that sort of effect on you, incredible… And it certainly, when you walk in there, you feel. It does have that positive effect on you. It's not sort of somewhere you walk in and go, oh this is drab and awful. You know, it's lovely when you go in there… as you walk in, it's welcoming. The, the design of it is lovely, it feels nice when you walk in, you feel comfortable when you walk in there. And you know exactly where you've got to go.*

Different design qualities were attributed to eliciting such impressions, however the overarching character identified was that the building was purposefully designed to look and feel less like a hospital, “which is what's exciting about I think, and nice” (Imogen, PMCC). This is a feel that Walter and James described as a hotel-like experience that favoured more inviting and impressive architectural qualities over the traditional hospital sterile and institutional atmosphere.

> *Walter, PMCC: It looks like a hotel experience too. It got a little bit of luxury about it, it is not sterile, I guess is the word.*
>
> *James, PMCC: I spent most of my working life in 5-star hotels, three times a week, and I can tell you this raise right up there with them, this building.*

One of the prominent architectural features regularly noted by patients at both PMCC and BRICC was the foyer design. In response to a question asking patients about what first comes to mind when reflecting overall on the hospital building, most participants pointed to the atrium space and its openness as a quality that helped shape their first impressions. The open feel of the entrance space, with its abundance of natural light coming into the atrium, contrasted with participants’ images of a typical hospital space and contributed to a welcoming and calming feeling when they first walked through the building (Imogen, Sara, Walter, Cameron, Kevin & James, PMCC; Margaret, Michelle & Diana, BRICC).

> *Imogen, PMCC: It's just that it's got all that open space, it's unusual I guess for like such a big building, to have such a big foyer space. To have so much light in it. I would think that was unusual.*

> *Sara, PMCC: I love the open space in the foyer, I like the room and your gaze is directed upward to the light, the light coming down makes you feel you're in like bright open space rather than a dark hospital and a warren of corridors where you do not know where to go.*
>
> *Kevin, PMCC: Yeah, a very spacious and open feeling. Whereas the other hospital tended to be a closed in sort of feeling. And even when you walk into the hospital, there is a light well down the centre of the building which gives a feeling of just openness.*
>
> *Cameron, PMCC: When I first came to Peter Mac it was quite a calming, quite beautiful coming into the ground floor.*
>
> *Walter, PMCC: I think when you first walk in and there is a whole open space, I think that helps a bit. There is not this confusion, people everywhere, 'cause there is enough room there.*
>
> *James, PMCC: But, that's the comparison that I first found when I came here was light, was airy and it was clean. There wasn't a mark on the floor.*
>
> *Diana, BRICC: The building, the design of the building is lovely. It's all very open, very welcoming.*

Figure 5.1 Entrance hall, PMCC. Photograph: Peter Bennetts. Source: courtesy of Plenary Group.

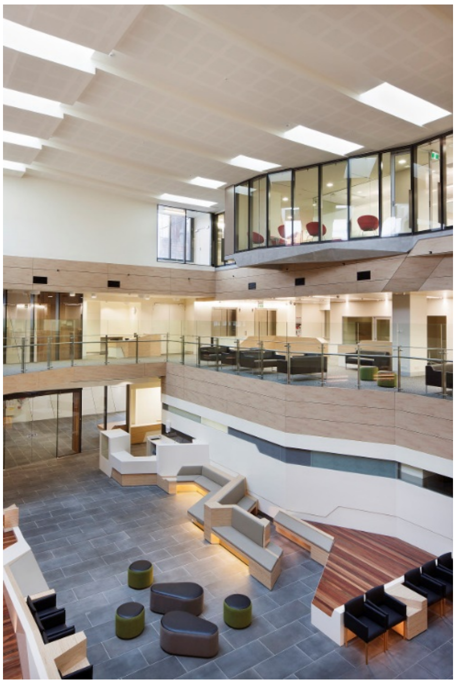


Figure 5.2 Entrance hall, BRICC. Photograph: Shannon McGrath.

In response to identifying other qualities that helped shape such calming and peaceful surrounding, besides not feeling crowded in the space, Cameron, alongside Catherine (PMCC) and Diana (BRICC), pointed to the idea of "visual connectivity" that such openness affords. Visual connection to different spaces that patients use across their treatment journey, was a prominent sign that symbolizes as well as restates the idea of "connectiveness" that Cameron experienced from both the services and the people of the hospital. On that he stated: "so, in the space, I never felt crowded, the feeling I have of space… It's quite strange feeling of connectivity, so on this floor I see my doctor over the outside of the floor and then I come around and have my treatment here, so I can actually visually see it and there is that beautiful space in between, just having that connectivity so I do not feel like far from, I can almost just see my journey going through and actually I see one of these at my treatment (immunotherapy), I can go up and I can almost eyesight, I can see where I get my physiotherapy. I had operation late last year in December, so I can see where that is, I can see the exercise physiology as well. So, it's kind of, the thing I feel here, overall I get a really good level of support, the services and the people, there is a real team of connectiveness, trying to support me, when I can see where I am going it certainly adds to that feeling."

> *Diana, BRICC: Obviously down in this section, when you walk in and it's very open. You can see, I guess the offices up there, there's a little room. You can see this section out here. Which is really quite nice, because sometimes you can see the nurses walking past and they give you a wave, or whatever you know, from upstairs.*
>
> *Catherine, PMCC: I like the visibility from one area to another.*

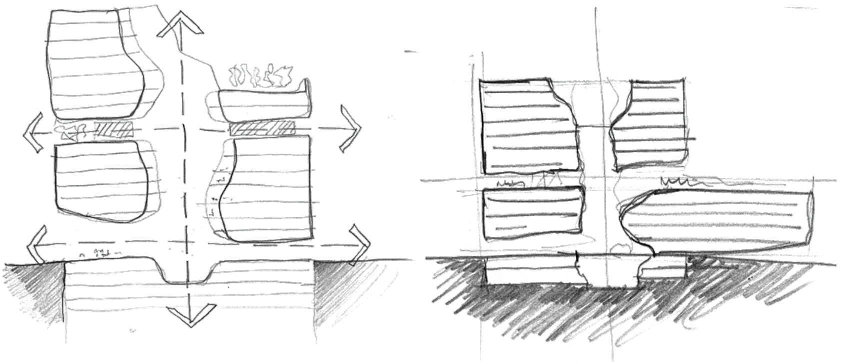


Figure 5.3 Architects' representation of the visual connection afforded by the atrium space at PMCC. Drawings: Credit McBride Charles Ryan Architecture & Interior Design. Source: http://www.mcbridecharlesryan.com.au/project/the-victorian-comprehensive-cancer-centre-vccc/

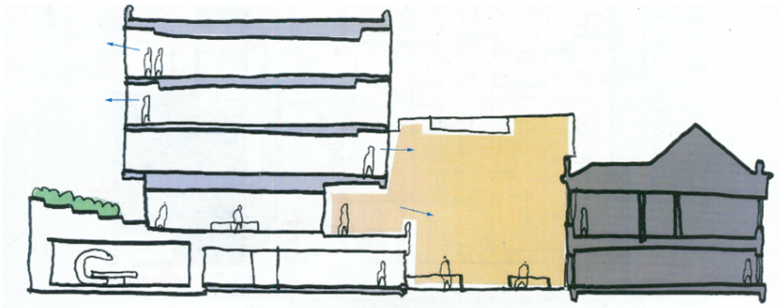


Figure 5.4 Architects' representation of the visual connection afforded by the atrium space at BRICC. Drawings: Billard Leece Partnership. Source: personal communication.

A couple of patients were critical though of the openness, describing the atrium as a big, empty space, that could have been better used for other functions that may lack space (Richard, David, PMCC; Michelle, BRICC). Michelle on her first thoughts of the study topic, besides her positive feedback, criticized the entrance design describing it as: "absolutely enormous. It's a big, big atrium, big empty space." Other participants were still appreciative of the impressing and welcoming role of the space but were more in favour of the functionality needs, highlighting that any consideration of the aesthetic appearance should not compromise on the functional efficiency of the building spaces (David, Richard, PMCC).

> *David, PMCC: It's a beautiful hospital right, there is no doubt about that at all. But I just look at it where I think some of the, centre bit type thing could have been, maybe had some extra floors or something in it, to put more beds and stuff like that in it.*
>
> *Richard, PMCC: Oh well, I think you know what I'm going to say and that is function is the most important thing. And for me, the visual side is secondary. It's all about making the space user friendly, for the staff as well as the patients. And that to me is paramount… I just hoped that they didn't compromise on the function side, at the expense of the beauty side. It is, it's certainly a beautiful building.*

In a follow-up question with Michelle (BRICC) asking to describe her experience when she first walked through the building, she stated: "when I came in, I was absolutely amazed. And I was amazed at the space as well, even though I'm criticising the space. You know, you come that door, you turn right, and you go oh wow, this is amazing." Following further reflection, she indicated: "I've been impressed with this place right from the word go. And it's to do with space and light." Michelle comments suggest that some features of the space, even if considered intellectually non-functional, can have a rather 'subconscious' positive impact. Walter (PMCC), who was primarily in favour of the open space, self-reflected on the potential waste of space and instantly stressed the importance of such a feature, not only for patients' wellbeing, but also for easing other functions such as wayfinding. He stated: "some might say it's a waste of space, but to us, to myself, it's an open area you can walk through easily, it's not like a closed foyer. A good area where you walk in, feel and stop and have a look around."

> *Walter, PMCC: Yeah, because I think when you, for me as a patient there is enough going on, and to have sort of no real distractions, if that make sense, to be, sort of, like I said, you walk in and to be clear where I'm going, just makes it a bit easier.*

Associated with the feature of openness was the detailed design, its visual character, of this centrepiece, the atrium. At PMCC, the most prominent feature, as one walks through the welcome hall toward the central atrium and looks up, are the curves of the architecture and how these are softly articulated with each floor level, creating quite a unique organic form, as described by Sara. This level of attention to architectural design came as a surprise to the participants, and was in striking contrast to their view of older hospitals, which usually feature “square and block like” design and are “probably more depressing” as pointed out by Imogen and her Mother (PMCC). Such an organic form contributed further to the welcoming and calming experience described by Sara and Catherine (PMCC), rendering the whole design of the atrium as an “eye opener” that Walter admired and felt comfortable within: “so when I first walked in to see that look up, it was something beautiful, that is probably, yeah, something to admire. Its captivating, this is the word. Definitely a warm captivating feel about.”

> *Sara, PMCC: It made me probably feel a bit calmer… Yeah, definitely positively.*
>
> *Catherine, PMCC: I like the way that it's, the light is good, so there is good lighting. The curves of the building are very calming and welcoming, and they make it interesting, if it was just a series of corridors it's easy to get lost and you feel constricted and so on.*
>
> *Imogen, PMCC: Well, I was thinking that there is lots of curved architecture in this building, curved lines. Which I guess is different from like old hospitals, which are all square and block like, and probably don't have enough light. And probably more depressing. Yeah. So, this building I guess with curved lines, and there is lots of light… I think the curved lines make it different from other hospitals, from old hospitals and that softens the architecture, I guess.*
>
> *Imogen’s Mother, PMCC: It's not all straight and angular and little boxes… So, you come out of the lift and it's not low ceilings and dark and dingy… Imogen: Like a tunnel… Imogen’s Mother: it just makes it a much lighter place to be. It's not such a depressing feeling to move around this building.*

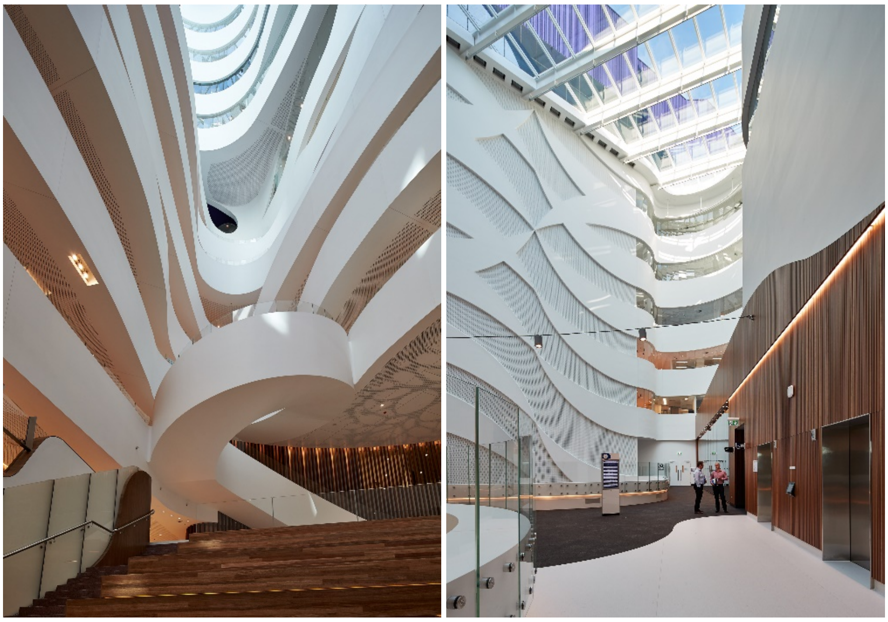


Figure 5.5 Atrium space, PMCC. Photograph: Peter Bennetts. Source: courtesy of Plenary Group.

Figure 5.6 Incorporation of curved architecture, PMCC. Top two photographs: Peter Bennetts. Source: courtesy of Plenary Group. Others: Photographs by author.

At BRICC, the entrance hall had also a unique, yet different, visual character that garnered patients' admiration. BRICC extends the Ballarat Base Hospital buildings with a new facility that incorporates a revamp of an existing red brick historic building. The thoughtful blend of this heritage building with the contemporary design of the central atrium was something that lent the space a unique character and contributed to patient appreciation of the thoughts behind such design and its execution. “I thought it was terrific. The features that I love about it, and my husband and I were talking about it the other day. The way they have incorporated the Ballarat original building space, and have incorporated the design, which must have been an external building space. So, it still has that lovely heritage feeling about it, which I love and I, in fact we both commented on how incredible it is that they've been able to do that, and the design associated with that” (Margaret, BRICC).

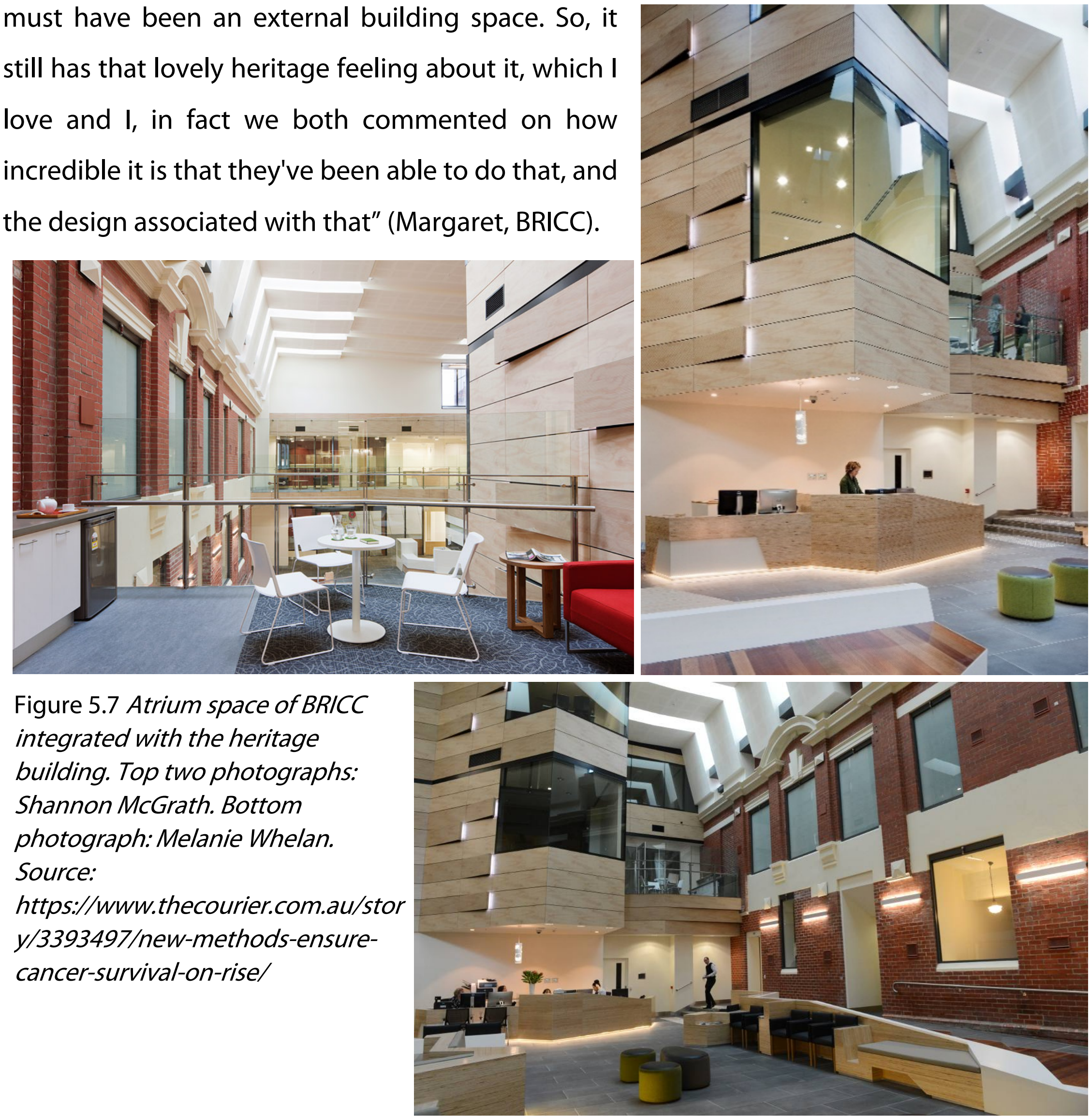


Figure 5.7 *Atrium space of BRICC integrated with the heritage building. Top two photographs: Shannon McGrath. Bottom photograph: Melanie Whelan. Source: https://www.thecourier.com.au/story/3393497/new-methods-ensure-cancer-survival-on-rise/*

Other common design features, such as the colour palette, artwork, finishing materials, and even wall angles, were further qualities that contributed to a less institutional feel of the hospital spaces. Imogen’s Mother on that (and Imogen agreed, PMCC) stated: “as you come through all the corridors, it's obviously a hospital. But I think the lighting is good, the use of colours to break up the spaces in the hallways. And things like, see the wall just over there. It's got a different colour. But you've also got a different angle, so it's not just all straight corridors. So, it doesn't feel so institutional.” The application of materials perceived to be warm, such as timber cladding, was also remarked upon as giving such impressions: “wood is warm and calming” (Catherine, David, Walter, PMCC).

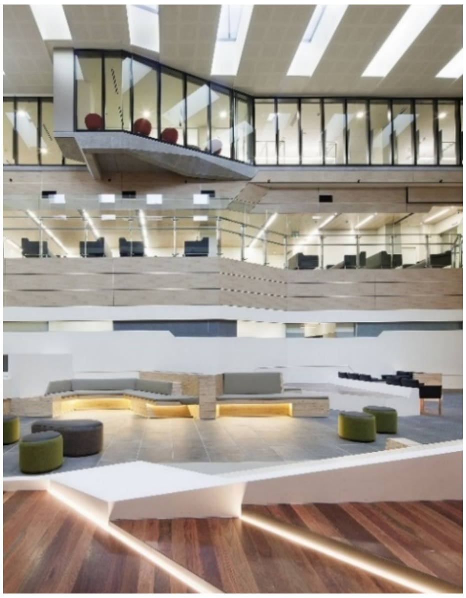
> *Imogen’s Mother, PMCC: I think the colours that are used, are not the traditional hospital colours. It's not that green, grey, off white, everything dull and it's really bright and the art work that's around the place, helps to contribute to that too. Very positive atmosphere.*
>
> *Imogen, PMCC: It's the colours that makes it different from old hospitals.*
>
> *Catherine, PMCC: There's lots of different textures around on the large wall, where the research lifts are behind. Some interesting stuff there, and the wood around the lifts, the patient lifts, is very, it breaks up the whiteness of the place.*

The ample space of the welcome hall allowed the integration of other communal facilities, such as a café, amphitheatre and unique seating spaces, which were further supportive of a non-hospital-like atmosphere, allowing opportunities for “bringing” varying aspects of ordinary life to the hospital building. The amphitheatre was a specific feature of PMCC. It was developed to connect the ground level with the Radiation Department in the basement, in which the steps were laterally extended to form amphitheatre seating, creating something that facilitated opportunities for people to gather, sit and engage in everyday activities. It was also used to host music concerts and organized events celebrating festivals such as Christmas, Lunar New Year and Easter. This is something that James’s family valued in how it affords ordinary aspects of life within the hospital spaces: “people also come, musicians and they play on the stairs sometimes. At Christmas, we've seen the Chinese dragon, we saw the Easter bunny yesterday, you know all that sort bringing life into the hospital.”

> *Imogen’s Mother, PMCC: And I think on one of our first visits here, there was a string quartet playing beautiful classical music on the stairs, going down to the research, oh the radiation theatre… Which is really lovely, the sound floating through that big space.*
>
> *Sara, PMCC: I always have a little look of that [amphitheatre steps] and just see if people sitting there and what they are using it for.*
>
> *James, PMCC: Wonderful, oh yeah. Really wonderful. And you go down into that lower cafeteria, you'll see so many people from Royal Melbourne that are having lunch here.*
>
> *Diana, BRICC: Into the main area, the new area, it's lovely in there. Obviously, you know, you've got your little restaurant, people to greet you.*

Figure 5.8 Amphitheatre steps, PMCC. Photographs by author.

Figure 5.9 Non-conventional seating spaces, BRICC. Photograph: Shannon McGrath.



The acoustics and integration of music in the background was a further “unusual” aspect that not only contradicted traditional believes about hospitals and influenced participants’ moods: “it was just had a quite a different impact” (Cameron, PMCC). But also left others, like Walter (PMCC), with positive memories that he continued to reflect on with his family: “oh certainly, something amazing, I don't know how to put that, not because my illness, but to experience something like that, I've never had that, never been around that sort of stuff, and then they had the band like an orchestra corralling once and that was absolutely beautiful, it was, like I came downstairs, I can hear it, and I came down, just when you sit in the atrium, that was spectacular… That was really nice touch… That is one of those, it’s like a moment that I've had and I still talk about to my wife and kids.”

> *Walter, PMCC: I was lucky enough to hear some music through here, in the atrium they actually had music couple of times and it was fantastic to hear that, the acoustics. I do not know if that was deliberate or not, but certainly hearing some music in there was captivating and very, yes, that was amazing experience.*

Continuity of initial positive impressions

Patients’ impressions were further shaped by the inclusion of other spaces as they progress in the hospital building. The inclusion and thoughtful design of a rooftop garden, at PMCC, and the wellbeing centre struck participants further, challenging ideas about traditional hospital design and what they expect them to be. Cameron described the rooftop garden as a “beautiful, nice and peaceful” place that is “quite unusual experience to have. It was an unusual experience to find anywhere really.” All participants at PMCC stressed how important this place is for their experience and how stunning and sensational it was. The wellbeing or wellness centre, particularly the one at BRICC, had quite similar influence. Its location, side-by-side with the main entrance, deemed it accessible to all visitors, right from their first presence in the hospital. Yet, its design was the thing that attracted patients, making them feel welcomed, comfortable and most prominently, less like a patient. “And the first place that I went to, was downstairs in the wellbeing centre. And, I go back there from time to time… It just makes you feel less like a patient, and it makes you feel welcomed and comforted” (Margaret, BRICC); “But the space itself is, is again, very nice. Very welcoming” (Diana, BRICC).

Once more, the most prominent character of the space is that it was designed to look less like a hospital. The introduction of familiar features such as the lounge space with couches, cushions and throws, the fire place, book shelves, computer access, kids play area, and even the kitchenette with oven, coffee making facilities, and fresh fruit, gave the space a familiar, home-like, rather than hospital-like atmosphere (Michelle, BRICC). Margaret described them as "the sorts of things that engage someone in a sort of an intimate enclosed, comfortable environment" that "doesn't speak to you like you're a patient." She found these features contributor to a domestic feel for the space, “which again lends itself to that feeling of a private home space… that you're immediately drawn to as feeling comforted.”

> *Margaret, BRICC: The lounge chairs, they feel comfortable. The kitchen space feels like a kitchen, it doesn't feel like a hospital. And there is always someone there to talk to. Even down to fruit on the table. It just gives it a, there's something very familiar about that space, that people would immediately go in and recognise, that there is a kitchen space. Yeah, so it's almost a domestic space in a way. That you're immediately drawn to as feeling comforted, yeah… But I know the lighting is dimmed a little, in some areas. And there's sort of cushions and throws and things around the place, which again lends itself to that feeling of, of a private home space.*

The fact that the hospital was purpose-built to suit the oncology function (compared to the former PMCC building that was originally built as the St Andrew’s maternity hospital) was something that added further to patients' impression of the space – the precise functionality of the spaces. Right from the underground parking and the convenient lifts (Richard & Walter, PMCC), to the treatment area where everything is "in its place" as described by Kevin and James (PMCC), not only impressed patients but also gave them confidence that they are in the right place to receive their treatment. "As I said, that it was new and purpose-designed, just for this process. It gave me tremendous confidence that I was in the right place to receive my treatment. And so, it proved, this is my third visit and it's all going very well" (Richard, PMCC). Standardized configuration of the space, where every area is designated for a specific function, was highlighted as an outstanding difference to older settings. Kevin on the treatment spaces stated: "yeah because in the old design, at the old Peter Mac hospital, everything was all over the place and this hospital, everything is in its place… That way you've got the walking space defined compared to the working space, that the nurses occupy… Because the other hospital was hopeless."

> *Richard, PMCC: Well the good is that my experience in here has been fantastic. It just, it's just impressive how well everything seems to function. And the presentation of course is, everything is immaculate. And the comparison from the older facilities at Footscray and even Sunshine, and Sunshine is a new building. But it didn't impress like this does.*
>
> *James, PMCC: … the openness. You know, the staff can move around without bumping into one another.*
>
> *Richard, PMCC: The treatment area itself, again obviously purposed designed and seems to function very well. The nurses don't seem to be struggling to find connections for any of their equipment.*

5.1.2 Inducing positive and calming impressions in an expected aversive and "disliked" situation

The role of the built environment in countering cancer patient expectations of traditional hospital settings is critical when considering the special stresses and uncertainties brought to the situation by a treatment such as chemotherapy. Patients are aware that this treatment feels contradictory: "here we are, very compliantly being led to a very comfortable chair. By some wonderful nurses, to sit and be injected with poison," Margaret stated. This toxic nature of the treatment renders it as "an odd thing to be doing." David, in a sarcastic tone of voice, described it as "the bag of evil", calling the infusion process as "crap" (Imogen as well) in which they pump "shit" into his blood. It is "a very emotional and stressful thing" to have, as Margaret framed it – in fact, "it contradicts everything that you think you should be doing."

Patients constantly hear about how sick they can get as a reaction to such treatment. Developing negative expectations of the treatment is therefore not unusual. When Margaret was going for her first chemo session, she was expecting the worst. She thought they may have to carry her out. She did not know really what to expect. Developing fears of the chemotherapy treatment space itself becomes reasonable, and this was prominent for some participants who described seeing the doors leading to the chemotherapy space for the first time as "scary" and "overwhelming."

> *David, PMCC: Because it kills your white blood cells. Kills 'em, that shit does… So, if they spill it on them. And especially being a female, they can actually get to the stage where they can't fall pregnant. And they're pumping this shit into me. So, yeah, it's not a cure. It just slows it up.*
>
> *Margaret, BRICC: But I knew that chemotherapy was through that door, and I knew that's where I was going to go at some stage and for me, that was pretty scary… So, the first thing that I thought about as I moved into that space as a researcher, was what a bizarre space it is. And the reason that I thought that is because here we are, very compliantly being led to a very comfortable chair. By some wonderful nurses to sit and be injected with poison. So, in that sense I thought this is a really, intellectually I thought, this is a really, really odd space.*

The design of the treatment space and what patients see when they first walk in may play a pivotal role in alleviating such worries. Similar to Margaret's comments, Diana described the first treatment session as "overwhelming", however the space gave her quite positive initial impressions, specifically with the presence of big windows. This setup rendered the space reasonably comfortable (Diana, Margaret, BRICC), as well as "quite calming" in situations where "you really don't want to be there" (Catherine, PMCC).

> *Diana, BRICC: It was very overwhelming, but I thought it was very nice. I had my family with me, and they made the same comment about the area was very nice. Well set up. Obviously got big beautiful windows and things that you can see out of, if you're having treatment.*
>
> *Margaret, BRICC: The spaces lend themselves to make you feel comfortable. The first space that I was in, I could see outside which was nice.*
>
> *Catherine, PMCC: The view from the therapy is nice though, it's nice to be able with the big windows the glass walls to get that natural light and see the trees and the buildings and that sort of things, so that's nicely calming, if you really don't want to be there.*

Another potential aspect in which the space can provide patients a less alienating experience relates to its layout or configuration. Pam and Katie (NEMIC), from the exploratory interviews with consumer groups, expressed how daunting it might be when walking through the chemotherapy space for the first time and being confronted with frail and ill-looking patients. "When it is your first treatment, you still got your hair, you haven't had all the negative reaction to it, and you sitting next to someone whose going through their six or whatever treatment, and they are pale, they have lost their hair, they look dreadful, it's quite challenging" (Katie). Pam on the same notion continued: "… and you go, oh that could be me. That's very confronting and very daunting when you go there with the hope that you will get through your chemo and survive, and you seeing someone who is pretty much dying." Besides the visual character of the space, as well as promotion of visual connection to the outside, designating spaces for new patients in separated treatment zones may help minimize such encounter and alleviate its initial daunting feeling: "until you become familiar with the space, it can be quite daunting for patients in the beginning of their treatment" (Pam, NEMIC).

Decreasing reminders of being a cancer patient

The apparent emphasis on a less hospital-like atmosphere across the hospital different spaces is not only important for the sake of flipping negative expectations associated with traditional hospital design, but further essential for the unique case of cancer itself. The sombre reality of this diagnosis and its treatment burden place considerable stress on patients and their families. It is indeed overwhelming: moving from a "healthy person to a patient overnight" as Margaret put it. "You do feel cut off from most people" as Imogen's Mother, who had cancer herself, described it: "you do feel different to everybody else. Everyone is having this normal life, and you're dealing with, you know, a life/death situation really." It is, therefore, not unusual for patients to develop negative thoughts about their time in the hospital, thinking of it as a place of gloom and sadness, particularly for their first visits (Margaret, Cameron, Diana).

The thoughtful introduction of non-traditional hospital design features, such as the open feel of the foyer and its unique visual character; the contemporary colour schemes, artwork and music; the cafes, amphitheatre, rooftop garden, wellbeing centre; and even the precise functionality of the spaces, held collectively a prominent role in shifting patient expectations of their time in hospital. The balance between a hospital that needs specific functional consideration yet caters for patients' emotional needs, achieved by these newly-designed cancer-care facilities, impressed and helped participants feel welcomed, calm and most prominently, less like a patient, leaving them with pleasing, unexpected, experiences despite such an overwhelming situation. "I do feel comfortable coming here and I didn't think I would… it enables you to feel confident and comfortable" (Margaret, BRICC); "for what is a pretty awful time, it was just had a quite a different impact" (Cameron, PMCC). It gave patients, who are likely prone to feel down or depressed when going to the hospital, the first impression that "it is OK, you feel like, ahh, it is OK, not, oh my God, oh my God, what is happening, am I going to, etc." (Pam, NEMIC).

> *Imogen's Mother, PMCC: And I think, this building seems to me to have a good balance between it functioning as a hospital. So, obviously it's got function for nurses and doctors, and all the rest of it. But it, it doesn't feel like it isolates the patients and the family from the rest of the world.*

It is indeed unlikely that the overwhelming fact of being treated for cancer slips out of patients' minds in these spaces, however they still appreciated any efforts made to not remind them further of a reality that they prefer to avoid. In that, balancing the inevitable clinical atmosphere of the healthcare facilities with anything that is not like a hospital space was very significant to patients. In one of the exploratory focus groups, a participant supported this view further when reflecting on the old hospital spaces that he used to attend, finding them to be dominated by clinical and cancer-related signs. It is something that most patients would expect as he described it, but still "it wants to be a place that is not constantly reminding you of the why you are there," instead, finding a balance to incorporate "something pleasant to look at or engage with rather than something that is just a reminder of the condition that you are unlikely to forget" (Patrick, GICS).

> *Patrick, GICS: I expect it to be fairly clinical… but it gets a bit weird when everything that you see is related to cancer, or health, or jobs or something like that.*
>
> *Margaret, BRICC: And my experience is that, as you can see, I'm well, so I don't feel like a patient, even though I've gone through all of these treatments. But, but you are a patient, but it enables you to feel confident and comfortable… Anything that is less like a hospital space is really important, so that space is incredibly important because it feels comfortable.*

Participants' elaboration on their experience when they first walked through the hospital spaces highlights how such features, even if considered non-functional by some, can have a critical effect not only on patients' first, but also their ongoing, visits to the hospital. That "wow," awe-inspiring factor, that impresses and welcomes people who come to the hospital for the first time, so that they don't feel completely overwhelmed, extends to subsequent visits. "I guess, I am <u>still amazed</u> when I walk in and I see the beauty when you stare out" (Cameron, PMCC); "I really enjoyed every visit to Peter Mac in terms of being in the building" (Sara, PMCC). Imogen's Mother (PMCC), in reflecting on whether her perceptions of the building changes over time, mentioned: "I do not think it changes that much. When you first come in, because it is so new and because the building is very different to what the other hospitals are being, it is Ahh, this is lovely. <u>So, you get quite surprised and amazed</u> by the space and the light and all that we talked about. And now we used to that, it just feels comfortable coming in."

In response to the most important qualities that a hospital space needs to provide, Cameron stressed on the "emotional connection" that such non-traditional setups help to shape. It gives a sense of "support" and "calmness" and hence help patients feel comfortable, and thus different to what they expected. They are comforted, not in the sense that it's a place where patients like to be, rather it eases their fears in a disliked situation and contributes to a less alienating experience – making it "a much lighter place to be in… if you have to be sick" (Imogen's Mother, PMCC). As David (PMCC) put it: "nobody likes to be in here mate, you know what I mean? And if you can make it as comfortable as possible. Like you know, when you walk through those doors and you come up into that thing and you look up there and think wow, it is a beautiful place. It really is."

> *Cameron, PMCC: I think probably the emotional connection first as something that is, it does give a sense of supporting and I guess calmness and, yeah, that was the thing that I was trying to describe when I first walked in, WOW, this is such beautiful, its amazing, and you hearing the music, that I think has its own psychological benefit when you are at a place like this… So, the first couple of times I was in here, I was just quite amazed about how beautiful the place is and how peaceful it was, especially with the music playing up and down, the acoustic was just, for what is a pretty awful time, it was just had a quite a different impact.*
>
> *Cameron, PMCC: I guess, I am still amazed when I walk in and I see the beauty when you stare out. Just today I was looking, I was in the waiting room to meet my doctor over the other side and I just happened to look up and I could see all the way up to the 7th floor I could just see the door of the restaurant… Its connection, so that where I maybe going afterwards, great, it's really unusual.*
>
> *Margaret, BRICC: So, I felt immediately comfortable downstairs. Comfortable in so much as, you've been diagnosed with cancer and as comfortable as you can possibly be knowing that any amount of design is not going to stop you having the treatment, yeah. But compared to some of the other spaces in the hospital, for example where I had the biopsy and so on. That's very rudimentary hospital space, and it doesn't make you feel comfortable to the extent that you do her… So, I do feel comfortable coming here and I didn't think I would. And it has to do with the space and the people. Yeah, it would not be as comfortable for me if it was a fundamental hospital space.*
>
> *Imogen's Mother, PMCC: If you have to be sick, this is a nice place to come.*
>
> *David, PMCC: It's more of a wow feeling. It's not to say hey, I've come into a place that I want to come into. Do you know what I mean? … It's always nice to look in through the window. But it's not nice to look out like we have, you know what I mean.*
>
> *Walter, PMCC: Windows, I think there is enough soft touches here, to feel comfortable.*

5.2 Diverting focus: Breaking up the intensity of the treatment day

The benefits of the provision of positive distraction has been extensively researched and is understood as a core quality of a healing and supportive healthcare environment. It is attributed to environmental features that have the capacity to hold attention and divert focus from potential negative thoughts associated with sickness and being in a hospital (Ulrich, 1991). Participants' experiences in this study highlight the importance of such a quality in supporting their presence in the hospital, pointing to several instances in which the built spaces can afford different levels of distraction, as will be discussed in the following.

5.2.1 Moments of distraction: the role of interior architectural features

Although the welcoming, uplifting and captivating feeling of the atrium space dominated participants' comments, some reflections referred to how its thoughtful architectural elements held further explicit distraction role that helped divert patient focus, even if it was for a very short period of time. In describing his experience of approaching the building, Walter (PMCC) stated: "I suppose being a patient, I never really notice, just more, probably conscious about becoming a patient in here." However, moving forward into the building and being confronted with the atrium space, Walter expressed how its unique design caught his eye and helped divert his focus: "the other thing that caught my eye was the centre of the building, the design itself that, the shape. To see the way they designed it with curves and the way it all, all the way up to level 7, that really caught my eye… When you walk in, that nice atrium, the way it feels when you walk in, that is definitely a plus and positive. Even if it distracts you for two minutes while you walking to become a patient in here, that is a warm feeling." Sara (PMCC) on this distracting role stated: "I like the room and your gaze is directed upward to the light… When you are in a really nice space it takes your mind off your troubles a little bit."

Several features that helped shape patients' first impressions and shift their negative expectations of the hospital setting played a simultaneous distracting role. In addition to the distinctive curved design of the floors and stairs at PMCC, participants highlighted the importance of light, artwork, paintings, and the patterns developed by different wall textures and materials. These were outlined as the "visual things" that attracted Sara's eyes, highlighting how regularly she used to observe such features when in the hospital. Referring to the artwork on the walls and the amphitheatre steps respectively, Sara stated: "I always look at that when I go past," "I always have a little look of that and just see if people sitting there and what they are using it for." Besides engaging participants visually, such features also constituted topics of discussion with their relatives (Imogen, PMCC; Margaret & Diana, BRICC) as well as means to attract hobbies such as photographing: "I often take photos when I come in and trying to get different angles of the building, which is good, it puts your mind to think about different things" (Sara, PMCC).

> *Imogen, PMCC: I was just thinking about it when we were having lunch upstairs, about how the architecture is pretty amazing. Yeah, we were just up on level 7 in the café, there is that big copper wall and I was just looking at that and thinking about the architecture a lot.*
>
> *Margaret, BRICC: I thought it was terrific. The features that I love about it, and my husband and I were talking about it the other day…*
>
> *Diana, BRICC: I had my family with me, and they made the same comment about the area was very nice. Well set up. Obviously got big beautiful windows and things that you can see out of, if you're having treatment.*
>
> *Sara, PMCC: this sort of criss-cross design thing… the curved stairs… Its design suits the organic feel of the building too.*

5.2.2 Extended distraction and mental escape: exposure to nature and changes of scenery

Within the treatment space, the inclusion of large windows with different views to the outside played a further distinguished role in taking patients' minds off their situation: "I think the big windows are really fantastic" (Sara, PMCC); "I think it's important to be able to see out and therefore you can forget about what's going on, you know and you can just watch the world go by, and forget about other stuff for a little bit" (Diana, BRICC). Infusion therapy can last for extended periods and in some cases takes the whole day (Michelle, BRICC), in which patients are left with few options to engage their time: "all you've really got is your, your walls around you" (Diana, BRICC). Provision of large windows allowed opportunities for lessening the impact of long treatment hours and helped patients overcome feelings of being confined and stuck to the treatment chair: "I was in there for up to 6 hours a day. You don't want to be sort of stuck in a little space" (Diana, BRICC); "well it's good to be able to see out. My treatment takes six hours, stuck in this chair. Well, not completely confined to the chair but certainly I'm within this area for six hours" (Richard, PMCC); "I've been in some of the smaller rooms and you feel more confined… But it [the window] makes you feel not as claustrophobic as being in such a room" (Kevin, PMCC); "you don't feel trapped" (Imogen's Mother, PMCC); "otherwise you feel enclosed" (Michelle, BRICC).

> *Richard, PMCC: See what's happening on the outside.*
>
> *Michelle, BRICC: I had my favourite chair, and I liked the chairs that looked out over the road because sometimes, because I, I had to. Sometimes people are only in the chairs for half an hour, but I was there for the whole day. So, I would, you know, I brought lots of things in but sometimes it was just nice to just sit and look at people going up and down the street, and going into the petrol station and so on.*
>
> *Diana, BRICC: So, if you can, if you've got that [the window] to take your mind off whatever else is going on there, well I think that's just nice you know. Sometimes, you know when I first started my treatment, and I was in there for up to 6 hours a day. You don't want to be sort of stuck in a little space.*
>
> *Kevin, PMCC: I've been in some of the smaller rooms and you feel more confined. Whereas in some of the rooms, nearly most of the rooms to be quite honest. You've got windows outlooking the street environment, with beautiful trees… Yes just the outlook. And the surrounding area, yup. Yup, the trees and just make you feel, I don't know how they make you feel. But it makes you feel not as claustrophobic as being in such a room.*
>
> *Imogen's Mother, PMCC: You don't feel cut off from the outside… When you go for your treatment, you don't want to feel even further contained and confined.*

Figure 5.10 Expanded views to the outside at treatment spaces. Top photograph: (PMCC) by author. Right photograph: (BRICC) Shannon McGrath.

As noted earlier, chemotherapy has unique stresses associated with it. The unnatural, chemical, type of treatment renders it as a "surreal thing to be doing" (Margaret, BRICC) that triggers bad and potential depressing feelings: "if you're in a windowless room, being pumped full of chemicals that make you feel like crap, it would probably be more depressing" (Imogen, PMCC). That "bizarre" idea of being led to a comfortable chair by wonderful nurses to be injected with poison is quite complex and may add unique stresses specifically during initial treatment sessions. Even though the setup of the treatment room with big windows and integration of non-traditional materials and colours helped alleviate such negative expectations and patients noted calmer feelings when they first encountered the space, participants who did not have the chance to sit by or have visual access to a window indicated how it would have helped relax them further and relieve their stress specifically during their first treatment session when expectations as to what the treatment will bring might be worst (Margaret, BRICC; Sara, PMCC). “And for me, looking at the, the more natural world when you're experiencing something as, as unnatural as chemotherapy. For me, would have been, it would have helped me, certainly with the first chemo… it would have relaxed me more. And I would have known what was going on in the day. So, to me that would have been number one, to be able to see out, outside properly” (Margaret, BRICC).

The unavoidable clinical atmosphere of the treatment space as well as the chance to encounter other patients with inferior health conditions may add further to such overwhelming situation. “I think when you're not feeling well, you don't want to be, you know, worrying about everything else that's going on around you or looking at other patients that are, are very unwell” (Diana, BRICC). “I'm a nosy person…You start to work out what's happening. You can see when someone is having trouble… That can be very stressful” (Margaret, BRICC). In that, the configuration of the space that favours options to orient the treatment chair toward a window view was considered valuable, not only to help patients forget about the treatment, but also divert their focus from the general activity within the treatment space, avoiding potential stressors associated with the clinical work of the room as well as contact with ill-looking patients, “it would have been easier for me in terms of my concentrating on things to focus on the outside” (Margaret, BRICC).

> *Margaret, BRICC: There is a row, there's a whole lot of chairs and everything is looking towards the reception desk. You know, you can hear for example, and I'm a nosy person. So, I can hear what's going on. You start to work out what's happening. You can see when someone is having trouble, and you can see that the nurses are trying to deal with that, and bringing the doctors etc. That can be very stressful.*
>
> *Diana, BRICC: Yeah. It's a, it's a long, long time to be sitting in one area where you've got three walls and you know, you're looking out at other people having treatment. Sometimes that's not a very comfortable scenario either… you don't really want to be looking at I guess other people having whatever treatment they're having either. Because if they're not feeling well either, they don't want me looking at them… But I just sort of think it would be nice if you didn't have to look at other, other ill patients or having other patients look at you if you're not well as well.*

Patients’ inclination varied between viewing natural elements such as trees, leaves and greenery (Sara, Cameron, Kevin, Imogen, Catherine, PMCC); the sky or play of natural light (Sara, Catherine, PMCC); the changing weather (Margaret, BRICC; Richard, PMCC); or just overlooking the street environment to get a sense of what’s going on outside. In that, participants appreciated opportunities such as looking at the traffic and antics of cars (Diana, BRICC; Richard, Catherine, PMCC), watching people moving on the street (Michelle, Diana, BRICC) and following the progress of site-specific conditions such as construction work.

> *Sara, PMCC: But more so is the trees and the sky and I guess the play of light is great to watch, like in the morning when the sun shines there and the light coming through the trees looks really beautiful and you get a really nice sense of nature and greenery, is good.*
>
> *Richard, PMCC: We've got two big construction sites just over the road. And then the, you watch the traffic and the antics of the cars. And of course, the weather, that's always so changeable in Melbourne as well, there is always something brewing.*
>
> *Diana, BRICC: look out and watch the world go by… You watch people go by, cars go by. You can see the scenery you know.*
>
> *Michelle, BRICC: look at people going up and down the street, and going into the petrol station and so on.*

A connection to outside

What appeared to be important, more than the type of view, was the notion of a <u>“connection to the outside world.”</u> Being able to look out the window was described as calming (Imogen, Catherine, PMCC), gives a feeling of peace (Kevin, PMCC) and “can make you feel a whole lot better” (Diana, BRICC). To see outside is “comforting” as “it puts you back into the real space, rather than this surreal space” (Margaret, BRICC). “You don't feel trapped, cut off from the rest of the world” (Imogen’s Mother, BRICC), rather it helped participants connect to the real world, prompting a “sense of life” as Cameron (PMCC) put it – “that's life and there are stuff going on the outside”. It symbolizes a connection back to the normal life, giving a sense of normality in a rather contrary environment: “it just takes you away from this artificial, contrary environment. And you know, could help you focus on what's going on outside. Sort of normality, if you like” (Margaret, BRICC); “so to see and look outside you have some normality” (Walter, PMCC). This is why windows and their associated views and natural light were regarded by all participants as one of the most important design elements, if not the most important, to include in a treatment space.

> *Sara, PMCC: … you get a really nice sense of nature and greenery.*
>
> *Imogen, PMCC: Being able to look out the window is quite calming.*
>
> *Catherine, PMCC: That's nicely calming.*
>
> *Kevin, PMCC: A feeling of peace when you look over the, look out the window.*
>
> *Diana, BRICC: Mainly the big windows and being able to have that view outside, certainly can make you feel a whole lot better.*

> *Margaret, BRICC: It's actually quite comforting to see outside.*
>
> *Cameron, PMCC: So it is nice to have the connect between the inside and outside of it in a way that's life and there are stuff going on the outside… So greenery, leaves are the things for me that is interesting, that sense of life, and just lots of space and light, coming in through that whole wall is just light coming in which is lovely.*
>
> *Walter, PMCC: I think again it gives you, it's not like a box, cause you know you're coming in for treatment so to see and look outside you have some normality, to be in touch with that outside world if it makes sense… Certainly important, that is really high, windows are definitely important.*
>
> *Katie, NEMIC: The world is still out there… it affects your mood.*

5.2.3 Destinations of retreat

One of the burdens of cancer treatment is that it often extends over a long period of time including both numerous hospital visits and potentially long treatment sessions. With such time spent during both infusion treatment, as well as treatment-associated preparations and consultation, participants valued opportunities to move away for a while to alleviate the intensity of such a routine: "even just a walk, cause when you sitting for a few hours and do your treatment, it's nice to go to a little area, like a seating area and just stretch your legs and go sit down for two minutes and come again. I think it's important to have that" (Walter, PMCC). "It would be probably nice if you could move away from that section… Yeah, just to get up and go to the toilet or go and grab a book. Or, that's, that's pretty much really it. Or you can just do a couple of laps of the nurses' station, just to stretch your legs, you know" (Diana, BRICC).

Within the Day Therapy Unit at PMCC, the presence of a lounge area with a kitchenette featuring seating couch and facilities such as a coffee machine and fridge gave patients opportunities to break up the treatment session at times of boredom or when bored with things that they do to usually pass time (e.g. reading): it gave "an excuse to go for a walk" (Richard, PMCC) and meet other people (Walter, PMCC). Similar to the role of windows, such destinations further countered the idea of being stuck in the treatment chair and allowed opportunities to escape, for a little bit, contributing to a sense of independence and freedom. "Once you get there you having procedures and so you kind of trapped there for a while" (Catherine, PMCC). "So, that gives me the feeling of independence I guess, that's, that's probably the word I was looking for… to be limited would be quite annoying [limited to the chair] … But it's just the feeling of freedom to be able to get up and move around, when I get sick of reading the book that I've brought with me" (Richard, PMCC).

> *Richard, PMCC: So, from that point of view it's nice to have that available and to be able to just go down whenever I need to and it's an excuse to go for a walk.*
>
> *Walter, PMCC: I know that from Royal Melbourne when I was over there, they had an area which actually had two couches, three couches, a TV and that <u>was an area that we used to meet a lot in</u>.*
>
> *Diana, BRICC: You're able to go and just do that, and maybe have a little section where you can sit down and have your cup of tea, and then perhaps wander back to where you're having your treatment yeah.*
>
> *Richard, PMCC: Oh well, certainly. Because I've got the flexibility with my old friend here, that's giving me my drug. If I could move around to perhaps a little outdoor area, for a change of scenery that would be terrific.*
>
> *Walter, PMCC: I go there to get my cups of tea. I have noticed in the past that there were some families in there and you can just see that there is not enough room, they are standing up, not enough seats.*

Even though a similar space was not offered at BRICC, participants praised the idea when they learned about its counterpart at PMCC. Pointing to a similar experience that she had at the Radiotherapy department, Diana expressed how an intermediate space that featured similar setup and some engaging activities such as jigsaw puzzles helped distract her mind from what she is about to go through "… that's quite a good idea. Yeah, so they're not sort of really, again thinking about what you're about to embark on. You're just thinking about you know, so taking your mind off, yeah." Some participants though did not favour the idea of walking with the intravenous pole and considered it to be cumbersome: "I don't want to pull this cable around" (David, PMCC); "usually as a patient you are too hooked up to the machine getting whatever treatment to be able to go anywhere" (Catherine, PMCC). However, such space, and others such as the cafes, chapel and rooftop garden remained significant for patients' extended presence at the hospital – before and after infusion sessions.

Figure 5.11 Kitchenette at treatment area, PMCC. Photographs by author.

One of these retreat spaces that received significant attention was the rooftop garden. All participants stressed the importance of such a garden space in shaping their experience. It constituted an additional source to break up the prolonged treatment days, as well as occupy waiting times, “because sometimes you could spend 3, 4, 5 hours here [referring to waiting], which I have done. And there is nothing to do, they just said go and sit down or can you come back in an hour or so?” (Kevin, PMCC). This is a situation that has been repeatedly expressed by most participants. David, on the burden of the treatment procedures and waiting time, stated: “I know people who are coming here, they might come in here 4 days a week, or if you've got blood transfusions and things like this. So, if you are in here for 2 days a week right, 3 days a week and you are in here for 8 hours and all you are doing is looking at, if you, this concrete.”

The provision of a rooftop garden was prominent in mitigating such feelings, providing a destination to escape and unwind from such a stressful routine: “it breaks it up. Really breaks it up, you know… like I said nobody wants to be in here anyway. But if you can break that up, it doesn't feel so bad… So, you get to kind of unwind a bit, you know what I mean…But the concrete walls have been taken away from you and you feel that little bit eased” (David, PMCC). Access to outdoor spaces allowed patients not only the chance to detach and get away from the general medical-related activities in the hospital, but also gave them further opportunity to relax and reflect. “… it's very [the rooftop garden], it is very relaxing and it's good to be away from the general run of things in hospital” (James, PMCC); “… and then of course you come to the rooftop garden and beautiful views and a place where you can go and just have a look from a distance, and just look out and be peaceful with the garden, it was, it kind of, hit the spot for me couple times, I was going up and just think, so it was actually quite nice place to go and do that” (Cameron, PMCC).

Even though a rooftop garden was not an accessible option at BRICC (Michelle), participants shared similar opinions about how such space would nourish their spirit with options to relax and recharge. Diana said: “I just think, you know, obviously you're sitting in there and if you're doing a 5- or 6-hour day, it's a massive day. So, I think if you could move away from that area and perhaps go and sit out in a, a little garden or sit near an atrium or something like that just to you know, more relaxing sort of environment I suppose, yeah. And again, just to move away from it and then when you're ready come back, you know… I think that would be nice, I think even some form of indoor atrium or something like that type of thing is, some nice plants and all that. Just a nice relaxing area where you can sit and just you know, have a little bit of peace and quiet and a little bit of reflection time I suppose, yeah.”

Similar to window views, access to an outdoor space was also considered a significant opportunity to connect back to normal life (Walter, David, PMCC; Margaret, BRICC). Participants saw it as a connection through which they get to appreciate the ongoing nature of life and what it affords in terms of other things to focus on, rather than dwelling on the inevitable negativity of cancer and its treatment. On that, Walter stated: "I think it brings some normality to your life. Cause when you are isolated, those sorts of things, that's where the windows are important, is to go and experience that and appreciate a lot more is going outside, breathing fresh air, getting a bit sunlight is very important."

The repeated reflection on a connection to the outside world and the notion of getting "back to normal" can be further comprehended through Margaret eloquent articulation of her experience and how such space, alongside other welcoming architectural features discussed in the previous themes, could latently support cancer patient presence in the hospital. Margaret described the consequences of a cancer diagnosis and its treatment as if someone is "stripped bare." "You become your rudimentary self. And, and it's incredibly confronting, because there's nothing to hide. There's no hair to hide behind, there's, you know… For some women they lose their breasts, so the whole sense of womanhood is gone. And you have to readjust yourself, and rethink who you are. And to come into a space, that is welcoming, is incredibly important for someone that is stripped bare, or stripped to the rudimentary self. And, you know, you couldn't state that more strongly. That the space is, for me has been incredibly important. Because I've been able to feel comfortable. And you have to feel comfortable when you're stripped bare. You know, and your being prodded and poked, and you know, blood taken and it's just endless."

The rooftop garden, alongside the previously discussed features that rendered a welcoming, non-traditional feel about the hospital space, constituted a critical source of support that gave patients a symbolic sense of control in times of endless manipulation. "Because I think it goes back to that comment about a natural space. Because when you're sick and you're being manipulated, and you, you have a sense of, loss of control of yourself. It's a, it's just a grounding. It's a, it's you know, fresh air, natural, a natural environment takes you out of that unnatural you know, situation that you're in. Same as when you're having chemo. It's just such a, a contradictory thing to be, being allowed to do to you, that it, to be able to look outside and see the day. Is for me, is comforting. Because it brings you back to some sense of normality, because you've got, in some ways diagnosed with cancer, you're completely out of control… I stepped onto the hospital treadmill and 6 months' later, I'll step off. And it's been just a whirlwind of no control of myself. You really do give yourself to the hospital and to the doctors and you know, and then you step off it. So it's, and it is unnatural and it's a real sense of loss of, loss of control. And I, you know, to me it just, it's a grounding thing, to be able to smell the air, to sit down in a space that is natural. In amongst everything else, I think would be, is an important, almost a human, an innate human requirement you would think. To feel natural, to have a natural space" (Margaret, BRICC).

Figure 5.12 Rooftop garden, PMCC. Photograph: Peter Bennetts. Source: courtesy of Plenary Group.

Figure 5.13 Rooftop garden, wellbeing centre PMCC. Photograph by author.

The wellbeing centre, particularly at BRICC, expanded the collection of spaces that are not necessarily about "sickness and being a patient" but rather promote "health and wellbeing". The domestic atmosphere of the space with the provision of different levels of sociability, such as the kitchen area, the living room, and the individual napping pods (at PMCC), provided patients with additional opportunities to retreat at times of feeling overwhelmed. "Sometimes we've had people who are just overwhelmed and they just need to have a lie down… it just means that people can feel a bit more comfortable. And, also the fact that people can choose to where they sit, because some people are happy to talk. Other people just want to sit…" (Michelle, BRICC). The provision of soft furnishings alongside the variety of activities facilitated by the space setup (e.g. beverage facilities, jigsaw puzzle, nap pods, computers, tables) rendered the place a favourable destination for some patients during prolonged waiting times (Margaret, Michelle, BRICC; Catherine, PMCC).

> *Margaret, BRICC: And the other thing about it, is that it provides a place to talk to people if you want to. And there's a, and it also provides different activities as well, that are about health and wellbeing. That aren't necessarily about sickness and being a patient. But the space is, yeah it feels like a lounge room.*
>
> *Michelle on contributors to a homely environment, BRICC: Heat, you know the fire downstairs is very. The fact that you have what's virtually the kitchen area, then you have the lounge, living room area. And the fires a sort of two-way fire, you know. So, that's very good. I do find the crochet, we have lots of groups that donate lots of things to the wellness centre. And people crochet a lot of things, I think they're a bit twee but some people love them. And that's you know, there's cushions and throws and sometimes we've had people who are just overwhelmed and they just need to have a lie down, you know. And they don't want to go lie in a hospital bed, you know. So, there's you know, people can just lie there… you can just have a wee sleep, a wee nap.*
>
> *Catherine, PMCC: The area in the wellness centre has soft furnishings it doesn't hold as many people and you just help make your own tea and coffee… There is jigsaw puzzles, computers to use, some tables where you could possibly do something at them, like if you brought a computer you could put it on the table and do some work if you could. So there is a variety of activities within the space… The jigsaw puzzle is interesting. There's also a short nap sleep pod thing, where you can be there for 20 minutes and have a rest. I use the tea and coffee and yeah sitting and reading, they have a reasonable variety of books but I bring my own. So, I just sit and read, have some food.*

Figure 5.14 Wellbeing centre, PMCC. Photograph: Peter Bennetts. Source: courtesy of Plenary Group.

Figure 5.15 Wellbeing centre, BRICC. Photograph: unknow. Source: https://www.alittlechangeabigdifference.com.au/about-the-wellness-centre.html

Spaces for family members

The sense of being overwhelmed, by the intimidating nature of the treatment and time spent in the hospital, may extend to accompanying family members. Lounge rooms near the treatment area and other spaces, such as the rooftop garden and wellbeing centre, provided companions with similar opportunities to relax and recharge, specifically during extended treatment sessions where patients may get to sleep or rest, leaving relatives with limited options to engage their time. "The first time we came to chemo, she was having a day chemo. And she just went to sleep, nearly the whole day… And I, sitting in this chair," reflected Imogen's Mother on potential instances of boredom for accompanying family members during some treatment days. This is a view that has also been supported by James's family, as important sources for occasional break: "because I think some people who are in here, day after day, for a very long time. The chatter I don't think is a problem, but sometimes you just want to be in that calm space." Cancer can be as overwhelming for companions as for patients in which such destinations give equal opportunities for a needed break: "…They can offload a little bit, because being a carer can be a pain in the neck. So, it gives another place for people to go…" (Michelle, BRICC). Patients potential need for rest was the reason Michelle continuously advises accompanying family members to go to such retreat places after spending some time with their beloved ones: "because you know, the person who's having the chemo probably just wants to have a wee sleep. So, so there's that. It's another option for people to go to."

> *Imogen's Mother, PMCC: Oh, down on level one there's the patient lounge [referring to the Wellbeing centre]. <u>So, if I, I've checked that out. If I wanted to, I could go down there and have a lie down for half an hour. Half an hour in a darkened room on the lounge.</u> So, it's for patients and for family. So, I think that's a wonderful space down there… <u>Ah, there is couches and chairs. But there is this one corner area, that they can screen off and it's quite dark and you can half an hour of lying down in the dark, to have a little sleep if you need it</u>.*

5.3 Provoking engagement beyond treatment

The inclusion of spaces that promote different, positive, experiences of a hospital environment, alongside their thoughtful design, rendered a special or further connection with patients who considered them not only destinations to detach and escape the treatment routine but also places to look forward to when visiting the hospital: "… It's something to look forward to, when you are here for a long time," Imogen reflecting on the rooftop garden at PMCC. Besides being an unusual space to find in older hospitals, the considerate design of the rooftop garden at PMCC with setups that allow for different levels of engagement for individuals and group gatherings, alongside the integration of the café space, contributed to an outdoor space that not only induces relaxation, but also attracts diverse interests and uses: "… and it almost feel like there are lots of different private spaces up there if you really want to be by yourself you can go and find little nook and turn your back, where you can sit along the communal table and you feel like being a part of a group" (Cameron, PMCC). Maintaining easy access is critical, as a similar rooftop garden was provided in close proximity to the day oncology unit at BRICC, however patient access was not possible (Michelle). Further consideration of protected outdoor spaces from wind and weather change was highlighted to maintain such accessibility, "it's got to be a nice day, as you know you can't, it's too bloody windy up there, you know" (David, PMCC); "… the weather outside is not always conducive to comfortable sitting" (Catherine, PMCC).

> *Sara, PMCC: Love the outdoor space in level 7, its really nice to be able to go outside and have a coffee sometimes.*
>
> *James, PMCC: And we had a roast lamb lunch and it was really nice. And it was a good price, you know, you can't argue with it.*
>
> *Michelle, BRICC: The other thing about here, is that, in my many times when I was having chemo. I noticed there was a roof garden. But you can't get onto it, you can't get out to it. What's the, what's the point? So, if you're going to do a roof garden, make it accessible.*

In response to whether the inclusion of such supporting spaces and the considerate architectural design of the whole hospital influenced his experience, Walter reflected on couple of things, including the chapel as a supportive space that induced his interest, stating: "does it help! yeah certainly, cause I like to use the chapel… I was here for a few hours and I thought oh, I might go there for that experience. I had my kids once and took them down there too, just to have a look… When you sit here for few hours, it's nice to have an area that you can go to." The wellbeing centre similarly extended such opportunities by facilitating additional personal and organized activities within its spaces. This new, steadily adopted, approach to patient support in recent hospitals is developed on the premise of providing a space that promotes engaging in activities beyond treatment and being sick – wellness-based activities. It is a place where a range of supportive services are sought in an environment that is deliberately designed to feel less like a hospital: “it's warm, it's airy, it's very comfortable and it's sort of homely” (Michelle, BRICC). This unique mixture between the provided complementary services (e.g. workshops, dietitian consultation, support groups, massage therapies, art therapy) and a space that is conducive to comfort and feels welcome, facilitated not only a destination to seek a break, but to further engage in organized and spontaneous activities that can be of crucial support to patients presence in the hospital.

The configuration of the space at BRICC, with different individual and group sitting areas (such as the couches around the fire place for more relaxed self-reflection time, books area, individual sleeping and consultation pods, the kitchen with the communal table, as well as areas with other shared activities, such as jigsaw puzzles) allowed for planned and spontaneous conversation to take place – a critical opportunity for patients as well as their carer to offload. “Some amazing conversations have happened there, because people sit down or if we as volunteers are sitting there having a cup of tea, and I had, when I was here last Thursday. And I was sitting with one of the other volunteers, and a lady came in. And, and people just offload to you” (Michelle, BRICC). The space at PMCC was also attractive to number of relatives, including James’s family who indicated interest in specific activities organized by the place as well as the general opportunity to retreat. On a specific workshop that they attended, James’s wife stated: “ah yes, they've got different sorts this year… So, we only came once because it's really something we wanted to learn about.” She elaborated on other occasions that she like to use the space, stating: “yeah, good. And you can also get cups of tea there, you know, help yourself to an urn and make a cup of tea and that sort of thing. And generally, we can make ourselves tea and biscuits and little snacks that you just do yourself. Or I can bring James a cup of tea.”

> *Michelle, BRICC: There was a lady in, she was having her first chemo, she'd just been diagnosed with lung cancer. And I was talking to her daughter and her daughter needed a lot, the daughter said you think I could have a cup of tea as well? I said yes, so she came along with me and she was able to offload a little bit.*
>
> *Michelle, BRICC: Yeah, there is one volunteer who comes in a lot. She's supposed to be here today, but she's sick. And she comes in and she bakes scones. And it's, it's a great idea. Because there's an oven and a microwave and so on.*

Figure 5.16 Variety of resources and setups afforded by the wellbeing centre, BRICC. Photographs: unknown. Source: https://www.alittlechangeabigdifference.com.au/about-the-wellness-centre.html

The place was further considered as a resource to rely on when participants needed to catch up with basic everyday activities such as doing some work (Catherine, PMCC) and meeting with family members (Margaret, BRICC; Patrick, GICS): “it's a space for you to sit and have your family with you if you want to. So, my daughter is doing nursing for example. So, she did a placement and we met there, and it's a comfortable space to be. Doesn't feel like we're sitting in a hospital.” It was also the first thing (at BRICC) that occurred to participants as a place to conduct the interview when they were first invited to participate in the study: “so, there's a real sense of the way the hospital has staffed it down there, and the way they run it, is to allow people to come and go and to have their family members or friends there. So, that's why I go down there. Because it, it's, you know, you're allowed to be there, and it's comfortable to be there, yeah” (Margaret, BRICC).

For other patients, it worked also as a useful place to stumble across information related to their health and wellbeing. Michelle described cancer diagnoses as “a medical freight train. You get so much information, you just don't know what's going on.” Setups such as noticeboards or digital displays through which patients can come across such information (e.g. support services related to transportation, financial problems, fatigue, etc. as well as entities such as Cancer Council) can act as a gentle reminder, re-directing patients towards things that they might not be aware of or have forgotten. “I mean the staff here are pretty good now at taking people down and showing them the different places, but the point is, when your mind’s just thinking I've got cancer, I've got cancer. And you don't, you know, you need to be shown around a second and a third time, I think… So, noticeboards are handy as well…, so that stuff can go up and you can actually start to read things at your leisure. Because it's not that you're not given information, it's just sometimes you're given so much information that you just can't absorb it” (Michelle, BRICC).

> *Michelle, BRICC: Yeah, as you, when you just came into the wellness centre, there was a great big noticeboard and <u>it was that notice board that I picked up that there was an ovarian cancer support group.</u>*
>
> *Margaret, BRICC: <u>They have activities that I'm interested in being involved with… It's actually quite a pleasant experience.</u> If I'm here earlier enough, I can grab a coffee. Everything is very, like I say, very comfortable space. I can drop into the wellness centre, I can meet my daughter there or my husband there, because he just works down the road. And there's no restriction.*

The notion of sparking interest in the place, both through its thoughtful architectural qualities and the way its different services are provided to support users at different levels, induced patients to voluntarily use the space and be involved in its planned as well as random activities. This interest rendered the space as a second home for some patients at BRICC, contributing to a unique sense of attachment. As Michelle put it: “… and what happens, and it happened to me and I hear it happening to people as well. When you finish your treatment you go oh, what am I going to do now? So, it's interesting that people get quite attached to the place and feel, because it's a place where you can be quite comfortable and open with, about your cancer.” Michelle highlighted how she developed such feelings, which prompted her to eventually volunteer at the Wellbeing centre – something that, according to Michelle, was quite common with patients. She stated: “so that's why I said to XXX [the manager of the wellness centre] at the end, you know I said, what am I going to do now? And she said I,<u> she said I hear this all the time.</u> Yeah, and <u>she said it's a very frequent thing</u>. Because it's almost, it becomes a bit like a <u>second home</u> because you know you can come and talk to people here. Whereas, I mean my friends have been terrific, my families been terrific. But sometimes they just want you to get on with it.”

> *Michelle, BRICC: And what happens, and it happened to me and I hear it happening to people as well. Because there are different things on offer, there are workshops and massages, and facials, so on. And you end up, well if you're like me and you reach out, you end up being in a lot. When you finish your treatment you go oh, what am I going to do now? So, it's interesting that people get quite attached to the place and feel, because it's a place where you can be quite comfortable and open with, about your cancer. Because people sometimes in families or with friends were, I mean I was okay but sometimes people just don't want to know. And you hear stories, there was a lady on Thursday that was talking about noticing that she'd see a friend in the distance and the friend would cross the road. You know, pretend that she hadn't seen her because people don't know how to treat you if you've got cancer, or you've had cancer, or other. So, that's what's very comfortable about it. Every day there is somehow connected to, either as a partner, or a volunteer or another.*

For this to occur, participants, particularly at PMCC, stressed the importance of providing information about the building and what it affords so that patients become aware of the existence of such spaces and services. When participants were asked about their potential needs for spaces where they can search for illness-related information, they responded more towards the need to find information about the building itself and what it affords. Catherine, Walter, Richard, Sara, Kevin and James’s Family from PMCC highlighted how long it took them to know about the existence of specific spaces at the building. “I haven't been told about them, I just found them as I have spent so much time here [7 months]. I think I more, I stumbled across them more than anything…” (Walter, PMCC); “Finding information about the space, about this centre, is very difficult, you better of wondering around and asking someone in the purple, one of the volunteers, because they all know where to send you… then it took a very long time to even be told about the patient wellness centre on the first level, it's out of the way it's not well signed and people aren't actually told about it that you can wait there if you have a long time between appointments or that sort of thing” (Catherine, PMCC). James’s family, reflecting on the wellbeing centre, stated: “so, there is a lot of things that you don't really notice, if you are just walking around until you've been here a while.”

> *Catherine, PMCC: initially it was just straight up to the loft, cafe and the outdoor area, [and after long time and getting to know the wellbeing centre] now it would mostly be, I'd go there, to that wellness centre level 1.*

> *Catherine, PMCC: There is a little kitchenette, but we weren't actually told about it because there is a lot of lack of information and a little bit of administrative strangeness. But that's not the fault of the actual area.*

> *Sara, PMCC: Hard to find the wig library.*

At the time of the interview, Walter, Richard, Cameron and Kevin did not know about the wellbeing centre in particular or had misunderstood its purpose. Following some explanation by the researcher, Walter stated: “I did not know about that part. I went to the chapel. Maybe I looked up at those timbers [leading to the wellbeing centre]. I must go and have a look.” This may explain why the wellbeing centre at PMCC did not receive similar praise to that at BRICC. The rooftop garden was a different situation and most patients knew about it, expect Richard: “mind you, as I said, I've been. I've, this is my third treatment and I've seen my doctor two or three times, so I've probably visited the building now. This will be, I think it's the sixth time. It's only that you've mentioned it that I've become aware that the rooftop garden is actually available. I haven't, nothing I've come across that says, that there is that area available if you want to use it.” His lack of knowledge of these ‘supportive spaces’, following further discussion of the existence of the wellbeing centre, made him describe it as if it was kept a secret from him: “yeah, it's almost seeming odd to me now to know that those, they are there, and it's been kept a secret from me.”

Some of the ideas discussed to better communicate the building components were brochures and digital displays (Richard, David, PMCC). David suggested that televisions at the waiting areas or even treatment rooms can do such a job instead of displaying distressing news (e.g. in waiting spaces). Richard, on the discussed information brochure, stated: “I think that would be very important. To somebody that is going to be, visits in a number of times. It would be very useful to know.”

> *David, PMCC: something about the hospital. People that have donated money, what's, like you know, people come in here they don't see where it first started. You know what I mean, so you could actually have something about the hospital on from when they started digging the hole, right up to where they are and what these machines do and you know, all that type of things. <u>Information. Because there is no information, there is no information about this hospital at all, that I know of</u>… just information about the whole lot. So. And how many tonnes of concrete. Like, who knows how much has gone into it. But you know, <u>how many floors there are, and you know, what this floor does, the chemo and the other downstairs does the radiation. Just information.</u>*

5.4 Fostering agency over surroundings: Attending to patients’ personal and changing needs

Participants’ experiences, besides highlighting the importance of the built environment to induce positive and welcoming impressions in such an aversive situation, pointed to a critical role that such spaces should play, in avoiding unnecessary obstacles, features or situations that are in themselves stressors. In that, participants reflected on several issues that predominantly relate to heightening a sense of control over all aspects of patients' interaction with the building.

5.4.1 Balancing community and withdrawal

Among the common topics raised by patients regarding the treatment space was the layout spatial arrangement and configuration. Participants responded with varying opinions regarding the levels of privacy facilitated by the options of shared and private treatment zones. Nevertheless, what was critical over such choice was the need to maintain an acceptable level of personal space – to not feel crowded. All participants disliked being cramped with rows of chairs set too close to each other: "I think it's nice that you've got your own areas. In Perth, in the basement, you were packed in, in just rows and chairs" (Imogen, PMCC). Cameron estimated this spatial quality as one of the most important design considerations for the treatment space: "so being able to have enough space that is not crowded. So, there is a room of, there is 6 people, it never feels, there is a lot of stuff happening here, it never feels crowded, I always have personal space to go through."

At PMCC, the treatment space was divided into zones of an average of six recliners each. Chairs were placed a minimum of two metres apart – a setup that satisfied most patients: "but to say that there would be a dozen or more in a space like this, I think that's starting to become a bit of an issue," Richard highlighted. In such a setting, participants did not mind sharing the space with other patients, rather some viewed it as a necessity from both a medical perspective (easy access and observation by nurses) as well as the level of social interaction that such shared space facilitates. It also gave a sense of spaciousness specifically with the inclusion of windows between the treatment sectors (Figure 5.17). These internal windows increased the sense of space for each patient and provided further visual connection to the external windows, acting as a reasonable compromise for chairs with limited access to external views (Imogen, PMCC). "I like the space, the windows. Kind of interesting having the windows between treatment rooms as well, so you're not kind of closed in small space, you can sense the bigger space around you" (Sara, PMCC). "Well, here I am sitting in a room. And I can see rooms down here, you know. It gives you a feeling of openness without being in a cell of some hospitals. And that I think is very important" (James, PMCC).

> *Michelle, BRICC: Yeah, no. I think if, as long as there's a bit of space so that people aren't cramped, then people can actually have the space even though they are surrounded by people.*

> *David, PMCC: Well, you only need the chair. You don't need any bigger. You know what I mean? I wouldn't start trying to cram it too much.*
>
> *Walter, PMCC: Certainly, the ward area is big enough for the recliners, for where we sit. I think that is certainly important.*
>
> *Kevin, PMCC: Ah, yeah everything was at the other hospital [old PMCC] more cramped. Closer together.*
>
> *Sara, PMCC: I know it is quite noisy in here now, but normally it just feels like a good amount of space, I do not feel like any one is too close to me, which is good, cause sometimes you get a bit tired and you want to have a sleep.*
>
> *Michelle, BRICC: Whereas here, you know, the nurses at least, you know, can get to you very quickly. When that lady went pale on me, when she pressed her buttons, the nurses were there in seconds you know. So, it's a balance of medical, medical needs and personal needs as well… Well, that feeling of knowing that nurses were within, were visible you know. Because I mean I had a couple of things that happened, where I thought what's going on here. So, you know that the nurses, so proximity of nurses at the nursing station.*
>
> *James, PMCC: Firstly, you talk to people or they talk to you…*

Figure 5.17 Top-wall windows between treatment zones, PMCC. A view from a treatment chair behind an existing column. Photographs by author.

Even with a shared space, some participants still preferred setups that afford small groupings of patients. For Catherine (PMCC), this was better for meeting the idea of a personalized space: “I think the fact that the chairs are in small groups is a good thing, so you have like two chairs and a bed or that sort of small areas rather than a very large number of people in one room… it feels a little bit more personal, and there's fewer people overhearing things, a little bit more privacy kind of things. You end up meeting the same people over and over again because you're on a similar treatment schedule and that's kind of nice.” Participants also highlighted the importance of a degree of visual privacy. A shared space that is exposed to every passing person was not conducive to a level of comfort that patients desire in such situation: “… I remember the old Peter Mac, the chemo ward, it was very visible, so visitors from the bathroom they can see you. It had chair, chair, chair, chair, so it was, and that is why actually, when I came here the first time, I was surprised that I got my own space here, there is a line in the space that is two, three metres in front of me, two meters on the side, just that personal space to go through this and I like that" (Cameron, PMCC).

That being said, other patients, mainly at BRICC, preferred to receive their infusion session in a fully private space. Participants saw this as essential opportunity to maintain a comfortable presence of their family members (Diana & Margaret, BRICC), engage in personal activities of interest (Walter, PMCC), and most prominently, avoid being seen at their sickest or seeing other ill-looking patients (Diana & Margaret, BRICC; Katie & Pam, NEMIC; Lynn, GICS). Sitting close to patients who might be struggling during their treatment exposes other patients to 'unnecessary' stresses in situations where they strive to maintain utmost comfort. Margaret, on this issue, stated: "but, when you're sitting having chemo and you've got someone in the next area, who is having trouble with it. That, I found that uncomfortable and I would have thought that the person next me felt uncomfortable too, because they were having trouble with it… One, it's hard to hear somebody that is elderly going through that. And two, it was hard for me to hear it because you know, you like to be as comfortable as possible and that makes you feel uncomfortable, because you're feeling empathy, yeah." A view also supported by Diana: "and it's not really that nice, to be honest with you, to be making eye to eye contact with someone that's, you know, makes you feel a little uncomfortable I suppose."

> *Diana, BRICC: Yeah, I think if it was in my situation, I think I would probably prefer to have my own space. Purely for all of those above reasons. That you know, you don't want to be looking at what other people are and they don't want you to be looking at them, and I don't want them to be looking at me if I'm unwell. So, for me personally I would like to have my own space. And sort of go about it that way, because it's a private thing and everybody is different and you know, not everybody is probably like me. A lot of people might like that open area. But for me, I would prefer to have yeah, just a, a nice area where I can sit and I can have my family and we can chat. And you know, do that type of thing.*
>
> *Diana, on the most important things in the treatment space, after providing windows, BRICC: But maybe just to make them a little more private, or the sections a little bit more private and obviously so that people can't be looking at each other.*
>
> *Margaret, BRICC: But there were people next to me, on either side, that were elderly people. Two, but one in particular that I could hear everything that was going on, and she was struggling with it. And I felt an enormous amount of compassion for her, and I felt empathy for her. And I you know, it would have been nice for her to have a private space. Because she was in a lot of pain, and I could hear it, she was right next to me. It was just a curtain between us, so I did think to myself then, two things. One, it's hard to hear somebody that is elderly going through that. And two, it was hard for me to hear it because you know, you like to be as comfortable as possible and that makes you feel uncomfortable, because you're feeling empathy, yeah.*
>
> *Margaret, BRICC: Yeah, so I enjoyed the space. <u>Particularly the spaces where you can have your own little alcove area, because you can have your family around you</u>. The last one I had was in the*

> *more open space, which I didn't like as much, because <u>it's a little bit like your on show and everyone's coming through</u>.*
>
> *Imogen's Mother, PMCC: Being very close to others allow for conversations but sometimes you do not want that… And sometimes people who were having chemo are very ill. And <u>Imogen is remarkably bright. And some people are very, very ill and probably don't want to be dealing with other people and their relations.</u>*

In emergency situations, a shared space can be rather stressful: "… when you're having chemo, you don't want to, and it's happened once for me, the doctor sort of had to be rushed in and go to the woman a couple [of chairs] down. And you could see it was all happening, you could see everything that was happening. And it's a bit stressful" (Margaret, BRICC). Curtains can give a degree of isolation if needed in such situations, but for Margaret, it still conveys that emergency status. "Although there's a curtain arrangement, but then that, that almost feels like emergency doesn't it? The emergency space where they pull it across, then they open it up and pull it across. Which you don't want in chemo because you're there regularly. And it does need to feel comfortable to an extent."

> *Margaret, BRICC: … you're not exposed to the workings of the room, the hospital workings of the room, or the emergency workings of the room. And I don't know whether you could or not.*

Privacy options therefore were regarded as critical, at least for patients whose conditions implied painful side effects (e.g. end stages) or potential anaphylactic reactions to the treatment. Such a negative reaction was the main reason Katie (NEMIC) considered privacy the most important aspect a treatment space needs to afford. It was also considered beneficial for specific circumstances, such as during first treatment sessions where anxiety and fear of the unknown can be at its peak. <u>"I think just for a day like the first one, I do not know, but if I was offered a private space on that first one, I might have taken it up, I was a bit anxious, I think</u>… the very first treatment I tried to do a cold-cap, where you put the thing on your head and it goes numb, it was quite difficult. So they had to give me some drugs to calm down so I got quite shaky and I got really drowsy, so I just, that was a bit stressful that one, my first time, trying this thing on my head, so that was probably the main time I was a bit conscious of wanting space" (Sara, PMCC).

For Sara, this need was also the case during other sessions when she felt tired or required some quiet time to sleep: "the last time I was quite tired coming in and I would sort of liked to slept a bit, but I couldn't because there was stuff going on. It was not a big deal, but sometimes you sort of wanted that bit of space, but actually it is really nice to have people around. <u>So, you kind of, [at] different times you want both things, one or the other I mean</u>. It is definitely nice to talk to people sometimes and then other times if you just a bit tired, it's good to be able to have space." It is indeed a "difficult balance", as noted by Katie and Pam (NEMIC), who suggested that architects should seek a degree of "flexibility" in the design to allow for such balance.

Having options of privacy also meant that patients would get further opportunities to have their family around without creating potential disturbance. Margaret highlighted the importance of considering more conscious seating space for family members specifically for the first session: "… you go in and there's these reclining chairs. Very obvious, for purpose. But again, chemo is stressful, particularly your first one. And to have your family comfortable around you, I think is just as important as the space." Family is the main "support crew", as expressed by Diana: "aren't they? you know, come along and support you so that's, that's a very important thing to have." However, the shared space was considered by some participants (including Catherine, PMCC; Margaret & Diana, BRICC; Patrick, GICS; Katie & Pam, NEMIC) to fall short in providing a comfortable presence for accompanying family members (enough space and chairs). Patrick, GICS said that partners in such conditions would feel as if they are "in the way of treatment," wondering "where to sit." He further stressed that: "it's a tough gig for the partner and you shouldn't just feel as if you are some kind of a transient that has to be jumping up and down out of the way." This was a situation for Margaret's family too, in that she noted them as a potential disturbance to the nurses' work: "but then, particularly with that more open space, the nurse couldn't get to me, and then they had to stand up and move themselves away. And my husband was, didn't know what to do and was twiddling his thumbs, and was stepping away… That was hard, to have the family around. Not because they felt uncomfortable, just because it was hard to get them around me and then the nurses were having trouble getting in and out and past people and stuff." Considerate space for family was also regarded by Diana as a facilitator for distraction from the potentially distressing activities and conversation that takes place in the shared treatment space "… if you're chatting to your own family and whatever, you sort of blocking that out a little bit."

> *Diana, BRICC: I think when you sort of, you're, I guess you're always aware of what's going on around you. Because I mean you can hear quite clearly when they're talking to the patient next to you, either side or opposite you. So, I guess you sort of know what's going on around you at all times. And I suppose that's you know, unavoidable unless you're put into a separate room like this [the interview room], I guess. But, yeah. So, you are aware of that, but then I suppose, if you know,*

> *if you're chatting to your own family and whatever, you sort of blocking that out a little bit, yeah. Yeah.*
>
> *Margaret, BRICC: They sort of drag a chair in and if someone else comes, you sort of stand there and need to ask them and they'll drag another chair from somewhere in. So, it's a little bit, not uncomfortable, but it could be more comfortable, maybe… Or a space big enough to have two or three family members around you in comfort. And I don't think that's. Most the time I was there half the patients had their family members. One, two or three family members. So, it gets quite crowded in that space. And to be able to sit around comfortably. It's not that my family wasn't comfortable. Because they sort of propped themselves and were sitting facing me, and we were chatting. <u>But then, particularly with that more open space, the nurse couldn't get to me, and then they had to stand up and move themselves away. And my husband was, didn't know what to do and was twiddling his thumbs, and was stepping away.</u> Those sorts of things, I think you could design a space where that could be better organised.*

For other participants, a private space was just a personal preference, "ultimately you like to have your own room but you know you won't have that. So that's certainly inefficient and cost-ineffective and it's a public hospital so you need to be realistic about that… Probably my nature, I think it's my nature to get a bit of privacy for myself, a bit of quiet time I guess" (Walter, PMCC). Even with the potential financial constraints to afford such options in public hospitals, a supply of simple furnishing objects (rotating tables) facilitated a set-up that gave Walter a level of privacy to meet his personal needs (Figure 5.18). "I sort of close myself in anyway with the table… Ah, just the table and the chair, I do not think above that. Like I said, ideally you would want your private room and a bed."

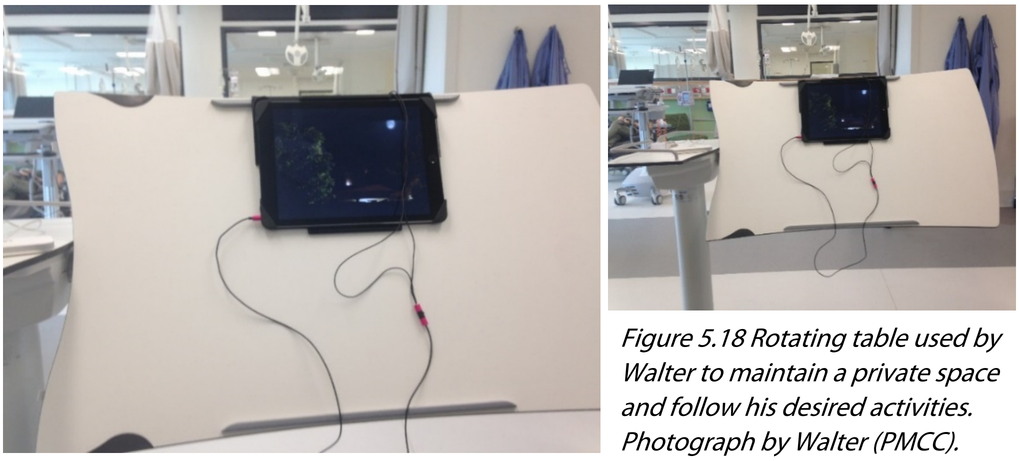


Figure 5.18 Rotating table used by Walter to maintain a private space and follow his desired activities. Photograph by Walter (PMCC).

Such simple options of flexible tables or chair arrangements, alongside basic screening partitions, may overcome the lack of fully private treatment spaces. Diverging the layout configuration from the traditional conformist-looking environment that features repetitive rows of chairs arranged toward the centre of the room may give patients further chance to orient themselves away from the general run of things and help support a level of privacy when needed. “So, to give people a variety of different set ups for chairs, rather than all be the same. Because actually, my memory of Adam Cano and St John’s, they were just, there was, you know, it was very nice, it was yellowy you know. But the chairs were tended to be up in a line, you know. And there was no, there was no partitions so. Whereas ‘round here, they've actually even got a couple of rooms, private rooms because sometimes people have issues that they need a lot of privacy” (Michelle, BRICC); “… to make it so that you're not actually invading other people's privacy. You know, whilst they're having their treatment. (Diana, BRICC).

Figure 5.19 illustrates an example of architects’ representation of the design shifts in planning the layout configuration and spatial arrangement of infusion-based treatment spaces. The images show how such design affords greater flexibility in balancing patient potential need for privacy and the requirements for medical observation. The “reverse donut” model, the division of the treatment spaces into zones, and the capacity to control chair orientation gives examples of the ways architecture can respond to patients’ diverse and potential changing needs.

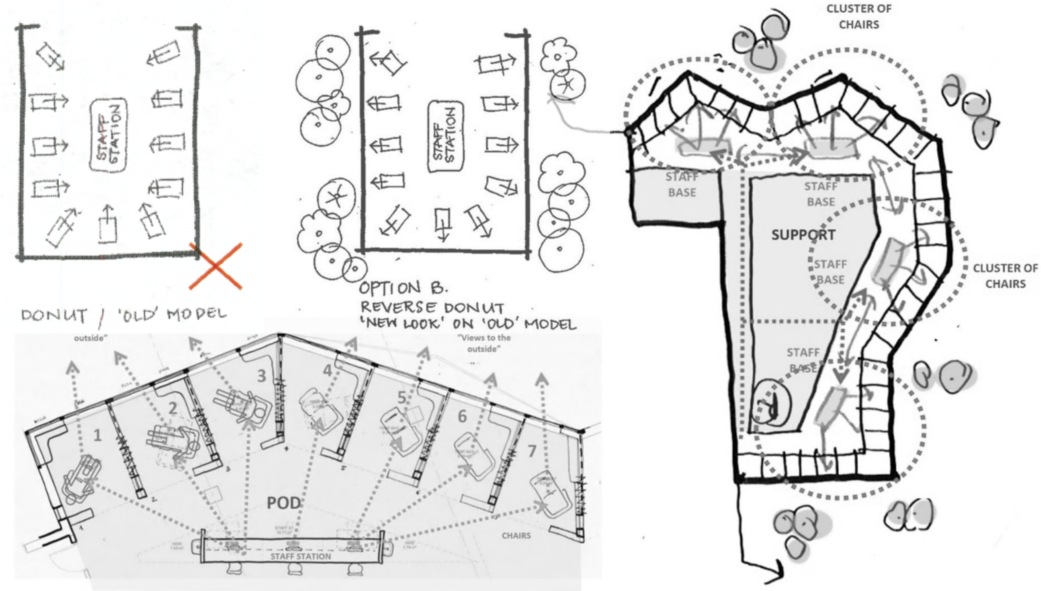


Figure 5.19 Architects’ representation of the conceptual design shifts in the planning of infusion-based treatment spaces. Albury Wodonga Regional Cancer Centre, Victoria, Australia. Drawings: Billard Leece Partnership. Source: personal communication.

Figure 5.20 provides another example, recently opened (July 2019) by Bates Smart architects, in how borders can be slightly, yet innovatively pushed. The design, besides introducing separated yet connected treatment zones, introduces other ideas such as: the slightly rotated, indirect-facing treatment chairs; movable ‘rotating’ partitions (facilitating greater flexibility to convert the shared spaces into more private one when needed); and switching glazing technology integrated with the partition design (increasing patient control over their visual connectivity while lying on the chair). Although these examples are slightly different from the design implemented at PMCC and BRICC, they still share some basic concepts while pointing to the variety of ideas that can respond to one issue of patient experience. Hence not limiting design to one solution nor hampering architects' creativity to produce novel ideas that can contribute to greater flexibility in the design of such spaces.

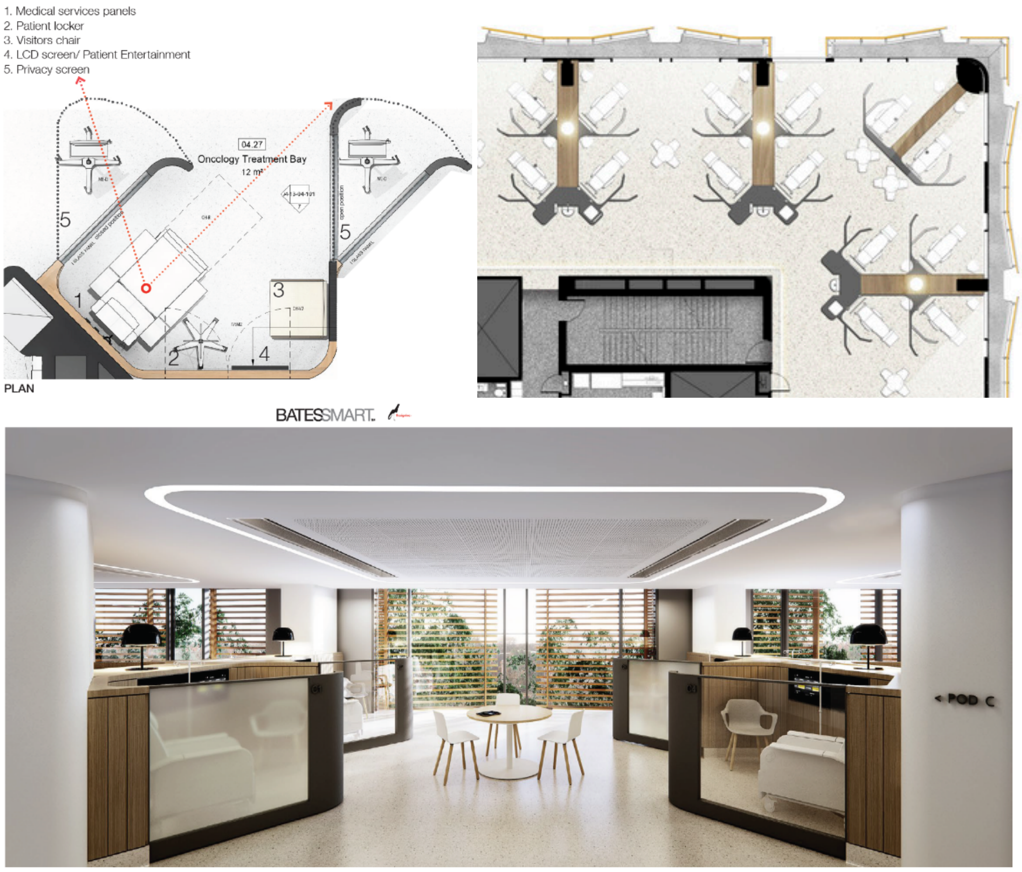


Figure 5.20 Architects' representation of the conceptual design of Gandel Wing, Cabrini Malvern infusion-based treatment spaces, Victoria, Australia. Drawings: Bates Smart. Source: personal communication.

Privacy and waiting

Desire for levels of privacy in other spaces such as the waiting area was also prominent in respondents' comments. Participants found waiting spaces to be generally crowded and cramped (Kevin, Sara, Catherine & Cameron, PMCC). Being exposed to the public users of the hospital was regarded a critical source of discomfort, specifically for patients whose outlook is affected by the treatment: "… that's incredibly important too. Because, I say that because, people are you know. They've got hair loss, they feel sick, they're anxious, and they need to, they need to feel comfortable and not looked at. And I think that they've done that reasonably well there. But, I do know that over the period of time that I've had the chemo, there was some people that were, I could see they felt uncomfortable. So, they were sitting there with bald heads, or sitting there with, you know, looking very, very unwell. Or needed to be sick" (Margaret, BRICC). Michelle shared a similar view, particularly for the radiotherapy waiting space which she criticized as being in a relatively exposed spot, very close to the public café: "so, a lot of the staff come down there. It becomes quite public… because when you're going through cancer, you're often very anxious and so you need to be in a space which sort of calms you down a bit."

Providing waiting spaces that are "tucked away, and reasonably private from people" was therefore important for patients. Considering further options in the design of the waiting space layout such as corners and alcoves as well as the integration of visual privacy partitions could give patients other options to maintain privacy when needed. "But I did, I was conscious of people moving up and back, and, and that airport lounge environment, that could be partitioned. Just for people that wanted that extra privacy" (Margaret, BRICC). Furthermore, the consideration of private meeting rooms can be of significant support in situations that involve sensitive communications. Reflecting on family members receiving shocking news about their mother's health condition, Michelle referred to the importance of such rooms in providing adjustment time to patients and their relatives before heading home "… but I wish I'd been able to say, at least give them the option of to come here, get themselves together before they headed out on the street."

> *Margaret, BRICC: Partitions yeah. At the moment it's an open space, it's like an airport lounge space rather than partitions. And I do remember one woman in particular, who was you know. <u>It's very hard for people to have that and when other people are walking past. It's different when you know the people around you are going in there, and they understand. But I did, I was conscious of people moving up and back,</u> and, and that airport lounge environment, that could be partitioned. Just for people that wanted that extra privacy.*
>
> *Michelle, BRICC: See this, I actually and this is the first time I've been in one of these rooms [the meeting rooms], but I, I had a situation happen at the beginning of the year, where I met somebody that I knew who was here with his mother and father. And his mother, I took one look at her and I thought oh my God you're not going to be here for very long. And when they came in, they got really bad news. And I sort of said, I didn't know what to, I didn't know what to say to them, because I didn't, I didn't know that these rooms were available. But again, you know, these rooms are very nice. But you won't, won't want to spend a long time here, because there's no window… Yeah and when I raised it with one of the other volunteers, they said oh you know, sorry we haven't shown you. There are these two rooms that if you see any people out visibly coping with, I mean as it was this bloke's mother died the next week here. And but I wish I'd been able to say, at least give them the option of to come here, get themselves together before they headed out on the street.*

The tendency towards desiring privacy options was prominent for all participants at the Ballarat site. The low density of population in such regional locations implies more chances of meeting acquaintances. With the potential social stigma of cancer, such situations might trigger enormous concerns to patients, which may explain participants' tendency for privacy options at this site compared to PMCC. "Ballarat is quite a small place. It doesn't bother me that people know that I'm coming here, but it does bother other people. So, there needs to be a sense of privacy as well" (Michelle).

5.4.2 Following a personal routine

The frequent and lengthy treatment sessions imply a significant amount of time deducted from patients' personal lives. Almost half of the interviewees spent an average of five hours or more per infusion session, with the rest ranging between one to four hours, not to mention the other time dedicated for preparation and consultation. These extended sessions, with the relative hardships of leaving the treatment chair (e.g. walking with the IV pole, fatigue), may encourage boredom and leave patients with limited options to occupy their time. It was therefore reasonable to hear participants' appreciation for any opportunities that would "help to pass the time away" as Diana stated it. Using personal phones or tablets, reading (newspapers, books, etc.), listening to music, and chatting with family members were examples of the common activities that patients considered useful to occupy their time during the treatment session. A chance for short naps was also highlighted, especially with the exhausting nature of the treatment that makes patients prone to feel tired and drained. "The first time I had a lot of drugs in my system, so I was really drowsy and slept. Which is fine actually because it makes the day go quite quickly" (Sara, PMCC). "… On one visit I actually had a bit of a snooze, I didn't even realise. The nurse came back and had a bit of a joke about me sleeping for about an hour, which was a good way to spend the time" (Richard, PMCC).

> *Imogen, PMCC: I've been looking at Instagram on my phone for most of the day. Yeah, when I was having all day chemo, sometimes I'd watch something on my iPad, yup, or sleep.*
>
> *Sara, PMCC: Well, I read newspapers and magazine, listen to music, do stuff on my phone, talk to someone if I have a visitor, different people might visit on their lunch break or something… But every other time I have just being reading, is my main thing if my mind isn't too scattered.*
>
> *Diana, BRICC: Movies. Books. My daughter, she came with me for most of my chemotherapy. We just brought in the laptop, we watched movies, we brought books in, we done puzzles. You know, just things like that, we'd just sit and have a chat for a while.*

> *Michelle, BRICC: So, I would always, I brought my iPad in and sometimes I'd put something on the iPad. I'd, I'd always would want my chemo to be in the sun, so I could do crosswords and I would read.*
>
> *Michelle, BRICC: I actually, I would always have somebody who would come in and visit for maybe half an hour. I didn't want somebody there the whole day. You know, I'd rather just read and look after things, and I always wore my slippers so.*
>
> *Catherine, PMCC: Often I've been just too tired and so you sleep. Other times it's reading, reading things on the phone or in a book… But most of the time it's just been resting because you're so tired because of the treatment that you're not actually doing anything much.*
>
> *Richard, PMCC: Oh, day dreaming and viewing out the window. But mostly it's, I just read and try and keep my mind as active as possible.*
>
> *James, PMCC: Well, I have got a novel. Which I'm trying to read. And I've been trying to read it since Christmas, but I get a little bit done every day. And a friend of mine, who is on one of these floors today, she's got a portable DVD. Sits there with that. So, yeah. It goes pretty quickly really.*
>
> *Imogen, PMCC: I bought a book, but my brain isn't really functioning really well.*

Other participants regarded the treatment sessions as part of their personal time in which they get opportunities to share experiences with likeminded people, get some work done, and even get a chance to relax and rest from their already busy life routine: "I usually use this as part of my quiet time, I'm pretty busy already" (Walter, PMCC). Cameron, on the same notion, stated: "reading books or talking like you saw the spiritual support person who came and had a chat. iPad, I got some videos on there, so I just sit here and have my own space and shut off and put the earbuds in, which is quite nice… I have three young kids and a 6-month-old baby as well, so I think I have a lot of a personal space, <u>even I'm going through this [hardship of cancer treatment], in a way it's nice to just have a little bit time for myself to switch off, turn off, at the treatment.</u>"

Providing facilities for patients to adjust their surrounding space may help them own their time and decide on the way they want to frame it. Spaces equipped to accommodate family members, facilities to orient the treatment chair and set the space up for work or sleep, and other basic fittings such as power points close to hand, are examples in which the space can give patients a degree of control to occupy their time in the way they desire. "Yeah, so even a recliner that you could actually turn away if you needed to. Or you felt uncomfortable, you wanted to go to sleep and not be looked at. That sort of stuff I think would be good" (Margaret, BRICC).

> *Walter, PMCC: I will plug in stuff. I got everything I need.*
>
> *Margaret, BRICC: … I did emails, work emails. And some reading of articles.*

Walter managed to close himself in using a simple table that could be adjusted between vertical and horizontal positions. As seen in the earlier Figure 5.18, this option to modify the surrounding space allowed Walter to maintain a level of privacy that he desired and it facilitated some of the activities that he prefers to do and even looks forward to every time he comes for treatment: "… you can see I set my desk up. That is all what I do when I am in here… Again, that was something that I always looking for," referring to the time he spent watching Netflix on his iPad.

The lack of such flexible spaces that maintains patient independence and lessens the potential feeling of being overcome by the built environment can be of discomfort to patients. Margaret pointed to a situation in which the limited movement imposed by the condition of the treatment drove her feelings of confinement and caused a degree of inconvenience in the way she wanted to occupy her time: "… once you've got it sitting there. When you, and I had my laptop and bits and pieces, and if you forget to get it, you're stuck. You know, you can't sort of, you can, but you run the risk of hurting yourself. So, you sort of, a little bit more table space would have been great, because then I would have been able to set myself up… But that was a problem for me, because at one point I dropped, I was reading a journal article and I dropped it, and I couldn't, didn't want to disturb the nurses because they were busy with other people, and I was fine."

A dedicated table and a storage space easy to reach while sitting on the chair can be of support in such situations. This was further raised by Patrick (GICS), one of the focus group participants, who described the way in which he conceived the treatment procedures, as well as the confining setup of the space, as triggers of feelings of being processed and loss of control. "It's as if the whole system is designed on the premise, you're going to come in, you're going to sit in the chair, like that, just by yourself, and you're gonna sit like this and you're gonna wait and treatment will come, and anything you choose to do outside of that, is an inconvenience or an add-on, or something that has to be cared for, none of this is built in upfront." Commenting further on the limitations imposed by treatment, he described it as if you being "hooked up… it is a bit like everything being an add-on, as soon as someone… it is not set up for that, you feel that the iPad or the book or whatever is in the way, as soon as the treatment person arrives, where do I put this that is not in the way." Similar setups were encouraged for accompanying family members as a way to support their presence and give them a choice to keep up with their life demands while taking care of their loved ones: "he often like to be able to do work, say on a computer, but there's no tables for that sort of thing" Catherine, PMCC; "A side table would be handy for family members" (Sara, PMCC).

> *Margaret, BRICC: … And thirdly to be able to adjust my comfort, my own comfort. Including bringing lights down if I needed to, but also being able to adjust myself so that I could have, even a little. There is a little tiny, weeny little table. But it's not big enough to be able to adjust myself so that I had, I was comfortable and set up for the three hours, or set up for the day. I think that would have been also important.*

A television was mentioned by some participants as a potential source for occupying time: "… but you make it comfortable. Televisions would be nice… look we are sitting in here whether it need be for an hour or I know there are people that are in here for 4-5 hours" (David, PMCC); "I had, well I only picked this up on Thursday. Because there was a lady there with a very anxious husband. And she, they had been allocated a chair that didn't have a TV. And she thought, she thought the TV would distract him a bit because there was some sport on and yeah, and I thought oh that's right, only some of the chairs have TV. And the chairs that I liked didn't have TV's because I didn't care" (Michelle, BRICC).

That being said, other participants disliked the idea, specifically if the television is going to be placed in shared spaces (e.g. waiting areas) without individual control over its content. On that, Catherine indicated that: "the morning TV is terrible" which was similarly perceived by Sara (PMCC): "I am really glad there is no televisions because I find televisions really annoying. So, in some of the waiting areas they have TV screens and you know the morning shows on and it just kind of like, oh don't want to hear about the news right now." Participants, with these views, rather preferred to bring their own sources of entertainment and pointed that engaging their time is generally an individual issue and nurses usually advise them to bring their own entertaining stuff: "it's good that you bring your own entertainment actually, because you know exactly what you want to. So, I always bring something to read, they've got magazine racks" (Sara, PMCC).

> *Walter, PMCC: I bring in my iPad, they got WiFi here which has been good. Watch some series on NetFlix. I do some talk to a lot of people as well. Most time now I switch to Netflix.*
>
> *Catherine, PMCC: I wouldn't like a TV screen around, no, even when I've been up in the inpatient [unit] I haven't had the TV going, because you're just so exhausted that any input is just too much sometimes.*
>
> *James's family, PMCC: And I think that would be good and possibly not having news on the TV or something that is really boring. Because when there is like a big drama, it's all over every TV and you can't get rid of it. Whereas maybe something more calming on those TVs. Watch something different.*

Facilitating opportunities to manage patients' own time extends to other situations, specifically the one related to waiting, which likewise can occasionally extend over couple of hours: “I've waited up to 5 hours at times” (Kevin, PMCC); “I had to wait for a long time and in the waiting room there's not much to do” (Catherine, PMCC). For some participants the waiting time, rather than the space itself, was the main source of angst and frustration, “… It's my biggest bugbear” (Kevin, PMCC). Considering options in the waiting space to maintain a level of privacy with accompanying family members, engage in specific activities of interest such as work or rest, or even provision of collective activities such as jigsaw puzzles, may facilitate opportunities for patient to engage their time. A simple idea such as jigsaw puzzles, where pieces of puzzles are located on a table for patients to collaborate in putting puzzles together, was seen by Lynn (GICS), not just as a way to occupy time, but also a tool that gives a sense of community collaboration describing it as: “a community activity that helps you rebuild yourself.”

> *Michelle, BRICC: Sometimes that waiting space for the oncologist gets quite busy, but there are a couple of options. People can sort of go round the corner, and there's a table where people and around the corner where the tea and coffee is. And there's another area sort of over by the window, where there's a slight partition.*

Even if the waiting space itself is not conducive to a similar variety of activities, other spaces within the hospital, such as the wellbeing centre or the rooftop garden, can form destinations of interest for patients during extended wait time: “sometimes I go for a walk up to the roof top garden sometimes. I might go for a little walk down to the shops over the road here” (Kevin, PMCC). In that, exploring ways to communicate an accurate figure of the estimated waiting time or adopting technologies to recall patients when their time is due, may liberate patients to leave the waiting space and give them further choice to occupy their time without concerns of missing their appointment.

> *Catherine, PMCC: The inability to go and get food, when you need to because you might be called at any minute.*
>
> *Kevin, PMCC: Oh, if they could notify you how long it's going to take, an exact figure. That'd be great. Because then I could go for, I'd know how long a walk I want to go for and yeah, it would be much better.*
>
> *Catherine, PMCC: So, it's possible of the, you know, displays of estimated time.*

5.4.3 Sensitivity to patients' treatment-related vulnerabilities

Other circumstances in which the built environment can support patients' needs stem from the distinctive vulnerabilities of this group of patients. Cancer treatment, and specifically chemotherapy, may have particular impact on individual's senses. Patients' olfactory, auditory, and sight senses become prone to atypical alteration in which patients may perceive the environment differently, compared to healthy individuals or even patients with other common illnesses. Cancer patients become also sensitive to temperature, require frequent use of toilets and are likely to develop significant tiredness and exhaustion.

Most of the study participants found the ambient environment relatively satisfying with few reported conditions of discomfort related to odours or temperature. Walter's experience in relation to his developed skin sensitivity to temperature was one of these incidences where the existing position of air-conditioning fins above treatment chairs caused him a degree of discomfort, suggesting that: "… they can put it to the side maybe. Maybe some deflectors there or any type of diffusion." The availability of toilets, in terms of both sufficiency and accessibility, was another area where participants praised the built environment in affording such need. "Because my condition is related to my bladder, which means frequent visits and there are toilets everywhere and it's fantastic … Every corner there's a toilet … Obviously that's been purposely designed because they know that lots of people have that problem, and they just work beautifully" (Richard, PMCC). In one of the focus groups, noise was also highlighted as a potential source of discomfort. "Noise is a huge issue… if your room had to be close to a nursing station, and the constant buzzing going off and staff talking. The doors tend to be quite noisy when they close as well. And when you are not in your best, or I am anyway I am much more sensitive to those sorts of things, or people walking down the corridor" (Katie, NEMIC).

> *Catherine, PMCC: For each group there's a toilet on either side of it, so in between one group and another there is a toilet, so it's very close to that sort of things so you don't have to go very far for that, which is also good.*
>
> *Walter, PMCC: The toilets through the layouts, ground floor, its good… Yeah, like when you first walk in you know, some other places you look up the signs and you keep looking, whereas here you notice pretty much when you walk in, not the first thing you see, but you know it's in your vision I guess.*
>
> *James, PMCC: They are fantastic. So, it's designed in a place like this. Plenty of toilets, because you know when you go on this treatment, you get a bit of treatment in the toilets sometimes.*

Participants expressed further awareness of the treatment's influence on their immune system and thus highlighted the importance of thoughtful design considerations that maintain cleanliness and a perception of safety. "I guess being in here with my illness, I know that my immune system is low and most people here would be in the same boat, so just touching stuff, is funny here you always suddenly become hygiene conscious, and with the lift, you press one button and you do not have to worry about inside, because I know from previous experience in lifts, they carry disease pretty much. That was probably one of the things that really struck me" (Walter, PMCC). A sense of safety was also attributed, by some participants, to the chance of seeing nurses and be able to call them at any critical situation: "I think it is important to be able to see the nurses" (Walter, PMCC); "Well, that feeling of knowing that nurses were within, were visible you know … so proximity of nurses at the nursing station" (Michelle, BRICC).

> *David, PMCC: Well it does, and you've got to be careful of, you know, you're coming into a place where people haven't got any immune system… Yeah and it's got to be kept clean, so you can't put too much stuff in here.*
>
> *Richard, PMCC: It's nice that there, it's all freshly painted and everything is immaculately cleaned and perfectly finished.*
>
> *James, PMCC: But that's the comparison that I first found when I came here was light, was airy and it was clean. There wasn't a mark on the floor.*

Although most of the design factors relative to cancer patients' potential treatment-related vulnerabilities were well considered at both hospitals, a critical aspect relevant to patients' potential physical frailty was highlighted. Participants raised a few incidences where disorientation and accessibility-related issues contributed to some discomfort during their presence in the space. Long walking distances due to the scale of the PMCC building with limited options to rest along corridors was one of those challenges specifically for patients whose mobility and physical energy were quite restricted. Catherine commented on a specific situation at PMCC where a staff-designated short-cut route could have saved her and other patients long walking distances: "… Day Therapy is in one corner, the consulting rooms are in the other corner. If you don't know about the short cut through the research lift foyer, you have to walk all the way around the entire U. It's not obvious that, someone who is maybe mobility-impaired or tired or sick can go the shortcut, you may think that you need to go all the way around. So that particular level is an issue about accessibility."

> *Catherine, PMCC: I think efficiency, being able to find a good way from one place to another when you have to get there, because often people don't have much energy.*

> *Michelle, BRICC: Because some people, you know sometimes, you know their mobility is quite restricted.*

Walking distances can get even longer if the hospital wayfinding system is confusing. The inconspicuous positioning of some signage and their small-scale text, combined by the nearly identical architectural character of most floor levels at PMCC, were raised as major disorienting factors: "it's very difficult to tell one level from another" (Catherine); "unless you go around you might not see the signs… where they having the sign kind of closer to the lifts might be handy. I know that there is a big one down next to the bathroom, I did not see that till later" (Sara). Furthermore, the layout design of the Day Therapy Unit, with again nearly identical corridors, was described as "kind of a rabbit warren" that causes further disorientation. "Once I got in it was like I'm not sure where I am, because of the way the corridors wind around and I didn't know how to get back and I didn't know how my carer would be able to find me again…" (Catherine) (Figure 5.21). Even with the compelling need for such corridors due to the scale of the building, simple architectural intervention such as distinctive colours or decorative objects placed at major intersections where people are likely to use can distinguish the way and act as recallable landmarks for better spatial orientation, providing a cognitive map as discussed in the review of Chapter 2.

> *Richard, PMCC: But the signage is very small and quite inconspicuous. You get out of the lift and sometimes it's right in front of you. But the lift row sometimes is 5 or 6 lifts in a row and the signage can be at that end, and you've got to look for the sign sticking out and you walk along to find it. To then find you needed to go back the other way anyway. So, I found that just a little bit confusing.*
>
> *David, PMCC: The only one I think we got caught out, I think one of the letters was around the corner wasn't it honey. It was one of, we didn't, I think it's because we weren't on that side, on this side we couldn't see it. So, we thought we were on the wrong floor. So, no we can't, it's on level 2. And it was just around the corner.*
>
> *Catherine, PMCC: The Day Therapy is kind of a rabbit warren, there is lots of little rooms and the way to get out is not very obvious, so you have to go along and then turn left and then right and then left, maybe! or do you keep going, then it needs to be good exit signs and direction of where people are most likely to go.*
>
> *Imogen's Mother, PMCC: And because the passage ways, I don't think they're circular. But they seem to go around and there are rooms on either side, so it's not straight lines. Which is good, it breaks it up a bit. <u>But it takes you a while to orientate yourself the first time you come in [to the Day Therapy Unit].</u>*

Figure 5.21 Internal corridors at the Day Therapy Unit, PMCC. Photographs by author.

The lift technology at PMCC was also a bit confusing for some participants. The incorporated, non-traditional, operating system requires users to first decide on the floor level they want to go to and the system then groups people with similar destinations and guides them to their assigned lift, with no need to press other buttons inside. Although the system has been praised by most participants, some patients expressed slight confusion, specifically in their earlier visits. “I must admit, I think if you first get here is probably the first day when you do not know which button to press, there is no up or down, it’s just a keypad. I think that certainly, it did not slow me down, but yeah, the initial getting used to it. I have seen a lot of people probably get confused with it, but I think once you know it, it’s not that hard” (Walter, PMCC). “If you walk up to the lift and you got the signs of what to do but then the thing [touch screen] is blank, how do you wake it up? what do you do… Until you get used to it, it's quite disorienting” (Catherine, PMCC). More detailed explanation of the operating system was therefore regarded important to eliminate such confusion.

Difficulties in wayfinding not only affects walking distances for potentially fatigued patients but may also induce further anxiety and stress: “… for me as a patient there is enough going on, and to have sort of no real distractions, if that make sense, to be, sort of, like I said, you walk in and to be clear where I'm going, just makes it a bit easier. I think the last you need is more drama to the way you trying to get to” (Walter, PMCC). “… if you're not feeling well or anything like that. That's the last thing you want, all you want to do is just go in and do what you've got to do, and you know, be able to know where you're going without having to worry about asking fifteen people which way you should be going" (Diana, BRICC). "Sometimes you are stressed as a patient and you do not want extra from the lifts for instance…" (Catherine, PMCC).

> *Catherine, PMCC: But being presented with the lifts and not knowing where to go and the overall layout of the area, there wasn't an explanation of the overall shape of the place or the, where you need to necessarily go, and yeah, the lift was a bit strange, even with the instructions it was like what do I do here… So, welcoming but a little confusing.*

Disorientation is one of the common complaints about traditional hospital design and may leave patients with long-lasting negative memories of such places. This has been the case for most participants, including Diana who described her experience of an older hospital relative to wayfinding as overwhelming and awful: "I did not like it at all. It just, it was very overwhelming. It was just, you know, hallway after hallway, doors after doors and it was just, we had no idea where we were going and it was so awful." Such conditions caused her and her elderly mother avoidable stress and walking distances: "… And then we got sent back, and then we got sent back to where we come from… I mean, we eventually found where we were meant to be, but it wasn't a positive experience to go in and say oh, this is lovely." Guiding the way to eliminate unnecessary steps is therefore critical, as one of the focus groups' participants framed it: "a few extra steps makes a hell of a difference…. You do not want to be finding the long way around to something, the toilets or whatever… if you keep going around you will find them eventually, but you want to go the most efficient way… if you are hooked-up and having chemo, you do not want to be doing those ten extra steps to find them" (Patrick, GICS).

Even with the occurrence of some of those incidences in the investigated hospitals, participants considered the wayfinding system relatively successful compared to other buildings and considered their comments as minor areas for future improvements. The overall sense of the ease of wayfinding in the explored hospitals was attributed to major architectural qualities such as the openness of the atrium space, natural lighting, visual connection to different floor levels, and the compact (block-like) design of the building, specifically at BRICC, which facilitated relatively short walking distances between different functions. These contributed, collectively, to a rather intuitive wayfinding as described by Margaret and others: "and the minute you walk in, it's sort of intuitive. You can see that's, you know, that's the reception area. There's coffee there, there's a nice space there. And it was, you know, it's pretty easy to find. You know that it's in one block. It's easy to find, so no problems at all finding it, no.”

> *Diana, BRICC: … it's not spread out all over the place.*
>
> *Cameron, PMCC: … when I can see where I am going it certainly adds to that feeling.*
>
> *Sara, PMCC: the light coming down makes you feel you’re in like bright open space rather than a dark hospital and a warren of corridors where you do not know where to go, like I found it quite easy to figure out where to go.*
>
> *Cameron, PMCC: No, it's always being really straightforward.*
>
> *Walter, PMCC: As far as the layout, I guess the layout is pretty good, it’s pretty easy to get around as far as I am concerned.*
>
> *Michelle, BRICC: There's a lot of good signage here, there's also volunteers on, usually on all the entry points. No, as long as there's some decent signage.*
>
> *James, PMCC: I found it very easy to navigate through the place.*
>
> *Diana, BRICC: Yeah, so you know exactly, with that design of the building that that's where you are going to head. There is no sort of walking in there and going no, you know, I don't know where I'm going.*
>
> *Diana, BRICC: So, when you come in, everything's pretty much, all areas are together which you know. We've got this area and the area downstairs, so it's not spread out all over the place. Which is nice, so it keeps it all together. So I think it's just the way that the actual design of the building is, has been done to make sure that everybody all, if you need to see the oncologist or the radiation oncologist, they're right near the radiation treatment area. So, everything's close by, yeah, which is really good.*

5.5 Concluding remarks

This chapter, through the interviews conducted at the Australian hospital sites, has attempted to respond to the first and third research questions of this thesis by identifying four key themes conceptualizing the role that supportive healthcare built environments may play in shaping cancer patients experience, accompanied by key architectural features that contribute to such a supportive setting. These ranged from the role of the built space in shifting negative expectations and providing opportunities to break up the intensity of the treatment day to its role in provoking engagement in activities beyond treatment and being sick and avoiding intensifying an inherently stressful situation by being sensitive to patient individual needs and treatment-related vulnerabilities. The next chapter reports on the interviews conducted in the Egyptian context as a further attempt to enhance our understanding of patients’ experience of the built space in rather depleted settings.

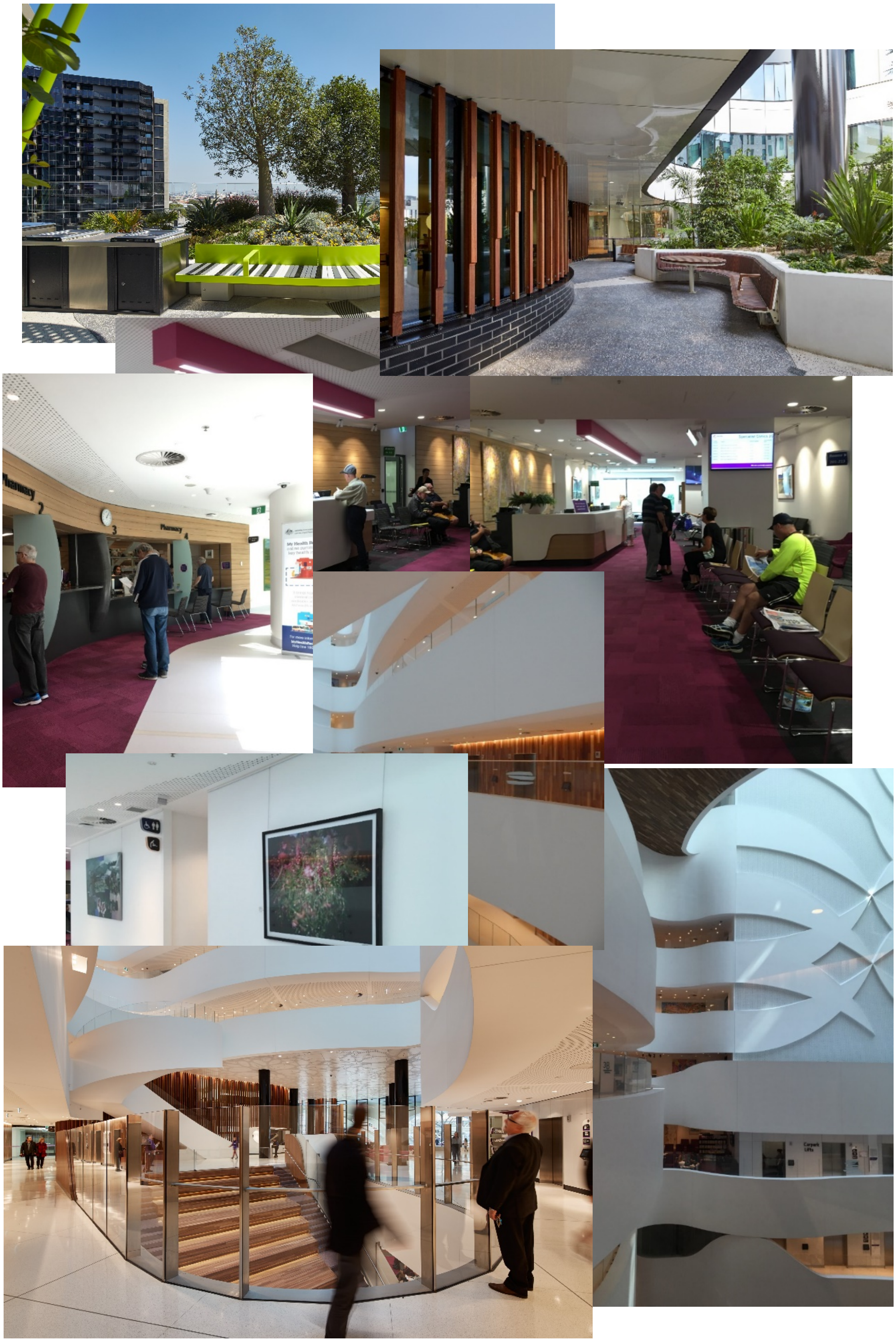


Figure 5.22 Image collage of PMCC interior and exterior environments.

Chapter 6

Interview results – Egyptian context

This chapter reports on the results arising from interviewing patients within the Egyptian context. Investigating patients' experience in this context provides a useful comparison to the Australian patient experience, enabling consideration of influential design elements in the hospital that supports the wellbeing of patients that potentially transcend context and culture. In comparison to Australian hospitals, public hospitals in Egypt are less well-funded and are generally in poorer physical condition, hence patients' experience is anticipated to be quite negative. This motivated the research in order to enrich the understanding of the role of the built space in shaping patient wellbeing by accounting for the potential negative impact arising from a rather run down, less developed setting that lacked thoughtfully designed spaces.

In-depth interviews were carried out with six patients attending South Egypt Cancer Institute (SECI) following the same framework pursued within the Australian context. Participants' experiences generally aligned with the experiences of their counterparts in the Australian context. Hence, the data was synthesized in the light of the previous chapter but grouped into two streams for simplification: current experience of the treatment spaces, covering fundamental aspects of a comfortable presence in the hospital (mostly physical comfort); and aspirations for optimal treatment spaces, narrating further the emotive aspects of design. In that, the chapter first communicates aspects of design relevant to patients treatment-related vulnerabilities that participants highlighted throughout their experience of SECI, followed by other emotional-related experiences relevant to the themes generated in the previous chapter (e.g. the role of the built space in diverting focus, provoking engagement beyond treatment). However, for simplification purposes, patients' experiences are embedded under the overarching themes noted within participants' experiences (actual and aspired), as the overall narration was relatively short due to the smaller sample size. Other matters brought to the discussion by the Egyptian participants are also discussed alongside participants' reflections on the built space, including the role of personnel conduct in shaping the overall atmosphere of care, which was equally highlighted by patients, and the potential consequences of the negative experiences of the spaces and staff members.

6.1 Basic needs of the space

Egyptian participants' overall impressions of the existing hospital spaces at SECI were predominantly negative. The rundown condition of the building, the deteriorated nature of furniture and low levels of support for patients' mobility undermined patients' physical comfort and rendered the overall spaces as hostile and depressing (Ali, Amal, Mazen, Samira, Najat). "People wait on the floor… The place is very crowded and make you feel more tired" (Najat); "Lifts are outdated, and they dedicate high quality lifts to doctors and general managers, whereas for patients they get the secondary/rundown facilities" (Mazen).

Egyptian participants spent a relatively long time in the hospital. The bureaucratic system of the public hospitals makes the day even longer. Patients are required to come early on the treatment day to finalize different administrative procedures before commencing treatment preparation and admission (sometimes treatment does not start before 3 pm despite early morning arrival). The extended time and the fact that most patients come from regional locations place additional stress on aspects related to physical comfort (all interviewed patients come from other cities than Assiut): "I travel to come here, I arrive already tired and exhausted. I need a place to rest at, not to get further tired" (Najat).

The dominant sense of discomfort was further compounded by the hospital's rigid system and what it imposes in terms of unnecessary commuting distances between the various administration offices (Mazen). In that, finding the way around was not an easy task for some participants due to lack of features that distinguish different floor levels and a lack of easy-to-comprehend signage (Samira, Amal). With the potentially large number of illiterate patients (averaging 35% in Upper Egypt and rising to 63.4 % for elderly population (60 years and over) according to the Central Agency for Public Mobilization and Statistics (CAPMAS), 2017), consideration of tailored signage systems (e.g. visual icons) becomes essential, as suggested by Amal. This aligns with Thabet (2003), who explored patients view of wayfinding in Egyptian public hospitals. In his study, wayfinding means, such as you-are-here maps, were regarded as unhelpful. Due to the illiteracy rate and the stressful situation of being in a hospital, patients indicated that they do not have time and energy to interpret such maps.

Furthermore, most participants found the building to be unclean and disorganized (Samira, Amal, Najat, Mazen). Commenting on the soiled corridors and toilets, Amal stated: "it makes you very uncomfortable… The first time I came here was in the uncompensated [publicly-funded] department. It was a very difficult situation: very crowded, blood in the corridor, unclean toilets." Like the Australian participants, the Egyptian group expressed awareness of the treatment's effect on their immune system and how they become vulnerable to more diseases: "it destroys your body" (Amal); "the treatment reduces your immunity… The most important thing in my illness is immunity, if the space is not clean, I will be prone to more infection" (Samira). A clean space was therefore imperative to maintain a basic sense of safety and comfort (Mazen, Ali). Reflecting on his experience of another hospital in Cairo, Ali praised its clean setting and the distribution of hand hygiene facilities (e.g. hand-rub dispensers), highlighting how such provision not only supports the overall sense of safety but also allows patients, who are likely to become more hygiene conscious, opportunities to maintain other aspects of their own comfort: "when I see hand-rub dispensers in front of me, I sanitize my hands. I feel reassured and I benefit others as well" (Ali).

Combined with the unclean conditions of SECI building was the inconsiderate practices of cleaning (timing and carelessness) and the use of detergents that irritate patients' olfactory senses (Mazen, Samira). These, alongside food smells, instances of smoking within patient wards and poor ventilation, contributed to an unpleasant indoor air quality: "I just wake up now on the smell of food… A lot of people come and smoke in the corridors, they are mostly visitors, and the smell travels to your room. This behaviour should not be in hospitals in general, and particularly in this place," Samira stated referring to cancer treatment facilities in particular. Although smoking is prohibited in Egyptian hospitals, general observation points to loose enforcement of these policies in controlling such behaviour. Other treatment-related vulnerabilities, such as sensitivity to temperature, continued to be challenged by the condition of the space. Patients referred to the existence of air-conditioning units to regulate their thermal comfort (Amal, Ali), however being denied control over such facilities, despite being individual units within their own rooms, thus limiting the air conditioning benefits (Samira).

Within the treatment spaces, participants emphasized other conditions and personal needs to maintain a comfortable presence, particularly control over their privacy and exposure to other users of the space. Participants' consistent desire for individual treatment spaces can be understood in light of the conservative culture in this Middle Eastern region, specifically for women (Amal, Najat, Samira). However, others described reasons for privacy related to the particular conditions of cancer and what it imposes on patient's physical and emotional health. Patients' need to avoid being witnessed at their most sick or seeing other ill-looking patients (Mazen, Samira, Amal, Ali), averting interaction with other intrusive patients, and the tension triggered by their potentially distressing questions (Najat), as well as a chance to maintain a comfortable presence of patients' companions – their main support crew (Ali, Samira) were other examples of the reasons behind a preference for individual treatment spaces. Privacy was also important in facilitating less stressful communication with the medical team: "I feel embarrassed to share personal information in front of other people" (Najat). These reasons, alongside others (such as facilitating opportunities to engage in activities of interest and have a sense of personal time, Mazen), align with the Australian groups' experiences and point to how such needs, that emerge from shared illness-related circumstances, can demonstrate universal similarities even if occurring in substantially different cultures.

> *Mazen: Witnessing other frail patients can be devastating for you.*
>
> *Samira: I may get unwell and I do not want anyone to witness me in such a condition.*
>
> *Mazen: A patient sometimes does not want to be treated or feel as a patient… when seeing all the other patients around, without chances to close yourself in, it acts as a continuous reminder of the illness and why you are here.*

Even with the difficulties in affording private treatment rooms, participants still highlighted the importance of maintaining a less crowded treatment space: "two [patients] are fine" (Amal). "When there are ten patients in a room, everyone with their own needs and conduct, how someone would feel comfortable?" Ali wondered. Maintaining comfort through a sense of personal space was also essential for family members. As can be expected, participants referred to the importance of a companion on their treatment journey, specifically, for patients who come from regional areas. Ali expressed how the presence of companions supports patients and makes them feel psychologically comfortable, however he and others, such as Mazen and Amal, criticized the lack of thoughtful facilities to accommodate their presence both within the treatment spaces as well as the overall hospital building: "every patient has only one chair for relatives, needs more" (Mazen).

6.2 Aspiration for better design

Despite the extreme difference of hospital built conditions between the Australian and the Egyptian contexts, Egyptian participants shared quite similar aspiration for the space and continuously reflected on what an optimal experience should be like. Patients highlighted how considerate attention to the design of the space and its visual character could have contributed differently to their psychological wellbeing (Mazen, Samira, Amal, Ali). Design features, such as visual access to outside views, gardens and provision of amenities to occupy patients’ time, such as television and Wi-Fi access, were frequently stressed upon as potential contributors to better experiences.

Some of these aspirations stemmed from participants’ actual needs and the negative experiences that they developed within the current hospital; whereas for others, a chance to visit other advanced buildings shaped their opinions further. Mazen, for instance, described the condition of his room, with its drab colours and appearance, to be gloomy, depressing and not conducive to an uplifting atmosphere. Alternatively, a room with more attention to the aesthetic appearance and what patients see would have better supported his wellbeing. Amal further supported this view, referring to how thoughtful consideration of simple features such as colours can alter the whole atmosphere of the space: “colours give a pleasant atmosphere to the whole space.”

On the other hand, Samira and Ali had a chance to visit another hospital in Cairo named Hospital 57357. This is essentially a children’s cancer hospital that has been designed following contemporary architectural models established in western cultures (www.57357.org/history/). Although it is a paediatric-based hospital, some of its general services such as radiation therapy are offered to adult patients. Samira and Ali expressed how the design of the hospital building was impressive and gave them quite positive experience that they continue to remember. Like PMCC and BRICC, the spaciousness, furniture comfort, visual and detailed appearance of the spaces, access to outdoor gardens and the like, contributed collectively to an overall pleasant and reassuring experience: "these all boost the morale, you do feel comfortable, makes you do not want to leave the hospital… It gives hope” (Ali); “The design is very beautiful, I can’t describe it… it makes you feel comfortable… the design from inside and outside is incredible” (Samira).

Amal had a chance to attend another private health centre in Assiut, Egypt. These centres are predominantly developed through individual efforts, rather than by corporate healthcare providers, and their scale is relatively small (e.g. occupying one or two stories in a 1000 m^2 residential building of 12 stories). They generally pay some consideration to the design of their spaces; however, the design quality remains generally modest if compared to the sites explored in the Australian context. Despite that, when starting to reflect on the space of this private centre, Amal’s facial expressions were remarkably different to hers when considering the current SECI, and when asked why she seems to be contented when reflecting on that space she said: "indeed it is incredible, good smell, toilets very clean and well equipped. I get inside the room and found it fabulous, beyond imagination, I did not expect it to be like that; personal screen [television], personal table, small fridge, very beautiful… But also needs money, very expensive."

Another desired feature of treatment spaces that almost all participants raised was access to breakout spaces and how the design may afford opportunities to relax and break up patients' time in the hospital. Lounges, cafes, and worship spaces were examples of destinations that patients considered important for their wellbeing. Mazen highlighted how existing lounges do not provide any aspect of comfort, not just because of their rundown furnishings and poor ventilation, but also that their location mixes patients with general users of the hospital. Mazen aspired to a more patient-dedicated space, pointing out that: "it needs a level of privacy and seclusion from other public visitors," as lack of such makes him feel an outcast and increases his perception of stigmatization.

Other highlighted features desired for these breakout spaces was access to outdoor gardens. Samira stated: "the treatment itself makes you feel sad and annoyed; nature in general is calming and makes you feel better." Reflecting further if such space was provided, Samira noted that: "the presence of such outdoor space would make me love the place." Similarly, Amal said: "I wish there is a lounge, outdoor garden… It helps lift up patient's spirit; the treatment is hard… sitting on the bed all day is stuffy." In reflecting on a television program that Amal used to watch, where patients received treatment in a hospital that has outdoor gardens and quite modern facilities, she referred to patients' status in this program by the following: "you do not feel that you get chemo in such place" – considering such conditions as a dream for her.

Similar to patients' experience within the Australian context, access to outdoor spaces, as well as outside views, were considered important in the way they allow for a change of scenery (Mazen, Ali), counter feelings of being enclosed (Samira), counteract boredom and shift focus away from melancholic thoughts (Mazen, Samira, Amal). Mazen pointed to the inevitable tendency to overthink the treatment and its consequences, however if the place provides any aspect to distract, it can be of great help. Even a view through a window, as Mazen stated: "it is like a break, as if I went outside and changed the scenery." Such facilities would contribute to a more positive atmosphere rather than the existing gloomy and depressing one, elevating a sense of engagement (Mazen). It is worth noting that SECI has an outdoor garden space, however it lacks basic features that allow for comfortable presence, such as easy access and convenient seating.

Promoting engagement beyond treatment

Participants' comments pointed to other opportunities where the built environment may afford further aspects of support and engagement of patient time. Amal and Ali pointed to the lack of information and explanation of the disease, in which a space similar to the wellbeing centre at PMCC and BRICC may give patients a destination to acquire supplementary understanding of their illness. Stemming from her own needs and without being exposed to such opportunities, Amal expressed a wish to find services that promote such awareness, as well as spiritual support – a place and services where she can find people to enlighten her understanding of how to deal with cancer-related challenges, as well as reassure and calm patients down. Mazen also pointed to the importance of a healthy diet and his interest in finding advice on appropriate nourishment. Following further discussion with Samira about complementary therapies, she pointed to her knowledge of such services, specifically art therapy, however she hasn't tried it: "if it was provided, I would have definitely tried it."

These comments point to the type of complementary services for which wellbeing centres are established. Things such as individual consultation, group therapies and even self-reflection time align with the type of experiences that Amal, Samira and Mazen desired and point to the need for considering the inclusion of such services as well as the careful design of their host spaces. A design, akin to those in the Australian context, where considerate attention to the space qualities not only facilitated the function, but also gave the Australian participants a calming and welcoming atmosphere in which to dwell and be at ease – a space that, to some of them, related pleasant experiences that they looked forward to in the midst of their challenging hospital time.

Mazen's comments support this notion further. The primary topics that came to mind when he first was reflecting on the hospital spaces were relevant to how the building can afford engagement in different activities that might be of interest to his age group. Mazen was in his final school year when he was diagnosed with cancer almost a week before his final exams. His sudden diagnosis and the quick start of treatment turned his life upside down. The time devoted to treatment and other associated presence in the hospital prevented him from progressing with his life the way he desired. He referred to how the three years of his treatment did not contribute to any new skills that he should be gaining as a student at such phase of his life, rather it deprived him pursuing many hobbies that he used to follow. His sense of ambition gradually shifted from interest in studying and hope for bright future to just the ambition of getting out of the hospital.

Mazen pointed to how the space could have been set up to support some of these challenges by providing facilities such as study areas that accommodate for individual and group presence as well as other spaces where patients can develop fundamental skills for life such as learning foreign languages or computer skills. To him, these imagined settings have the capacity to change his perspective of the hospital from a place for diagnosis and treatment that is full of painful and negative experiences to a more pleasurable place to be in, describing it as a "break" place where patients can be entertained while getting on with their lives and feeling productive: "it will help patients love this place. A patient would feel that the hospital is not just a place to receive the treatment, rather a breakout or retreat place that I come to rest in during my treatment and gain benefits [e.g. educational progress]. The patient will not focus on the treatment that he/she is about to undertake, rather take potential benefit out of it. Instead of wasting my time, I am gaining benefits… Not a place that disrupt/disable my life, rather a place that I will progress through, and I will learn new things. So, I will start love coming here."

Interestingly enough, Mazen's thoughts align with the You Can 'ONTrac' Centre introduced at PMCC. ONTrac is a specialised, purpose-built, space within PMCC that integrates both dedicated treatment as well as support spaces for adolescents and young adults with cancer aged 15–25 years. Stemming from a realization of the specific needs of this group of patients and how cancer challenges not only physical and emotional aspects of their lives but also educational progress and future prospects for adulthood, PMCC, in collaboration with Sony Foundation, established this centre to provide better support to this group of patients during such crucial formative years of their lives (VCCC building, media releases).

Besides providing spaces for counselling, with healthcare professionals skilled in working with this age group as well as professionals who can guide school and career plans, the space offers a range of settings to meet the breadth of individual needs of this young group. This includes a lounge area with options for individual retreat in a series of small pods and booths where individuals can relax or study, in addition to collective spaces and a fully equipped kitchen where patients can engage in group activities. The space provides further dedicated areas for school and study as well as entertaining rooms with latest movies, communication and gaming technologies where patients can frame their time in activities that are not necessarily disease-related, rather promote a continuation of their life outside of cancer (https://www.petermac.org/ontrac). The alignment between young Egyptian participants and the youth initiative at PMCC points to the way built spaces can be established to support patients particular needs if designed with input from target population.

6.3 Personnel conduct and the overall atmosphere of care

Combined with the deteriorated conditions of the built spaces, hospital personnel and their conduct were frequently brought up as additional contributors to patients' prevailing negative experience. Participants referred to the crucial role that the medical and administrative teams play in their experience and wellbeing, with few reporting positive experiences and finding staff members to be kind, listen and have a degree of patience, while others encountering negative situations with some doctors as well as nursing, administration and other workers in the hospital.

The tolerance of the treating doctors in listening to patients' concerns was praised by Ali and Najat as a critical source of relief. In that, attitude of staff was important, not only for the way they provide care and treatment, but also in listening to patients' concerns. Even if medical staff end up listening without providing objective feedback in return, Ali still considered such chances critical to express and offload his concerns. Other participants were critical of staff conduct and found their behaviour contributing to a further negative atmosphere. Apart from their own treating doctors, Mazen and Samira expressed their extreme unhappiness with other medical staff and their patronizing conduct. They described their attitude as tough, aggressive and rude with little to no tolerance. Samira expressed how nurses do not respond on time, leaving patients between half to one hour before attending to their request. She used to send her companion several times to the nurses' station before getting any response. In one occasion, where she was experiencing shortness of breath, it took them almost an hour to respond and when they came, they started arguing and blaming her for not having patience. In another occasion, she observed a doctor inserting a cannula for a three-year-old child while continuously yelling at him as he was crying. It was indeed shocking – "instead of being kind and providing facilities to entertain kids, they deal with them with such an aggressive attitude” (Samira). Mazen experienced similar instances, not only from the medical team, but also from administrative people as well as cleaners, who once shouted at him.

Other negative occasions were relative to the bureaucratic system of the hospital and obstinacy of administrative procedures which added to the negative atmosphere and exhausted patients with unnecessary delays, as well as walking distances that caused them, sometimes, to miss their appointments (Amal, Mazen). As most patients come from regional and rural locations, a missed appointment not only delays treatment but also places additional travel burden on them. This left patients with extremely negative experiences that was further compounded by the rundown and gloomy conditions of the hospital spaces – “generally, the patient should not worry about anything once he/she arrives to the hospital, but the fact is that the space and the service overwhelm patients with many secondary issues,” Mazen stated.

6.4 The built space and patients’ psychological wellbeing

Egyptian patients constantly referred to the importance of psychological wellbeing for their healing process (Mazen, Samira, Amal, Ali) – “the treatment is essentially psychological, if I am not psychologically well, there is no need for it. Now if you come to eat and you are angry or upset, will you eat? you will not feel like eating even if you are hungry, same for treatment,” Ali illustrated. He further explained: “for instance if you go to a doctor and he tells you, you’re going to die, go home; that's it, he destroys you. Even if you have hope to live, you will lose it. But if you provide hope, you can tolerate everything, and when they bring treatment you take it. But without hope, I will not take anything… If I am not psychologically well, I will not accept the solution [treatment].” For that, staff kindness, in addition to an overall positive impression of the space, were highlighted as opportunities to give patients a much-needed sense of hope and reasons to hold to the treatment. Ali, on his short experience of 57357 hospital stated: “the facilities help you accept everything and the place there help you feel that positive. You say, oh God, I want to be in that place, even if a better care is provided here [at Assiut’s hospital] but based on what you see [referring to 57357 building], your spirit will be more comfortable there.”

Most participants agreed on the negative impressions of the built space and how the building, alongside other aspects of care, are not conducive to a positive mindset: “the overall atmosphere does not facilitate any level of psychological comfort, rather it triggers a state of depression" (Mazen). During the interview, Mazen wondered several times how doctors advise him (and most other patients) on the importance of their psychological wellbeing for a successful treatment, while in the meantime, patients did not find anything conducive to that in either the building and its spaces or staff attitude. Mazen, on the significant role of the built space, continued: "I considered this place, one of the days, as my second home; and for it to be my second home, it needs to be prepared so that I can feel comfortable within it. I stay in with a degree of psychological comfort. As I maintain my comfort at my home, I need to do the same here. But I can't find any comfort here. I just want to escape the place by any means. I want to go out of here and that's it. But if there was any of the things that I told you about [re space qualities and facilities that allow different levels of break up and engagement], my perspective would have changed… I would occupy my time better as well." However, the reality is that everything surrounding him was nurturing negative thinking and allow it to flourish: "at the end of the day everything is written, but Allah [God] asks us to make use of all available means and do our best as far as we live with the hope that things change, but if I judge on the things provided here, everything will put you down, it leads you to death! they destroy me more and more," Mazen further narrated.

Participants comments point to how an overall positive atmosphere, through both caregivers and the built space, can help patients' psychological wellbeing and give them reasons to hold to the treatment, whereas a negative experience of any aspect of their time in the hospital may build-up distances that risks patient compliance. This was clear through Samira's as well as Mazen's expressed experiences. In reflection, on her experience coming to the hospital, Samira stated: "every time I had to come to this place I request and appeal to Dr. XX not to come, please I do not want to come here, and her response is that I am so sorry, but there is no way around, you have to come." Samira highlighted how the condition of the space as well as attitude of some staff members made her feel bad and develop negative experience that build up a barrier between her and the place to the extent that she pleaded to her treating doctors to allow her not to return to this hospital in particular and get the treatment in one of the private health centres that she used to attend. However due to her health condition at specific stages of the treatment, her doctors advise her to go to the main hospital as the one and only option to deal with her sophisticated condition.

Mazen, who was immensely upset with the building and service, highlighted how the deteriorated condition of the space and lack of facilities that may motivate his presence, in addition to the bureaucratic process, long walking distances and waiting time, made the experience even harder and drove feelings of not being willing to come back to the place: “with the deteriorated conditions that I see here, I delay and postpone medical appointments as I do not want to come here.” He further explained how this contributed to a negative experience that may have affected the overall progress of his treatment: “I got a period of time where I did not want to come here, I can show you most of my papers, I tore them apart, I used to hold and break my medication. Why? because my life became all treatment, treatment, syringe, cannula, I hated all that. But as I tell you, all these qualities of the built environment, if they exist, may help one overlook and forget a little bit.”

Potential differences between older and younger generations

The Egyptian patients’ experiences are extreme in comparison to those of the Australian patients, but they point to the importance of the built environment in patient perceptions of their treatment. Although they had not all experienced them, the Egyptian participants considered the kinds of support spaces and facilities that promote a sense of comfort and safety as well as support their emotional wellbeing through opportunities to relax and break up patients’ time in the hospital as immensely important, preferring them in some instances over the higher level of treatment capacity available in the public hospital. Aversion to the poor quality of spaces, and lack of support, provoked some patients to delay or avoid their treatment.

Egyptian public hospitals are generally recognized as having low service quality, with inhumane and humiliating treatment of patients by medical and staff members (Thabet, 2003), as well as shortages in prescribed drugs and medication (Gadallah, Zaki, Rady, Anwer, & Sallam, 2003). Besides participants’ reflections on incidences of inhumane conduct, some patients also brought up the latter medication issue. Mazen mentioned that patients, many times, needed to buy their own medication. Ali also highlighted that patients in need of blood transfusions are required first to find donors by themselves. With such shortcomings, it was expected that Egyptian participants would consider the built environment of a secondary importance, if not trivial, given that essential aspects of care are below standards.

Although it was remarkable to observe the close alignment between Egyptian participants’ aspiration for better healthcare environments (how they envisioned the way spaces should be designed and set up to meet their experienced needs) and the Australian contemporary buildings, it is worth noting that these aspirational views were mostly reflected by the younger group of participants in Egypt. Four out of the six interviewee were below 30 years of age. The older generation, represented by the other two participants (Najat and Rahma), were the ones whose experience, and views, lined up with the latter mentioned anticipation where they did not seem to consider the built environment to be crucial to their care.

Najat and Rahma showed a general acceptance of the built environmental conditions and were not looking for much improvements, apart from having basic physical comfort in the space. In that, Najat indicated that she was not paying much attention to the building, as just finding the medication and care that she is after was the most important thing for her. This was also apparent in the comments by Rahma, with whom the interview was held in the waiting space of the public (free-of-charge) sector of the building. SECI offers two models of services: private and free-of-charge (publicly-funded) services. The private sector occupies two levels of the building and is set up as individual rooms that accommodate either one or two patients, whereas the free-of-charge sector is generally based on shared treatment spaces. Both services share the general areas of the building, such as the entrance, circulation, etc.

At the time of the interview, Najat and Rahma were receiving their treatment within the public sector. The waiting space, where the interview with Rahma was conducted, exhibited very noisy conditions at the time of the interview. Workers and cleaners were rearranging the chair positions in a very inconsiderate and insensitive way to patients’ presence. They even forced patients to stand up while they did the rearrangement. With these circumstances and the rundown conditions of the space, the atmosphere could be described as extremely annoying and upsetting. Despite that, Rahma was superficially accepting of the situation, indicating that: “in another place we may not even find this [referring to the current condition of the space].” When asked about the surrounding extreme noise in particular, she stated in a defeatist and despairing mood: “you will never change these people’s attitude, they are like that.”

It is worth noting too that all participants of the study were on a same day treatment model of care, however they all had previous experiences of being admitted to inpatient units in the same hospital, so their experience might be mixed between these two settings. Furthermore, given that the private sector has individual treatment rooms set up similar to inpatient units, patients on same-day care are allowed to stay overnight if their treatment started late or they felt the need to do so (e.g. coming from a regional location). Some of the participants' treatment protocol was also extended across two consecutive days (Samira), in which patients continued to occupy the same room rather than travelling back to their regional city. In such situations, or in the consequences of delayed preparation of the treatment or administration procedures, patients who received treatment in the public sector are forced to leave and return another day, which was an experience that Amal went through on previous occasions.

6.5 Concluding remarks

Egyptian participants' experiences, as outlined in this chapter, highlight the importance of the built space in supporting patient wellbeing and conveying a sense of hope – potentially encouraging reasons to return. The lack of such level of support contributed to a relatively negative experience that showed incidences of refraining from returning to the hospital. Participants' overall reflections on the space were split between negative impressions of the existing conditions and aspiration for spaces that hold thoughtful supportive architectural qualities. In that, most experiences aligned with the built conditions provided in the Australian contexts, however as experiences that patients' desired, rather than being actually met. Egyptian participants highlighted other issues related mostly to the main pillar of healthcare organizations – the staff and medical team. Participants were generally satisfied with their treating doctors, however some of them experienced negative incidents relevant to the conduct of the nursing team and other staff members that compounded the negative experience they had with the space.

In the following chapter, the results of the Australian and Egyptian interviews are discussed in further depth, highlighting the potential distinctive role of healthcare built environments in supporting patient experience and the extent to which it may influence patient satisfaction and wellbeing. The chapter also reflects on the importance of the emotional wellbeing in cancer patients' experience and the role of the built environment in complementing a comprehensive level of patient support.

Chapter 7

Discussion of the interviews

Drawing on the interviews conducted for this thesis in Australia and Egypt, this chapter summarizes the role that the built environment plays in supporting patient experience and discusses the findings in light of the available literature. Drawing on the potential latent or implicit signification of patients narrated experience of the built environment in both the Australian and Egyptian contexts, the chapter further attempts to respond to the **second research question** (what impacts do different healthcare environmental conditions have on patients' satisfaction, wellbeing and other health-related outcomes?) by highlighting the distinctive effect of the built environment and elaborating on the extent to which the built space may affect patient wellbeing and other health-related outcomes, such as pre-treatment anxiety and compliance with treatment. It does so by discussing three themes, including: the capacity of the built environment to contribute to positive memories; balancing the unavoidable presence in the hospital; and encouraging reasons to return.

The notion of comprehensive patient-centred care and the role of the hospital built environment in complementing such an approach is also considered, responding to the **fifth research question** of this thesis (to what extent is the physical environment in outpatient cancer facilities conducive to a climate of patient-centred care?). A selection of patient quotes are reused in this chapter to point to the topics that will be discussed in the following paragraphs. Two further areas are discussed including: the contribution of the built environment in promoting a sense of normality; and the idea of intentionality in design and how architects' empathetic consideration of patients' circumstances may result in better translation of designs that communicate supportive messages.

7.1 Leading roles of hospital built spaces

7.1.1 The built environment and first impressions

Cancer is one of modern life's most dreaded diseases. The impact of such a diagnosis on an individual and their family is deeply complex: the diagnosis and subsequent treatment disrupts almost every aspect of patients' lives, including day-to-day activities, work and social life, financial conditions, personal relationships, and self-independence, just to name a few

(Department of Health and Human Services, 2011a). Its treatment imposes further physical and psychological challenges where patients are likely to lose aspects of good health: experience changes in appetite, changes in memory capacity, mobility and bodily appearance; become prone to abnormal fatigue; and endure substantial stress and anxiety. As noted from this study's participants' own words, cancer diagnosis prompts a sudden feeling of being cut off from most people, turning a healthy person to a patient overnight, in dealing with a sombre 'life/death' situation. It is no wonder why an unprecedented sense of vulnerability, loss of control and fear of the unknown is commonly associated with a 'cancer experience'. With complex medication regimes and the 'counter-intuitive' toxic reality of a treatment such as chemotherapy (besides its widely known deleterious effects), a visit to a cancer hospital by a patient can be tremendously stressful, particularly the first visits.

"for what is a pretty awful time, it was just had a quite a different impact"
"it enables you to feel confident and comfortable"
"I do feel comfortable coming here and I didn't think I would"

The considerate design of the investigated hospitals' building within the Australian context not only shifted participants' expectation of a traditional hospital space as drab and dull, but more importantly conveyed a powerful, welcoming and calming message, that things can be alright. It gave patients a crucial feeling of reassurance, helping to alleviate the inevitable worries and fears associated with a visit to such place, particularly for patients' first time at the hospital for treatment. A major contributor to such impressions was the deliberate intention to design a place that contrasts with the expectations about a traditional hospital space, in other words, to create a place not recognized as a hospital. Thoughtful integration of key architectural qualities, such as a generous central atrium with abundance of natural light bouncing throughout the space; consideration of non-traditional colours, finishing materials, artwork and background music; and even the precise functionality of the space where everything is in its place and staff do not scrounge for space and resources, contributed collectively to such a tranquil atmosphere.

Another stand-out design characteristic was the consciously architectural approach of the atrium space's shape and appearance. The striking geometric form of the atrium space and its soft "organic" curves at PMCC ("not all straight corridors") and the reinvigoration of the historic building at BRICC contributed to a strong visual character of the space that further impressed, as well as inspired visitors. Participants' invariable reflection on the role of the architectural form and spaciousness in shaping such an uplifting and peaceful experience supports Van der Linden's recent postulation of the importance of such design aspects to patients' wellbeing. As discussed in the literature review in Chapter 2, in their study at one of the Maggie's wellness centres in the UK, Van der Linden et al. (2015) explored patients' opinions of what a healing environment entailed. Unique and non-traditional forms were regarded as important for such a concept in the way they provoke both relaxation and stimulation, rendering an "energizing" atmosphere that "inspires and plays on one's imagination" (as stated by one of Van der Linden's study participants). Spaciousness, that accompanies such architectural approaches, was also highlighted in other studies as a main component of a room's physical attractiveness (Pruyn & Smidts, 1998), where lack of such has been linked to perceived crowding and potential environmental stress (Stamps III, 2007). It has been further described by hospitalized cancer patients as a source for 'maintaining positive thoughts' (Timmermann et al., 2013).

Although the investigated hospital (SECI) in the Egyptian context did not carry similar spatial qualities, participants who had the chance to experience other advanced healthcare settings in Cairo referred to comparable experiences, when first visiting the place, to those outlined at the Australian context. The design of the entrance space of 57357 (the other hospital they attended in Cairo) with the considerate details of its visual appearance and its relative spaciousness, contributed to a rather pleasant and reassuring experience different to the experiences they had at Assiut's hospital (SECI). It is worth noting that the apparent similarities of patients' positive experience of the geometric forms at both PMCC and BRICC, despite their different design approaches, as well as the comparable experience of the Egyptian participants at the other contemporary setting in Cairo, encourages rather than limits architects' creativity. It suggests that it is the thoughtful exploration of unique visual characteristics of the space that has the capacity to inspire and stimulate patients' minds, that is important, rather than limiting design to a specific form or appearance.

Drawing on the language of streetscape and urban town squares, the atrium space, at the Australian hospitals, blended activities by integrating settings such as cafés, unique seating spaces (e.g. low walls for seating and public art at BRICC) and amphitheatre steps (at PMCC). This design approach facilitated ordinary, everyday, scenes to take place within the hospital setting, making the space more familiar, less intimidating and adding to the less hospital-like atmosphere that their unique architecture encouraged. Participants sense of an overall uplifting experience was further extended and supported throughout the hospital building by the inclusion of other ‘unexpected’ spaces, such as the rooftop garden and the wellbeing centre. Their thoughtful design gave the spaces, in some instances (e.g. in the wellbeing centre), a familiar, home-like, experience that made participants feel less like a patient: “[it] doesn't speak to you like you're a patient” (Margaret, BRICC).

The deliberate approach of eliminating aspects, or signs, of traditional hospital design, as well as balancing the medical-related presence, was important in shaping patients first impressions and rendering a desired welcoming and calming atmosphere – helping to alleviate the inevitable worries of the imminent clinical procedures. Design qualities that pay considerate attention to aspects of human-centred design principles and begin from a position of empathy with how patients feel, encouraged users of the space to feel immediately comforted, as conveyed by most participants. Here, the term ‘comfort’ is used in a sense that does not mean it’s a place where patients like or want to attend, rather that it eases the aversive and overwhelming situation, contributing to a less alienating experience and making it “a much lighter place to be in… if you have to be sick” (Imogen’s Mother, PMCC); “… so that's nicely calming, if you really don't want to be there” (Catherine, PMCC).

Unlike the outcomes of the review in Chapter 2, participants of this study did not refer much to the design of the hospital environment as a ‘home-like’ except for the wellbeing centre at BRICC. Instead, the focus was on how the space was designed to look less like a hospital, with a non-institutional-like impression, which rendered the experience rather comfortable and calming. The incorporation of aesthetically pleasing environments and the use of features that can be described as domestic or familiar, that individuals encounter across different aspects of their ordinary life, was the leading reason of why such a design approach conveyed positive feelings or impressions compared to traditional hospital settings that are generally dominated by a clinical and sterile appearance. Even though these contemporary approaches in the design of hospitals are not explicitly similar to home, the concept of feeling comforted, safe and relaxed is similar to what someone expects from a home experience (Coyle, 2004; Seamon, 2000; Timmermann et al., 2015), and may have been the reason that drove some patients to describe it as home-like experience. As suggested by Timmermann et al. (2015), the importance of knowing and being in a space that holds familiar features can be comprehended through Christian Norberg-Schulz’s phenomenological theory on the meaning of home and dwelling (Norberg-Schulz, 1985). Through knowing and belonging to a place it becomes possible for individuals to dwell and find an existential foothold. The ability to dwell is also linked to the ability to orientate within an environment and experience it as meaningful (Timmermann et al., 2015) which, to an extent, was the common factor for incorporating domesticity into design approaches in the investigated Australian hospitals.

Studies in curative oncology settings point to patients' deliberate conduct in avoiding reminders of their 'illness and vulnerability' including conscious efforts to avert specific behaviours or situations (e.g. avoid weighing themselves regularly, disregard potentially distressing discussions) (Baker et al., 2016). Participants' accounts in this study point to the role of designing a less hospital-like atmosphere in giving patients additional opportunities to maintain such a desired position. It does not mean that patients will become unaware of or forget about their conditions, rather it helps patients to overlook them for a little bit: "it wants to be a place that is not constantly reminding you of the why you are there," rather incorporating "something pleasant to look at or engage with rather than something that is just a reminder of the condition that you are unlikely to forget" (Patrick, GICS).

The reassuring experience was also critical when first walking through the chemotherapy space. Being exposed to ill-looking patients with their potentially pale and hairless appearance can add significant stress to an already anxious situation. Such an encounter is, in fact, quite confronting as it may challenge patients' potential hope to get through the treatment and survive, as indicated by some participants. The day therapy space was considered clinical and daunting for participants, due to its inevitable treatment producers and medical-related presence. However, according to participants, basic architectural interventions can moderate such dominating perceptions. The integration of big windows and the breakup of the clinical atmosphere with thoughtful use of non-traditional materials, colours, and even wall angles, were prominent in patients' comments about balancing such an atmosphere. The configuration of the spatial layout that allows the grouping of new patients in segregated zones, away from patients who have already started their treatment, is a further, reasonable, way to avoid additional stress during patients' initial treatment sessions.

7.1.2 The role of opportunities to break up the intensity of the treatment day

Participants' positive impressions when they first walked through the hospital building can be further comprehended in the light of Ulrich's theory of supportive design. A major role of a supportive healthcare environment, according to Ulrich, is to foster coping with stress through design strategies that promote wellbeing. Besides facilitating access to social support and patient control over the physical-social surroundings, the capacity of design elements to positively hold attention and stimulate patients' minds is considered a core quality of such supportive design. It is through this stimulation that the environment may elicit positive moods and feelings; as Ulrich defines it: "a positive distraction is an environmental feature or element that elicits positive feelings, holds attention and interest without taxing or stressing the individual, and therefore may block or reduce worrisome, thoughts" (Ulrich, 1991).

Despite pointing to some distraction moments, participants' narrated experiences of when they first walked through the building further suggests a dominant emotional component that connects to the spirit over mere distraction in the patient's mind. This 'emotional connection', as labelled by some participants such as Cameron (PMCC) and Margaret (BRICC), was considered one of the most important overarching atmospheric qualities that a hospital space needs to realize through its architectural design. This emotional connection to the design promoted an overall sense of support and helped patients feel comfortable and different to what they had anticipated: "I think probably the emotional connection, first as something that is, it does give a sense of supporting and I guess calmness and, yeah, that was the thing that I was trying to describe when I first walked in, wow, this is such beautiful, it's amazing" (Cameron, PMCC).

Most studies reduce positive distraction to its role as a mental stimulator that helps divert focus from illness-related thoughts (Devlin et al., 2016; Nanda et al., 2012; Pati & Nanda, 2011). In this thesis, participants' wide experiences, from feeling inspired and captivated by the atmosphere of the place to an instant sense of welcome, calmness and reassurance, suggest that it is rather difficult to fully comprehend the mechanism through which design promotes wellbeing as mere consequence of positive distraction. Even though the architectural elements of the space contributed to moments of direct positive distraction, they still held that distinctive role of captivating patient emotions and being features that patients admire in the first place – through which, feelings such as welcome, comfort and reassurance seems to occur. Whether one comes before the other is quite challenging to postulate and requires further research to interrogate, as the current results suggest that it is rather a more interrelated relationship.

This position aligns with precedent studies that define patient response or satisfaction with a space as the combination of affective and perceptual/cognitive evaluations of the setting (Dijkstra, 2009; Zineldin, 2006), with the two being highly interrelated (Russell & Pratt, 1980). The former is delineated as the emotion-inducing quality (feelings or attitude) attributed to an environment or object (Russell et al., 1981), which can be semantically represented by adjectives such as lively, boring, and relaxing (Russell & Pratt, 1980) or as described by (Andrade et al., 2012) as the degree of pleasure or arousal of an environment. Whereas the latter is related more to the way things are cognized – modes of categorizing the object qualities (Russell et al., 1981). Examples include judgment of a place's level of attractiveness (Andrade et al., 2012) or ambient conditions such as the level of quietness, thermal comfort, and cleanliness (Russell et al., 1981). In this categorization, the affective or emotive component is believed to be the initial level of response to an environment – "the direct emotional impact of the situation" as defined by Ittelson (1973), followed by the cognitive appraisal of the space (Dijkstra, Pieterse, & Pruyn, 2006; Ittelson, 1973; Russell & Pratt, 1980).

That being said, participants' overall reflections on other instances in which the built environment facilitated diverting focus and blocking worrisome thoughts reinforces the importance of such experience in supporting patient wellbeing. Besides the relatively short moments of distraction at patients first encounter with the hospital space, two further unique distraction moments occurred across other spaces. These instances, in which the built environment clearly contributed to diverting patients' focus, can be summarized relative to the architectural qualities as follows: i) components of the built space that are relatively static (interior design features); ii) components that expose patients to motion and change of scenery; and iii) components that allow for physical detachment from the treatment space and other hospital-related clinical procedures.

> *"when you are in a really nice space it takes your mind off your troubles a little bit."*
> *"even if it distracts you for two minutes while you walking to become a patient in here, that is a warm feeling."*

Visual attributes that are of a relatively static nature, such as interior architectural forms, artwork, colours, and furniture, provided concrete opportunities for visual and mental engagement besides their dominating role in rendering a welcoming and reassuring atmosphere. Participants expressed how such features regularly caught their eye, affording 'moments of exploration and reflection'. Such features also constituted topics for discussion with patients' companions and provoked engaging in activities such as photographing. Even though such instances of explicit distraction were modest, participants regarded them as helpful in providing valuable opportunities to forget about their presence in the hospital, even for a short period of time. The distraction moments were also not exclusive to patients' first visit, but rather allowed opportunities for engagement across various visits.

"… it's important to be able to see out and therefore you can forget about what's going on…"
"it would have relaxed me more… it puts you back into the real space, rather than this surreal space."
"can make you feel a whole lot better"
"otherwise you feel enclosed"
"… you don't want to feel further contained and confined."
"sense of life… that's life and there are stuff going on the outside"

The other profound and invariably highlighted level of distraction was the one in which the built environment facilitated opportunities for patients to observe outdoor motion and change of scenery. In that, views to the outside world were extensively stressed and appreciated. Provision of 'large' windows within the treatment space, besides contributing to a less-alienating impression when first walking through the space, acted as an important source for positive distraction every time patients came for infusion treatment. It stimulated their minds to briefly escape the contradicting reality of the treatment – mitigating feelings of being confined to the treatment chair and alleviating boredom of lengthy infusion sessions. Similar experiences were narrated by Egyptian participants, however these were as desired experiences that a presence of thoughtfully designed window, as well as outside access, could have afforded. Although the Egyptian setting included windows, their scale, position and orientation were not in favour of good views or connection to the outside.

Views to the outside, particularly nature, have been regularly identified through various studies as an important source of positive distraction (Malenbaum et al., 2008; Raanaas, Patil, & Hartig, 2012; Ulrich et al., 2010). Likewise, viewing nature was highlighted by participants alongside other street-related views. What appeared to be essential, over the type of view, was the notion of a 'connection to the outside world'. The potential feelings of being cut off from most people was symbolically mitigated by such a connection. It encouraged a calming, peaceful and comforting feeling by taking patients away, metaphorically, from the artificial or unnatural environment they find themselves in and bringing them back to the real world. Such a connection to ordinary life was influential in prompting a sense of 'normality' in situations where every aspect of patients' normal life is disrupted. It is therefore not surprising as to why windows were constantly stressed as an imperative feature when participants were asked to name three of the most important design qualities that a treatment space needs.

"… But if you can break that up, it doesn't feel so bad"
"… But the concrete walls have been taken away from you and you feel that little bit eased"
"… just to move away from it and then when you're ready come back"
"… and it's good to be away from the general run of things in hospital"
"… go and experience that and appreciate a lot more is going outside"

The ultimate level of distraction facilitated by the design of the hospital spaces was through the chance for patients to break up their treatment routine and access spaces that are not necessarily about 'sickness and being a patient' but rather promote 'health and wellbeing'. Intermediate spaces within the treatment area, such as a lounge and kitchenette space, as well as other spaces across the hospital building, such as the rooftop garden, cafes, chapel, and the wellbeing centre, provided opportunities to physically escape the intensity of the treatment day and detach for a while. The presence of such facilities sparked motivation to go for a walk and break up the clinical routine – they gave an "excuse" to attain a desired sense of escape at times of feeling overwhelmed. They also constituted alternate resources to counter the feeling of being stuck in the treatment chair, as well as occupy potentially long waiting times, thus contributing to a sense of independence and freedom.

A key source for detachment was promoted by the presence of the rooftop garden at PMCC. The stimulation of the garden as a multi-sensory experience, including visual as well as olfactory and auditory senses, was what distinguished such a feeling of escape, in comparison to other indoor destinations or even a window view. Its grounding nature that, again, connects patients back to real life, promoting a sense of normality to balance the artificial clinical routine. It gave patients an appreciated opportunity to unwind, rest and nourish their spirit with options to relax and recharge. No one wants to be in a hospital with such illness, however, when it is a fact, such spaces and features of the interior design ease patients' feeling about their presence so that "it does not feel so bad" (David, PMCC).

The provision of varying levels of stimulating architectural features, from the static to others that facilitate opportunities to mentally as well as physically escape the treatment, demonstrate the significant support to patient experience that thoughtful design can provide, as lack of such may leave patients with significant focus on their inherent worrisome thoughts, leading to further stress. Participants' narrated experience of different sources of distraction in a hospital space, as well as the distinctive role of each source in enriching their experience, complements Ulrich's theory of Supportive Design with further in-depth and detailed understanding of the various design strategies through which the built space may realize such beneficial experiences for patients, as well as their companions. Ulrich's 1991 theory was intentionally broad, subsuming various patient-related experiences and needs, and was not claiming to be comprehensive (Ulrich, 1991). The themes arising from the discussion of patient experience of emotional connections and mental distraction of architectural elements give further understanding and depth to Ulrich's approach.

7.1.3 Places of interest within places that you are compelled to be in

"… it's something to look forward to, when you are here for a long time"
"it's actually quite a pleasant experience"
"it's interesting that people get quite attached to the place and feel…"
"it becomes a bit like a second home"

The provision of thoughtful breakout or retreat spaces left patients with positive and pleasant experiences that rendered such spaces as resources of interest that patients looked forward to despite being part of a larger unfavourable or disliked place – the hospital. The unique design of the rooftop garden (at PMCC) and the incorporation of café spaces as well as other setups, such as corners and alcoves that cater for varying user preferences, facilitated wide range of opportunities to engage in different activities of interest (e.g. meeting with family members; reflection time). The wellbeing centres were similar in the way they were designed and staffed to encourage patient to connect, both alone or in groups, and seek wellness-related support from experts, volunteers and people with similar experiences. The design of these spaces, with tailored setups to meet individual and group demands (such as relaxation opportunities around the fire place at BRICC, individual sleeping and consultation pods, and more communal spaces within the open kitchen at both Australian hospitals), contributed to them being preferred destinations by patients and their companions as well as useful sources to engage in planned and spontaneous activities of interest that allowed patients opportunities to offload their concerns. Patients felt comfortable in such spaces and most prominently less like a patient which was the reason for such as a space, like the wellbeing centre, to be described as a second home. This was apparent at BRICC where the manager of the space, according to one of the participants, pointed to how commonly patients expressed a sense of attachment and belonging to that place which induced some of them to keep an active connection with the hospital even after finishing their treatment. This was the case for Michelle who continued to volunteer at the centre following the end of her treatment.

Such spaces did not exist within the Egyptian setting, yet were nominated by participants as desired spaces for opportunities to relax and break up their time in the hospital. Outdoor gardens, lounges, cafes, and worship spaces, alongside spaces tailored to a younger population that afford engagement in activities that are not necessarily disease-related (e.g. studying, learning fundamental skills such as foreign languages or computer skills, support information and spiritual needs) were considered helpful in turning the hospital space to a more pleasurable place to be in – participants describing the potential existence of such facilities as resources to start loving the place (Samira; Mazen). That being said, where such spaces did exist, finding ways to communicate their existence (such as noticeboards, digital displays, or brochures) so that patients become aware of their presence at the start of their treatment, was considered important by many participants who found it hard to easily find or know about these supportive spaces and services, particularly at PMCC.

7.1.4 Avoiding intensifying inherently stressful situations

Another major way in which the built environment can promote aspects of support was predominantly related to increasing levels of personal choice and sense of control, which helped to avoid conditions where a patient could be overcome or frustrated by the built space. While striving to design spaces that promote wellbeing to alleviate the burden of illness, the designers of healthcare facilities should also be considerate of avoiding unnecessary obstacles and environment-related conditions that are uncontrollable and can be themselves stressors, such as exposure to undesired noise, TV content or unwelcomed social interaction. A lack of control over a specific event per se, rather than the event itself, could be the major source for experiencing such stress or discomfort (Sherman-Bien et al., 2011; Varni et al., 2004; Veitch & Gifford, 1996). Music, for instance, as Evans and Cohen (1987) described it, can be perceived both negative and positive depending on the source (e.g. traveling from a neighbour place vs personally played) (Ulrich, 1991). Availability of options to control aspects of the surrounding environment, both ambient and physical, may give patient the ground to tolerate a specific condition that might be rather annoying.

Cancer patients are prone to particular treatment-related vulnerabilities. Chemotherapy confronts patients with unique challenges ranging from potential change in appearance, unusual fatigue, reduced physical capabilities, and aversive anaphylactic reactions, to altered sensitivities to odours, temperature and noise. Such challenges are stressful not only because they are uncontrollable, but also because they can be intensified by poorly designed spaces. By being sensible to such vulnerabilities, the built environment can play a complementary role in alleviating some of these stresses.

"they've got hair loss, they feel sick, they're anxious, and they need to, they need to feel comfortable and not looked at"
"I don't want them to be looking at me if I'm unwell"
"… it's a little bit like you're on show and everyone's coming through"
"… as long as there's a bit of space so that people aren't cramped"
"you kind of, [at] different times you want both things, one or the other I mean"

For instance, privacy options at both the treatment space as well as waiting spaces can give patients a needed sense of control to self-regulate interaction with others. Such choice was important for patients whose outlook is affected by the treatment (e.g. hair loss) or felt sick and wanted not to be seen at their most ill. Potentially negative reactions to the treatment, specifically during the first session, were one of the main reasons for some participants to be conscious of wanting such a private space. During that first treatment session, an option for privacy was also considered significant, to avoid being exposed to ill-looking patients or potential emergencies of the shared treatment space that can add significant tension to an already anxious situation. A choice for privacy was also desirable for patients who wanted to engage in personal activities of interest or maintain a close presence of their companions. Similar reasons were attributed by Egyptian participants as reasons for requiring individual treatment spaces, with the conservative culture of the Middle East adding to such demand, specifically for women.

Other participants, within the Australian context, did not mind a shared space, finding it positive in facilitating opportunities for social interaction as well as maintaining a sense of spaciousness compared to being confined to smaller spaces. However, a dedicated personal space within that shared room, one that is not overly close to other patients, was considered essential by all participants. Patients strongly criticized conditions of being cramped in spaces with repeated rows of treatment chairs; rather preferring small groupings (between 3 to 6 chairs) with basic options for privacy, such as curtains, when needed.

Patients’ diverse and sometimes changing needs, based on the treatment day, suggests the importance of considering varying levels of privacy in the design of treatment spaces to meet patients’ preferences depending on their health status and ability to interact (Bisschop et al., 2017, Rowlands & Noble, 2008). An obvious solution is to provide just single treatment rooms, but (according to participants’ experience) it is also possible to maintain a choice of levels of privacy through other design features such as arrangement of chairs into small groupings; the capacity of changing the chair’s orientation away from the central activities of the room; the use of partitions and furniture that allow a level of adjustment to the space to be relatively private; and provision of private room options for critical conditions and communication of sensitive information. These elements can facilitate alternate options to meet patient desires and overcome the economic challenges (high expense) of providing entirely individual treatment spaces. Patients’ potentially heightened stress and need for privacy for their first treatment session raises another design challenge to minimize encounters with frail patients. Besides the role that staff can play in making considerate allocation of new patients, designing distinctive zones within the treatment area for new patients, in addition to increasing choices for individual treatment rooms, can provide reasonable solution for such conditions.

> *“you're coming into a place where people haven't got any immune system… Yeah and it's got to be kept clean”*
>
> *“everything is immaculately cleaned and perfectly finished”*
>
> *“… which means frequent visits and there are toilets everywhere and it's fantastic”*

Patients’ potential treatment-related somatic challenges such as pain, nausea, fatigue, sensitivity to smell and temperature as well as changes in their physical strength and immune ability highlights other areas in which a sense of control can be either fostered or undermined by the design of the built space. In the investigated Australian hospitals, the ambient environment was relatively successful in satisfying comfort for patients’ senses. Indoor air was usually perceived as fresh, with some reported conditions of discomfort related to temperature and positioning of air-conditioning vent fins relative to the treatment chair. Minimizing the need to touch potentially contaminated surfaces and objects, such as lift buttons, and maintaining an immaculately clean environment was also a key concern for immunosuppressed patients and conveyed messages of safety to patients who are likely to develop a high level of hygiene consciousness. The design of the hospitals’ buildings was also regarded as effective in providing an abundance of and easy access to toilets across the hospital spaces, which for some patients is a treatment necessity and they regularly visited toilets during their treatment session.

"it's very difficult to tell one level from another"
"unless you go around you might do not see the signs"
"but the signage is very small and quite inconspicuous"
"the Day Therapy is kind of a rabbit warren"
"It's not obvious that, someone who is maybe mobility impaired or tired or sick can go the shortcut"
"for me as a patient there is enough going on… I think the last you need is more drama to the way you trying to get to"
"a few extra steps makes a hell of a difference… you want to go the most efficient way… if you are hooked-up and having chemo, you do not want to be doing those 10 extra steps to find them"
"… because often people don't have much energy"

Within the Egyptian context, as can be expected, the conditions were predominantly the opposite to the Australian hospitals: most participants experienced a general sense of discomfort and found the building to be unclean, disorganized and exhibiting poor indoor air quality. Physical comfort, in particular, was not supported at most levels of the space design including the deteriorated conditions of the furniture and the relatively long walking distances, exacerbated by a bureaucratic system of processes patients and treatments and an ineffective wayfinding system. Patients' vulnerability to different sources of fatigue implies the need for special attention to maintain a comfortable presence in the hospital. Considering patient fatigue extends from providing convenient and comfortable furnishing to supporting mobility and effective wayfinding in order to eliminate unnecessary steps. Minimizing walking distances from one place to another while providing options to rest along the way were highlighted as critical design considerations specifically for patients whose treatment has a direct influence on their mobility.

Disorientation through inadequate wayfinding considerations, not only amplifies walking distances but also induce angst and frustration among users of a space (Ulrich et al., 2010). The open design of the atrium space at both Australian hospitals and what it affords in visual connectivity to different destinations was regarded significant in rendering a rather intuitive wayfinding. The compact (block-like) design of BRICC also facilitated short walking distances for mobility-impaired patients. Other design features were less successful, such as the positioning and scale of signage, as well as the near identical look of corridors at some departments at PMCC. Paying considerate attention to such design elements and provision of distinguishing features using harmonised interventions of colours, materials and landmarks may facilitate a better spatial orientation experience.

Patients' experience of the conditions that either facilitate or hinder navigation aligns with the review conducted in Chapter 2 which suggests that improving wayfinding is a complex task that requires a blend of different design features (e.g. spatial arrangement, visual features, environmental information) as well as consideration of other factors such as human differences and organizational policies, in order to achieve a coordinated system that has the capacity to effectively inform navigation. The latter was evidently apparent in the Egyptian context where the obstinacy of administrative procedures, besides the lack of easy-to-comprehend signage (tailored to the existing high illiteracy rate), contributed to unnecessary extra commuting distances.

> *"… you gonna wait and treatment will come, and anything you choose to do outside of that, is an inconvenience or an add-on, or something that has to be cared for, none of this is built in upfront"*
> *"even I'm going through this [hardship of cancer treatment], in a way it's nice to just have a little bit time for myself to switch off, turn off, at the treatment"*
> *"I usually use this as part of my quiet time, I'm pretty busy already"*
> *"help to pass the time away"*
> *"I'd rather just read and look after things, and I always wore my slippers"*

Infusion therapy entails frequent and lengthy visits to the hospital, deducting enormous amount of time from patients' personal lives and leaving them with limited options to engage their time in the hospital. Considering patients' limited movement in the extended treatment sessions, concerns in the way such spaces should be equipped to maintain full independence, when needed, become fundamental. Session times were regarded differently by participants, from just a long time that they seek to occupy, to a sort of personal time that they considered as a break from their already busy life or even a chance to be productive and get some work done. In that, patients used such times to engage in ordinary activities such as using personal tablets or phones, watching movies, reading, listening to music, having short naps, and chatting with family members. Regardless of how their time was utilised, providing flexible settings that allow patients to set up the space for the type of activities they want to do was the underlying condition that may help patients not only to overcome the potential boredom of the treatment sessions, but also to own their time and decide on the way they want to frame it. Such flexibility was also highlighted for waiting spaces in which patients are prone to experience prolonged periods of waiting. Besides efforts to eliminate waiting time in the first place and providing similar setups to engage in activities of interest, some participants endorsed the benefits of having a calling system that liberates patients from remaining in the waiting room and provides them with the choice to leave and seek other spaces without concerns of missing their appointment.

7.2 Distinctive effect of the built environment

7.2.1 The capacity to contribute to positive memories

The extent to which a hospital space can influence patient experience may differ across medical specialities as well as facility type, such as inpatient versus outpatient settings (McCormack et al., 2011). When the case is cancer-related, such spaces become part of patients' lives and hence have the capacity to play a distinguished or unique role in their experience. The usually prolonged treatment regimens and follow-up care requirements turn the outpatient facility to a setting similar to home in terms of time spent there. Reflecting on her awareness of the hospital space, Margaret indicated that prior to her cancer diagnosis, most of her experience with hospital settings was around ordinary visits such as giving birth or visiting relatives, in which she paid little to no attention to the space and its design: "… I hadn't really taken a lot of notice of the spaces, except that a hospital looks like a hospital."

Being diagnosed with cancer, patients described life as revolving around treatment: "… but when I was diagnosed with breast cancer in December last year. My whole life became a hospital," Margaret continued. This has been noted by Egyptian participants too, including Mazen and Ali who considered the space at some point of their treatment as a "second home" due to their long and frequent visits. In such conditions, the interaction with the healthcare setting increases and architectural features and spaces that have the capacity to support patients along their treatment becomes rather valuable.

Participants expressed experiences from a welcoming, less alienating environments that shift negative expectations and foster a degree of comfort and reassurance, to an uplifting and inspiring one that helps ease the treatment intensity and even promotes a level of engagement and interest in the midst of such an overwhelming situation, point to the significant role that the built space may play in shaping patient overall experience and wellbeing. This contribution is evident when tracing patients' impressions of other traditional settings. Australian participants' prior experience with such settings varied between an overwhelming, uncomfortable experience that rendered the space unpreferable if an alternate option was offered (Michelle, Diana, Cameron, Kevin), to an awful, horrible experience that patients hated and negatively remembered (Margaret, Imogen, Diana). These "terrible" and "horrible" spaces, as described by number of participants, conveyed feelings of constriction and isolation, leaving patients with negative and rather depressing sentiments. Egyptian participants' ongoing experience of South Egypt Cancer Institute, that occupies a relatively traditional building, further asserts the development of such negative experiences and memories in poorly designed and maintained hospitals. Most participants were immensely upset with the deteriorated condition of the Egyptian hospital spaces, indicating a dominant sense of discomfort with their hospital engagement, from which they wanted to escape.

Traditional hospitals are commonly recognized with a specific look and smell. Previous research (Schweitzer et al., 2004), as well as participants' reflections, frame them as institutional, sterile places that feature rudimentary conditions dominated by clinical aspects, narrow corridors, cramped and crowded spaces, dull colours, lack of natural light, and encourage a high level of disorientation. In contrast, the thoughtful design of spaces, which strive to eliminate signs of such traditional settings and incorporate impressive and inspiring architectural features (e.g. non-traditional forms, colours, natural materials, large fenestration) that help tranquil the users of the space as well as afford various moments of exploration and reflection, demonstrated significant potential to transform patients experience to a relatively positive one. Accommodating spaces that facilitate everyday scenes to take place within the hospital setting (e.g. amphitheatre, cafe, public art galleries) contributed further to a familiar, less intimidating, atmosphere. Outfitting healthcare settings with opportunities to break up the intensity of the treatment day within spaces and activities that are not necessarily illness-related, but rather encourage engagement in activities that promote health, wellbeing and continuation of life outside of cancer (e.g. kitchenette, lounge areas, rooftop garden, wellbeing centre), helped infuse patient experience with further positive moments. Last but not least, being sensible to patients' treatment-related vulnerabilities, as well as their diverse and sometimes changing needs, by eliminating potential environmental obstacles and increasing personal choice and sense of control over the conditions of their surrounding spaces demonstrated further how attentive design to patients' particular emotional and physical sensitivities may **latently** convey a powerful sense of environmental support – leaving patients with positive impressions and memories: "that was really nice touch… That is one of those, it's like a moment that I've had and I still talk about to my wife and kids" (Walter, PMCC).

Such positive memories were evident among the Egyptian participants' reflection on other contemporary settings that they happened to attend throughout their treatment journey (Amal, Samira, Ali; SECI). These settings contributed to relatively positive experiences that were apparent not only in the participants' narratives, but also through Samira and Esalm's facial expressions when recalling their experience in such spaces: "indeed it is incredible… fabulous, beyond imagination…" (Amal, SECI).

Patients experience is complex, shaped by several factors, such as quality of care and staff conduct (Otani, Waterman, Faulkner, Boslaugh, & Dunagan, 2010; Steinke, 2015; Zineldin, 2006), making it challenging to disentangle the unique contribution of the built space. In spite of the unavoidable overlap between the contribution of people and space to patient experience, as well as the reasonably accepted significant and superior role that people play in shaping the overall atmosphere of patient experience (Sitzia & Wood, 1998; Yavas et al., 2016), the distinctive role of the built environment may still be disentangled through participants who had the chance to receive treatment at both old and new settings of the investigated Australian sites (Kevin, Cameron, PMCC and Margaret, Michelle, BRICC). The invariable, positive, shift in their experience within the investigated settings and their relative sense of comfort, confidence and inspiring feelings point to the concrete contribution of the built space, given the relative stability of prominent confounding variables such as care model and staff cohort. This was also the case for Samira (SECI, Egypt) who received treatment with the same doctors at two different settings. However, the investigated hospital in her case contributed negatively to her experience, leaving Samira with extreme desire to refrain from and not come back to her current treating hospital compared to her narrated positive experience in another private centre.

Participants' experiences of old versus new settings point to a potential distinctive role of the built environment; however, such an interpretation needs to be treated with caution giving the small number of interviewed patients. Further research that explores experiences of larger numbers with additional attempt to control other contributing factors (e.g. service quality) is therefore warranted.

7.2.2 Balancing the unavoidable presence in the hospital

A further level of distinction that can be linked to the built space emerges from an empathetic understanding of the special conditions of this disease and its treatment. The effect of cancer is very confronting and relatively traumatic as it expands beyond physical challenges to psychological, social, vocational, and financial aspects of a person's life. Its treatment, particularly chemotherapy, is usually described as "a very emotional and stressful thing" to have, as framed by Margaret, as well as Imogen, Sara, Amal, Samira and other participants. Chemotherapy's toxic nature places additional challenges that make it hard to logically or rationally process. Treatment and its associated spaces are therefore usually described as odd and bizarre spaces from which patients develop fear and potential resistance. "So, when you go into a chemotherapy room and you know you're about to be injected with the poison, it's, you're going to be hesitant and resistant to it anyway… You have to compliantly sit there, and what you feel like doing is pulling it out and running," Margaret reflected.

This desire to retreat is restrained by the scarcity of alternate and reliable treatment options, however it can be further altered by the condition of the built space and its potential role in lessening or easing the inevitable submission to such contradictory situation. Designing spaces with considerate attention to patients' needs, by granting patients a critically-needed sense of comfort and assurance, was important not only among the study participants, but also through other anecdotal evidence shared by doctors and staff members. In a published media documentary of PMCC Annual General Meeting 2016, Professor John Seymour narrated how cancer patients usually come to the hospital overwhelmed with preconceived fears and negative expectations of their time in there. However, the moment they walk through the building there is invariable shift in their impressions that Professor Seymour attributed to both people as well as the place: "I see a lot of new patients who come in and their first visit to the institution and almost invariably they say I was dreading coming here, I thought it was going to be a place of gloom and sadness, but the moment I walked in the door, there is warmth, there is energy, there is a positivity, and that is a universal message that I get from patients." One patient in the same recording stated, "… As much as its hard coming here as a patient and even as relatives, but having the building the way it is, yeah it makes it a hell of a lot easier." Participants in the current study not only confirm such view, but also demonstrate how careful design of the hospital spaces extend patients' positive experiences beyond just their first visit.

Although the condition of the disease and its treatment implies negative moods and patients are not expected to have a liking for attending such a hospital, designing spaces that stem from careful understanding of patients physical and emotional challenges helped ease patient presence at the hospital and gave them opportunities to tolerate the overwhelming fact of being a cancer patient as well as the inevitable time spent in a space they found aversive in the first place, extending the experience for some patients to a relatively comfortable, pleasing and positive experience. In contrary, rudimentary hospital spaces may alienate and discourage patients from returning to treatment in case they build up negative experience with the space. Australian participants' experience of traditional hospitals may point to some of these extreme possibilities, specifically when understanding Imogen's emotional reaction to having chemotherapy treatment in a rudimentary, basement floor, hospital setting: "I hated going to XX. And as soon as we'd get there, we'd like walk through really fast and yeah, yeah. I don't like being here but it's not as bad… It was horrible, no light, no colour, everything was pretty grey, yup, miserable."

Patients potential desire to refrain from attending such settings can be further noted among the Egyptian participants, who repeatedly highlighted how the rundown condition of the built space contributed to negative experiences that built up a substantial barrier between them and the place. This was evident across different instances, such as Samira's supplication to her treating doctors to allow her not to come back to that building in particular. Mazen further stated how his negative experience with the space, as well as people, drove him to avoid coming to the hospital and postpone several appointments to the extent that he sometimes tore apart his medication records and decided not to get back before amending his decision. Mazen indicated that this happened a number of times and he consequently missed a number of sessions. Although there might be different reasons that prompt such behaviour, the negative experience of the built environment in his case was a critical component, in that it may have been the deciding factor or the breaking point.

7.2.3 Encouraging reasons to return

Mazen continually expressed how the built space could have helped him and others develop positive memories to balance the inevitable hard times in the hospital and, above all, find reasons to come back and continue the treatment: "I just want to escape the place by any means. I want to go out of here and that's it. But if there was any of the things that I told you about [re qualities of the built environment], my perspective would have changed," Mazen further referred to how his experience was not supported at any level and how bad he felt when looking back to his diary and seeing how his writing was all about depressing times and sadness. He felt that the absence of any positive signs in the built space added up to an overwhelming experience and made it unbearable at some points in his treatment.

Along the same lines, Ali expressed how a sense of hope that can be cultivated through both people and the place, may help patients tolerate their hard times in the hospital and above all give them reasons to accept the treatment, as a lack of such, according to his opinion, would make him more reluctant to accept the treatment. Ali, on his short experience of 57357 hospital, stated: “the facilities help you accept everything and the place there help you feel that positive. You say, oh God, I want to be in that place, even if a better care is provided here [at Assiut’s hospital], but based on what you see [referring to 57357 building], your spirit will be more comfortable there… if you provide hope, you can tolerate everything, and when they bring treatment you take it. But without hope, I will not take anything.”

Likewise, Samira, Amal and Mazen expressed how appealing and comfortable features of the space could not only transform patient experience but also render it as an endearing space that eases their time in the hospital and even motivates them to continue coming there. It was a literal dream for Amal, indicating how such spaces would lessen her focus on the chemical infusion. In reflection on his specific condition as a young patient aged 20 years old, Mazen highlighted how cancer and its treatment disrupted every aspect of his life and above all hurt his learning progress and hence, his hopes and ambitions for a bright future. He continually reflected on how the space could have helped, not only easing his presence there, but also supporting him, with spaces and activities that allow him to frame his time in the hospital in a productive way, and thus turning the place into a motivator to both move on with life outside of cancer and continue the treatment. Such setups, according to Mazen, have the capacity to change patients’ perspectives of the hospital from a place focused only on diagnosis and treatment, full of painful and negative experiences, to a place that encourages hope and moving on with life.

> *"it will help patients love this place. A patient would feel that the hospital is not just a place to receive the treatment rather a breakout/recess place that I come to rest in during my treatment and gain benefits (e.g. educational progress). The patient will not focus on the treatment that he/she is about to undertake, rather take potential benefit out of it. Instead of wasting my time, I am gaining*

> *benefits… Not a place that disrupt/disable my life, rather a place that I will progress through, and I will learn new things. So, I will start love coming here."*

The importance of Australian participants' pronounced positive experience with the hospital spaces, as well as the Egyptian participants' aspiration for maintaining hope and a positive attitude through aspects of the place and its design, can be understood in the light of Lazarus and Folkman's theory of stress and coping. According to this theory, there are two primary means (e.g. thoughts or activities) through which individuals may seek to cope with stressful and challenging situations. One way is to alter the problem by finding definitive solutions, while the other focuses on regulating the emotional responses to the problem, if individuals perceive that little or nothing can be done to **immediately** change such conditions (Lazarus & Folkman, 1984). Changing thoughts, making positive comparisons, and finding positive value in negative events are examples of such emotion-focused coping strategies. Cancer and chemotherapy treatment raise stress to a significant level that requires prolonged time to alter (Schneider et al., 2004). Participants' comments on the role of the built environment in boosting their morale by conveying messages of hope and glimpses of positivity are congruent with such a theoretical framework and point to how the built space may play a distinguished role in encouraging a positive mindset and prompting positive values that may give patients reasons to stay and continue to undergo the treatment. It also aligns with Golembiewski's (2012) argument in which he stated: "when people are beleaguered with anxiety about their state of health and about the future, it's hard to imagine that any other psychological interventions could be more significant than developing reasons to hang in there and believe that everything is going to be okay in the long run."

Studies in general point to the role of customer positive experience and satisfaction in affecting different behaviour such as consumer loyalty, intention to return, and willingness to recommend the provider to others (Yavas et al., 2016). This is believed to be of additional importance in healthcare settings as it may increase the likelihood of patients to get better by positively affecting their compliance with the treatment (Otani et al., 2010). In cancer settings, Wessels et al. (2009) reported that patient satisfaction with care has been noted as a critical indicator of patient adherence to treatment, likelihood to remain with the medical services and maintain good relationships with medical staff, as well as contributing to better clinical outcomes. Patients' potentially extreme negative experiences and rebellious thoughts or behaviour toward the treatment (as noted across the Australian and, more prominently, the Egyptian participants) point to the importance of boosting patient satisfaction and finding ways to balance potential negativities in order to avoid conditions that might affect patient adherence to treatment. Indeed, many factors play crucial roles in supporting cancer patients to hold to the treatment, such as the medical team, family members, etc. The outcome of this study sheds light on the integral role that the design of the built space may play in supporting overall patient experience and satisfaction. In that, the built environment appears to play a complementary role by either motivating patients to stay with their treatment or act as an object that alienates and discourages them from returning in case they build up extremely negative experiences with the place.

This view aligns with the outcomes of Kleeberg et al.’s (2005) study, which explored (through quantitative surveys) patient satisfaction with care across different outpatient oncology settings in Germany. The variance of patient loyalty, measured by willingness to recommend the facility, was explained mainly by four aspects of care. The second leading factor was patient satisfaction with the physical environment, which explained 25.4% of patient willingness to recommend the facility, followed by insufficient information (third) and the patient-nurse relationship (fourth). The leading factor was the patient-physician relationship (39.4%).

7.3 Cancer and the role of emotional wellbeing

The role of a positive experience in shaping patient wellbeing and the healing process can be understood through the auspices of studies by neurosciences and the emerging field of psychoneuroimmunology (PNI). According to this field, the mind and body, represented in the nervous and the endocrine systems, are in constant interaction. Impressions and thoughts are accordingly transformed through the brain to the rest of the body, leading to diverse physiological changes. During stressful situations, the body may react by increasing respiration, blood pressure, heart rate, muscle tension and perception of pain, due to the excess release of stress hormones (Malkin, 2008). In general terms, negative stress can weaken the immune system, undermine effectiveness of vaccines, make the body prone to severe and more frequent infections (Sternberg, 2009), and slow wound healing (Kiecolt-Glaser et al., 1998). Stresses, anxieties, and fears simply compound the effect of illness and inhibit patient's capacity to be cured. Positive beliefs and expectations, on the other hand, can play a role in promoting health and healing. Positive emotional responses may stimulate the brain to release hormones and nerve chemicals that are essential to boosting the immune system and help speed healing (Sternberg, 2009). A number of studies of cancer patients noted that positive emotions were linked with a reduction in tumour growth and an increase in antibody production (Malkin, 2008).

Although the explicit influence of encouraging a positive attitude as part of the patient healing process might remain controversial, its effect on patient symptom distress (the degree of discomfort experienced through treatment-associated problems) is quite apparent. Emotional distresses extend to affect not only subjective feelings (e.g. satisfaction, wellbeing) but also the severity of the treatment side effects. Anxiety, for instance, has shown to have an additional and unique contribution to symptoms like anorexia, nausea, vomiting and fatigue, not to mention its potential role in increasing the recall of side effects experienced during chemotherapy treatment, which has been also reported to negatively influence patient compliance with the treatment (Mullaney, Pettersson, Nyholm, & Stolterman, 2012; Schneider et al., 2004; Wagland et al., 2016).

Sitzia and Wood (1998), in their study, highlighted that around half of their participants (N=173) reported feeling tense (not relaxed) during chemotherapy sessions. The authors noted further high association between pre-treatment anxiety and dissatisfaction with one aspect of the treatment space – the level of privacy. Sitzia and Wood (1998) argued that “as anxiety in the chemotherapy context is firmly associated with symptom distress”, such dissatisfaction may exaggerate the inherent pre-treatment anxiety and hence adversely affect patients’ experience of symptom distress.

Participants’ experience, in both the Australian and Egyptian contexts, point to comparable instances. Participants emphasized the importance of less intimidating space, specifically during first treatment session, that could be achieved through: an aesthetically appealing design; less clinical atmosphere; connection to the outside; the capacity to avoid viewing ill-looking patients; and, above all, options for privacy. The latter was apparent in several instances of participants’ comments including Katie and Pam (NEMIC); Lynn (GICS); Diana and Margaret (BRICC); Sara (PMCC); and Samira, Amal and Mazen (SECI), who all stressed the importance of privacy options to mitigate the contextual sources of stress, such as potential emergencies of the shared treatment space and conditions of being witnessed at their sickest (e.g. during potential anaphylactic reaction to the treatment). The consequences of such stresses were evidenced by Sara’s experience, who described how pre-treatment anxiety during her first session and the trial of the cold-cap for the first time turned her experience quite stressful, to an extent that she couldn’t handle it while being witnessed by everyone (resulting in her getting shaky and drowsy following further administration of drugs to calm her down). In that, Sara regarded an option for a private space (if offered) as helpful to lessen such a stressful situation. It is accordingly plausible to argue that finding ways to relax and calm patients down through a conscious choice about aspects of the space design, as articulated throughout this study, may help mitigate patient pre-treatment anxiety and hence contribute to alleviating the severity of symptom distress. However, future studies, in more controlled contexts, are important to further explore and precisely document such impact.

7.4 Towards comprehensive patient support

As discussed earlier, the challenge of cancer treatment causes significant disruption to an individual person that expands to affect most aspects of patients’ lives. Furthermore, the potential change of bodily appearance, such as hair loss, and even the disruption of crucial aspects of personal essence, such as a sense of womanhood for patients who go through mastectomy or other situations of losing a body part, may leave patients with a striking sense of being stripped bare or stripped to the rudimentary self. These, alongside the fact of handing oneself into the care of the hospital, with seemingly countless treatment-related interventions and side effects, contribute to a substantial sense of vulnerability and loss of control (Edvardsson et al., 2006; Høybye, 2013).

Cancer-related studies place significant emphasise on supporting patients as a person and placing their needs and expectations at the centre of care in order to empower them with a sense of control and a chance to readjust in such whirlwind situation (Department of Health and Human Services, 2016). The Victorian Cancer Plan (2016-2020), by the Victorian Department of Health and Human Services (DHHS) Australia, identified areas such as continuity and co-ordination of care, scheduling, cost, and communication as key areas to empower patients and maintain a model of comprehensive patient support (Department of Health & Human Services, 2011a). Providing options and choices to choose the place and kind of treatment that patients receive and, to a degree, who treats them extends the areas in which healthcare organizations can facilitate a further sense of empowerment.

In this realm, studies in chemotherapy contexts highlight the importance of managing treatment-associated problems as one of the essential contributors to enhance patients’ quality of Life (QoL). Studies point to the importance of targeting not only the physical problems (e.g. through drugs that address treatment toxicities) but also finding means and interventions for emotional and social support, which have been reported to have a comparable impact on patients' health-related QoL similar to the one caused by the physical side effects of treatment (Wagland et al., 2016). As argued by Sitzia and Wood (1998), for patients with serious illnesses, health care becomes primarily characterised as an emotional experience. Ways for emotional and wellbeing support are therefore considered key for attaining optimal care and as one of the principal contributors to clinical excellence in cancer care (Balding, & Anderson, 2007). It is defined by the Victorian Cancer Plan (2016-2020) as one of the key areas for improving cancer outcomes beside primary preventions, screening and early detection, and indeed treatment.

A growing body of research is accordingly advocating for integrating aspects of supportive and palliative care into the standard oncology care targeting early treatment stages (Bloom et al., 2015; Kamal & Kaufmann, 2017). This approach is being adopted as a response to the significant improvements in QoL, satisfaction with care and the less severe problems experienced with early implementation of such services (Kamal & Kaufmann, 2017; Wagland et al., 2016). Supportive care is a complementary level of support that aims to enhance patient experience of relief and control of their suffering, by means of symptom and pain management (Timmermann et al., 2015). Complementary therapies, specialist counselling, rehabilitation specialists, and information and education support are key components of this level of care (Annemans et al., 2012; Kamal & Kaufmann, 2017). An overarching aspect of such an approach is to support a patient emotionally and spiritually in order to give them grounds to adjust and cope with the potential burdens of the treatment and its side effects.

While the concept of supportive care has implications at the level of space planning to provide the required setups for such supportive services, participants' experiences, as detailed in this thesis, point to the additional role of the built space in complementing an overall level of emotional support and sense of empowerment beyond mere accommodation of complementary and supportive services. Patients' experience pointed to several instances in which the built environment, through exploiting the power of emotions, can subtly and latently empower patients and heighten their perceived sense of support. A considerate window view and access to an outdoor garden, besides giving opportunities to positively distract patients' minds from melancholic thoughts, lessened feelings of being cut off from the rest of the world and prompted a sense of 'normality' by connecting patients back to the real world in situations where every aspect of their normal life is disrupted. A rooftop garden in particular, with its multi-sensory experience, promoted further a sense of normality and control by allowing opportunities to escape the intensity of the treatment day, fulfilling an innate human requirement (breathe fresh air, get sunlight), and above all furnishing the grounds to appreciate that a lot more is going outside – symbolizing and encouraging a connection back to a desired normal life.

Provision of breakout spaces that are not necessarily focused on ‘sickness and being a patient’ rather promote ‘health and wellbeing’ such as relaxation lounges, kitchenette and the wellbeing centre gave patients further concrete sense of control to independently decide and seek readjustment in a situation they perceive to be about endless manipulation. Eliminating environmental obstacles and increasing patients’ autonomy over their surrounding environment to better frame their time in the hospital in the way they desire, played a further role in balancing potential feelings of lack of control and being bounded by the built space. Simple options to regulate patients’ privacy and set up the treatment space to facilitate following basic, everyday activities of interest helped some participants frame their time in the hospital in the way they liked, promoting further their sense of support and control.

Developing an emotional connection with the place, to not feel alienated, and encouraging hope and positive thoughts through positive values of the space design extended the overall sense of support that patients realize through the service and people – establishing a comprehensive sense of support that connects across all aspects of the hospital entity (people and the place) – conveying a level of care for the whole person. This is something that was verbally expressed by Cameron, who highlighted how the sense of emotional connection that he got from the building extended the level of support that he experienced at the service and people levels. As noted in one of the studies reviewed in Chapter 2, and further supported through participants narrated experiences in this thesis, such a role of the built environment in boosting patients’ morale and maintaining positive thoughts may transform a patient visit from just a place to see a doctor to a place that encourages venturing and moving forward – a place that relates to the mind beyond diagnosis and treatment, but also focused on hope, wellness and activities of complementary support.

The importance of affording such level of support is consistent with recent attempts to view health not only as “a state of optimal physical, mental and social wellbeing” as defined by the

World Health Organisation (2006) but also as "the ability to adapt and to self-manage, in the face of social, physical and emotional challenge" (Annemans, Van Audenhove, Vermolen, & Heylighen, 2018). This view is the basis of the concept of person-centred care which, as reported by Morgan and Yoder (2012), stands on the notion of facilitating opportunities for individuals to: "i) possess considerable qualities, ii) draw strength from available resources; and iii) find a way to remedy difficulties." Acknowledging patients' needs and the challenges they go through in the design of healthcare settings may lend a ground to expand this status and help promote an atmosphere of comprehensive support that tackles not only the micro-level of the patient-centred care model (e.g. communication between patients and care providers) as postulated by Liberati et al. (2015), but also the macro-level which is facilitated by aspects such as leadership commitment to patient-centred care, information and education support, and improvement of the built environment.

7.5 Intentionality in design

Through this study and patients' lived experience, we can clearly see how approaches articulated and promoted by the early advocates for healthcare buildings that promote psychologically supportive environments (Ulrich, 1991), side by side with basic aspects of functional efficiency, cost and codes, have started to reap benefits. The increase in architects' awareness of the role that the built space can play in patient health and wellbeing has prompted a notion of intentionality in designing hospital spaces to convey certain messages and feelings. This was apparent throughout the interviews conducted with architects as part of this thesis who all expressed how they devote more time and attention to empathise with users and in researching their breadth of needs. In that, and besides intuition and common sense that lead major parts of architects' design conceptualization, participating architects in this study also relied on research and experimentation in the design of their healthcare-related projects to steer their intuition and develop designs that realise tangible benefits for the users of the spaces. They used a number of different ways to conduct background research in preparation for the design, including: attending key conferences and reading relevant scholarly literature on health outcomes, wellbeing and the built environment; examining important precedents; understanding from relevant clinicians any research undertaken within treatment spaces to improve process or outcomes; and developing prototypes to inform design decisions in particular areas.

The discussion with architects pointed to a high correlation between their design intentions for the buildings and the patients' lived experience of them. Architects, in both the national (Australian) and international contexts (UK and USA), talked about their deliberate approach to developing designs that are founded on the notion of supporting patients to cope with illness-related stresses and to help alleviate their anxieties. They showed clear awareness of the particular physical and psychological challenges that cancer patients go through and how they intentionally try to harness the built environment to support patients explicit and latent needs. Designs that responds to both patients' physical frailty as well as psychological wellbeing were equally emphasized during the interviews.

Architects reflected on how they target designs that oppose the clinical, sterile atmosphere of older hospitals and instead borrow and blend domestic architectural features with the aim of making the experience, not only less alienating, but also pleasing and welcoming. In that, they endeavour to provide environments that foster calm, comfort, and provide opportunities for reflection and social support as means to support healing, besides exerting conscious efforts to balance the clinical appearance within treatment spaces. Architect 1 (Billard Leece Partnership) indicated that patients tend to "ponder on their environments quite a lot" due to the lengthy treatment sessions and accordingly highlighted, not only the importance of expanded visual connection to the outside and the aesthetic appearance of the treatment spaces, but also reflected on how they try to balance the clinical presence of the spaces by reducing all the clinical clutter: "pack them in cupboards behind the head rather than being on the visual focus of patients."

Increasing options and choices in both the treatment spaces and throughout the hospital was another overarching notion in the architects' design approach. Considerable effort went into the design of the treatment spaces and how to give patients different options of privacy or means to entertain themselves or otherwise occupy their session time. This heightening of sense of control was also thought through for other supportive spaces within the hospital. Architects design intentions behind the inclusion of breakout and supportive spaces aligned well with patients' lived experiences of them as important places of retreat and repose. On that, Architect 1 (Billard Leece Partnership) highlighted how such spaces contribute further to the notion of empowering patients and balancing the dynamic of their presence in the hospital: "… and so, all of a sudden it changes that sort of dynamic of being under someone else's care to having a little bit more control over yourself and your environment, and what you can do… to just get away from everyone."

Increasing patients' sense of control, either in treatment spaces or throughout the hospital, that can help normalise patient lives was evident across all the architects' reflections. Alongside organizational efforts to minimize the disruption of a disease such as cancer on patients by facilitating solutions that limit the amount of time dedicated to treatment (e.g. saving travel time, eliminating waiting time), architects indicated how design can promote such notion further by "setting up the design to support daily activities that are normalizing their treatment and not having their treatment take their life away from them" (Architect 3 ZGF, USA).

Interestingly enough, patients overall first impressions of the PMCC building as outlined in this study align with the architects' original design goals and the way they conceptualized its role. In a published interview with Christon Batey-Smith of DesignInc, one of the project's architectural firms and team members, he elaborated on how they carefully explored ways to use the architecture and built form to induce key messages of optimism and hope. A focus on both the patients' first encounter with the hospital spaces as well as their ongoing impressions were integral to the design process: "we wanted our first experience to represent the experience that they will have throughout the building. Again, its inspiring, hopeful, there is some softness and warmth, and the idea that the experience of patients will be enhanced and will be different in this building," Christon stated. Participants articulation of their first impressions of PMCC and how their experience was gradually shaped as they progressed throughout the building and got used to it, not only aligns with the architects' intent, but also provides crucial **evidence on how architecture, when thoughtfully considered and executed, can deliver such intangible, yet powerful messages**. This study has found that in general that the hospitals live up to the design intentions of the architects, and that the rigor in their preparation for the designs has helped this.

This concludes the research activities conducted as part of the qualitative inquiry phase of this thesis. The different roles of the built environment in shaping patient experiences, as outlined in the results and discussion of the interview phase, is depicted in a conceptual diagram (Figure 7.1) summarising the explicit and implicit themes arising from this research alongside the main extracted codes that contribute to them. The following chapters, on the other hand, elaborate on the development and field testing of the survey tool.

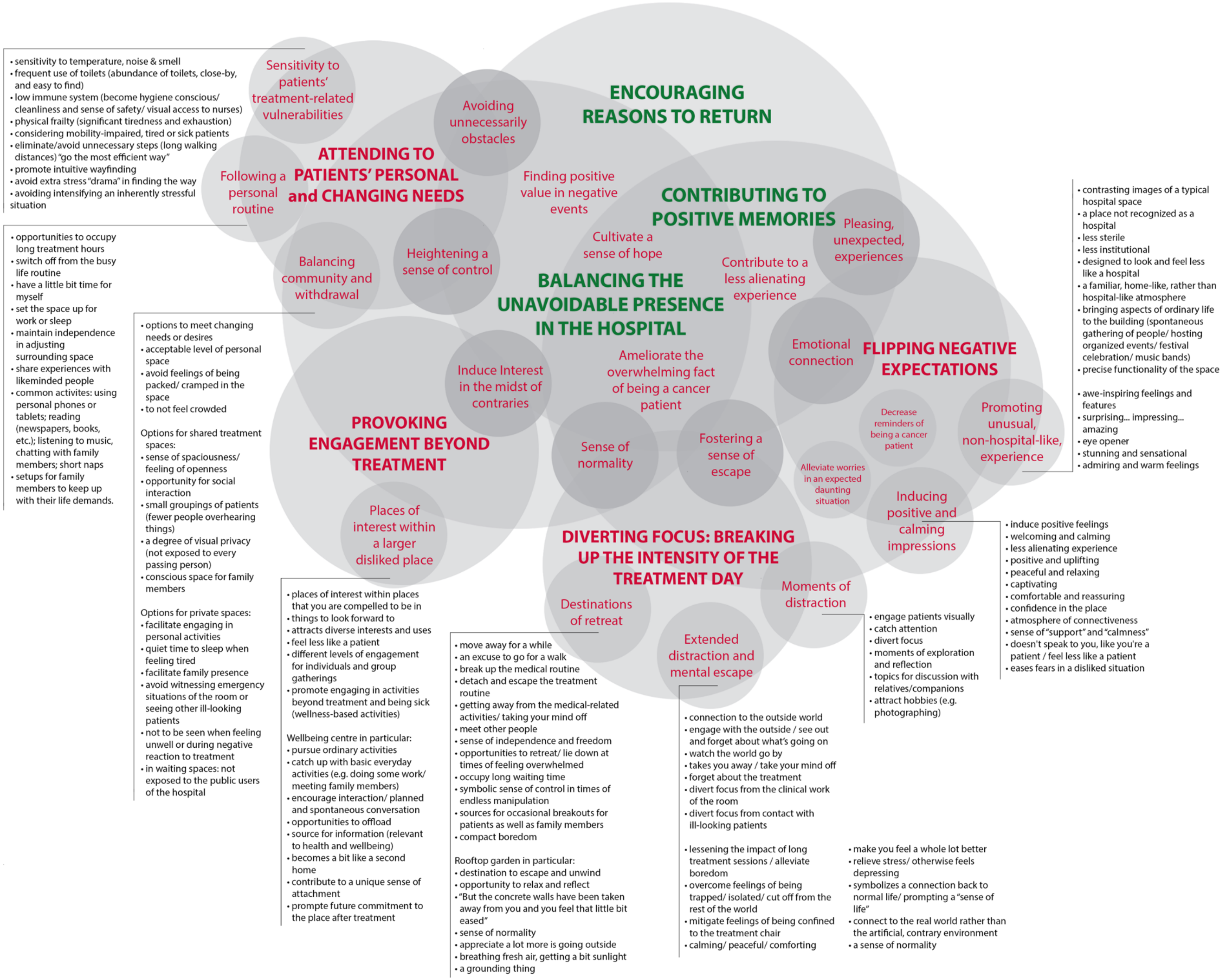


Figure 7.1 Main roles of the built environment in shaping patient experience.

Chapter 8

Survey tool development

This chapter describes the development and ongoing validation of a tool designed to measure cancer patients' perception of ambulatory cancer facilities and the extent to which the built environment of such healthcare settings possesses the qualities that contribute to the creation of a supportive or healing-promoting environment. Established principles for developing valid and reliable measurement scales (Streiner et al., 2015) as well as relevant literature (Richardson et al., 2007; Sherman-Bien et al., 2011) were carefully followed in the planning and execution of this tool development.

According to these sources, two main phases can be distinguished in the process of developing rigorous tools. The first phase is concerned with establishing initial credible properties of the tool's content through an iterative process, involving: reviewing relevant literature and existing tools; conducting interviews and/or focus groups with the intended population; consulting with recognized experts in the field; and undertaking preliminary pilot testing (Richardson et al., 2007; Sherman-Bien et al., 2011). The subsequent phase is an expanded field testing among the targeted population, aiming to further examine the tools psychometric properties through various statistical techniques. This includes, but is not limited to, exploratory and confirmatory factor analysis to examine and validate the underlying constructs of the tool; internal consistency reliability using Cronbach's alpha measures; as well as other validation techniques such as convergent and discriminant validity, concurrent criterion validity and predictive validity (Streiner et al., 2015). This chapter reports on the first phase – the steps taken to establish initial aspects of validation including content, cognitive and usability tests.

8.1 Precedent work

Seminal references in this field, including Streiner et al.'s (2015) book on the development and use of health measurement scales, stress the importance of reviewing previous attempts of relevant tool development as a first and crucial step for developing relevant content of any new tool: "the first step is to look at what others have done in the past. Instruments rarely spring fully grown from the brows of their developers. Rather, they are usually based on what other people have deemed to be relevant, important, or discriminating" (Streiner et al., 2015, p. 19).

Here, relevant literature has been considered at two levels: exploration of qualitative studies that address cancer patients narrated experience of the healthcare built environment; and review of tools developed to measure patients' perception of the same context. Through integration of insights from qualitative studies conducted to reveal the meaning and significance of patient experience within oncology care settings and other established evidence of what constitutes a supportive environment (drawn from a database of over 500 pieces of research), Chapter 2 identified key architectural design qualities that have the potential to support treatment and empower patients, with particular reflection on patients undergoing intravenous anti-cancer treatment within ambulatory settings. Five major themes were synthesized, constituting a conceptual framework guiding the development of this tool. A further review of existing tools and their item content was carried out in Chapter 3. Besides pointing to shortcomings and prevailing limitations in the development of similar tools, the review contributed to a pool of questions that further guided the initial development of this tool.

In total, 30 questions were devised as an outcome of these reviews, covering the built environment of ambulatory cancer facilities at two levels or scales: a local level, representing the immediate treatment area; and a global level, representing the overall hospital setting such as the waiting spaces and other relevant spatial experiences across the building (e.g. accessibility and wayfinding). Questions were formulated with intention to cover patients' general experience of the built environment overall, rather than satisfaction with individual architectural elements. For instance, questions relevant to wayfinding were aimed at measuring the perception of ease in getting from one place to another rather than satisfaction with individual components of a wayfinding system (e.g. visual signs, maps, information kiosk). This was important in overcoming the limitations noted in previous tools' approaches to measure satisfaction with single architectural elements, which resulted in shortcomings in attaining a list that can be comprehensive of the wide range of architectural features that may exists in one healthcare building.

In sum, this study's survey items were developed and drawn from existing tools, guided by the conceptual framework for delivering supportive healthcare environments developed in Chapter 2. Relevant items (developed in previous tools) were used and refined as appropriate to suit the context under investigation: the experiences of day oncology patients.

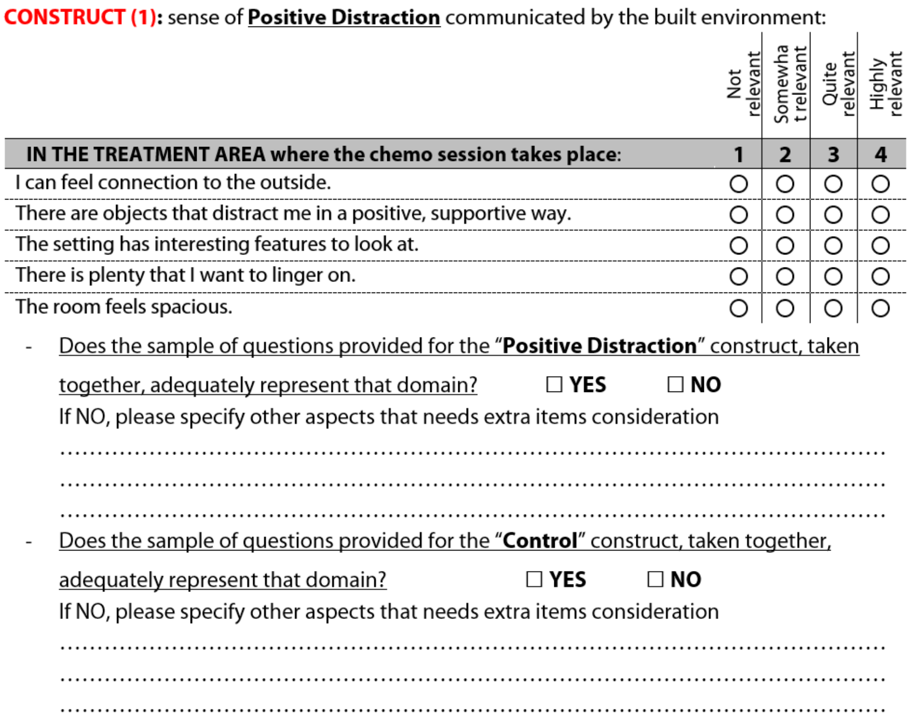
8.2 Content validity

The second stage involved exploring the face and content validity of the devised tool through a method known as Content Validity Index (CVI) (Polit & Beck, 2006). Content validity is defined as "… the degree to which an instrument has an appropriate sample of items for the construct being measured" (Polit & Beck, 2004, p. 423). The process entails evaluating the content of the developed tool by seeking out feedback from recognized subject matter experts (Elijah-Barnwell & Friedow, 2014; Polit & Beck, 2006). Polit and Beck (2006) suggest three to ten experts as a satisfactory number of the vetting panel.

Potential experts were determined from the list of authors of the reviewed articles in Chapters 2 and 3. Their professional and research experience in this field, either through qualitative exploration of cancer patient experience of the healthcare built environment or through the development of similar tools measuring patient perception in other healthcare settings, were considered reasonable indicators of their profound knowledge of this context and competence to provide relevant feedback. Fourteen experienced scholars/architects were identified and emailed with the CVI form and other relevant materials (Appendix A.4). Eight experts replied, of which two did not fill the form but provided general written reflection.

The panel included former architectural practitioners and professors of architecture (n=2), professors of psychology who developed similar built environment tools (n=2), professors in clinical medicine and author of articles concerning cancer patient experience of the built environment (n=1), professor of landscape architecture with experience in restorative landscapes within healthcare settings (n=1), professor of nursing and healthcare architecture (n=1), and a research director in a renowned architectural firm (n=1).

As indicated earlier, the devised items were grouped into two main spatial-related scales (the treatment area and overall hospital setting) with an attempt to group them into further sub-scales covering the principal components of a supportive environment as per the conceptual framework of Chapter 2, representing the following conceptual ideas: positive distraction (PD); control (Ctrl); social support (SS); safety and comfort (which was later labelled as physical and sensory support); information support (Inf); and complementary support (Cs), (the last two were then combined into one domain). This preliminary draft was then sent to each of the determined experts to test for the item-relevance to the nominated domains (Appendix A.4). In particular, experts were asked to i) rate the extent to which each introduced question is relevant to the scope of its intended domain using a 4-point ordinal scale ranging from "not relevant" to "highly relevant," and ii) determine whether the sample of questions provided for each domain, taken together, adequately represent that domain. A sample of these questions are provided in Figure 8.1. Experts were also encouraged to comment on any legibility issues and point to any missing important areas or items.



CONSTRUCT (1): sense of **Positive Distraction** communicated by the built environment:

	Not relevant	Somewhat relevant	Quite relevant	Highly relevant
IN THE TREATMENT AREA where the chemo session takes place:	**1**	**2**	**3**	**4**
I can feel connection to the outside.	○	○	○	○
There are objects that distract me in a positive, supportive way.	○	○	○	○
The setting has interesting features to look at.	○	○	○	○
There is plenty that I want to linger on.	○	○	○	○
The room feels spacious.	○	○	○	○

- Does the sample of questions provided for the "**Positive Distraction**" construct, taken together, adequately represent that domain? ☐ **YES** ☐ **NO**
  If NO, please specify other aspects that needs extra items consideration
  ……………………………………………………………………………………………
  ……………………………………………………………………………………………
  ……………………………………………………………………………………………
- Does the sample of questions provided for the "**Control**" construct, taken together, adequately represent that domain? ☐ **YES** ☐ **NO**
  If NO, please specify other aspects that needs extra items consideration
  ……………………………………………………………………………………………
  ……………………………………………………………………………………………
  ……………………………………………………………………………………………

Figure 8.1 Sample of the Content Validity Index questions.

The experts' relevant and irrelevant responses were coded in a spread sheet accompanied by a Word file compiling their comments and potential wording suggestions. As suggested by Polit and Beck (2006), the ordinal response scale was dichotomized to relevant and not-relevant responses by aggregating ratings of 1 and 2 into one group 'not-relevant' and 3 and 4 in the 'relevant' group. Item-level content validity index (I-CVI) was then computed by dividing the sum of 'relevant' responses by the total number of experts. I-CVI is an essential measure to objectively guide decisions for revising, deleting, or substituting items (Polit & Beck, 2006).

As noted in Table 8.1, experts rating of the I-CVI deemed more than one third of the items below 0.78, the lowest acceptable value recommended by Polit and Beck (2006), with scores ranging from 0.16 to 0.66. That being said, only three items (10%) scored below 0.5 with 80% of the items scoring values over 0.66. In general, problematic issues were relevant to ambiguity of some items, academic wording, and double-barrelled questions. Other comments were relevant to questions that confound the existence of a specific service and the appropriateness or quality of the spaces accommodating these services.

Table 8.1 I-CVI aggregated replies

			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	%
Positive distraction	1	I can feel connection to the outside.	1	1	1	1	1	0	83.3
	2	There are objects that distract me in a positive, supportive way.	1	1	1	0	1	1	83.3
	3	The setting has interesting features to look at.	1	1	1	1	1	1	100
	4	There is plenty that I want to linger on.	0	1	1	1	0	1	66.7
	5	The room feels spacious.	0	*	0	1	0	0	16.7
control	6	There are choices I can make to maintain my privacy (e.g. curtains/choosing between private or shared treatment areas).	1	1	1	1	1	1	100
	7	I can adjust and re-arrange the surrounding conditions (e.g. furniture) as needed.	1	1	1	1	1	1	100
	8	When I need staff, I can easily find means to call them.	1	1	1	1	1	1	100
	9	During the treatment session, there are facilities that allow me to undertake familiar activities as needed (e.g. reading/ using laptop/ watching TV/ or the like).	1	1	*	1	1	1	83.3
	10	I feel I have control over the surrounding physical environment.	1	1	1	0	0	1	66.7
	11	I am able to maintain adequate thermal comfort.	1	1	1	1	0	1	83.3
	12	I can reduce sources of noise.	1	1	1	1	0	1	83.3
	13	I smell fresh air.	1	*	0	1	0	1	50.0
social support	14	The setting facilitates the presence of family/friends during the treatment session.	1	1	1	1	1	0	83.3
	15	My family/friends feel comfortable when accompanying me during the treatment session.	1	1	1	1	1	-	83.3
	16	There are places (e.g. lounges/cafeteria) to be with my family/friends.	1	1	1	1	1	0	83.3
	17	When desired, the hospital setting facilitates engaging in social activities (e.g. with fellow patients).	1	1	1	0	0	-	50.0
	18	When I need confidentiality, I can find places to hold private conversations with staff.	*	1	*	1	1	1	66.7
safety & comfort	19	I can feel a sense of ergonomic comfort (e.g. the furniture is comfortable).	1	1	-	1	*	1	66.7
	20	I can clearly find my way in the hospital.	1	1	-	1	1	1	83.3
	21	I can easily access different locations in the hospital (e.g. things are close by).	1	0	-	1	1	1	66.7
	22	The place maintains high hygiene standards.	0	1	-	0	0	1	33.3
	23	The hospital setting looks neat and clean.	1	1	-	1	1	1	83.3
information support	24	I can find sufficient facilities (e.g. library/materials) to search for illness related information.	1	1	1	1	1	0	83.3
	25	The hospital provides support spaces for educational forums (e.g. learn about the disease or its consequences).	1	1	1	0	1	0	66.7
	26	I can find spaces to access previous survivor experiences (e.g. in person or documented).	1	1	1	0	1	1	83.3
	27	I can find spaces to consult with staff on disease-related information.	1	1	1	0	1	1	83.3
complementary support	28	When interested, I can find different opportunities to engage in optional complementary therapies (e.g. support group therapy, aromatherapy, art therapy, acupuncture, etc.).	0	1	-	0	1	0	33.3
	29	The spaces provided for complementary therapies are appropriate.	1	1	-	1	1	0	66.7
	30	I can access different types of relevant amenities (e.g. beauty shop, religious facilities, etc.).	1	1	-	1	0	0	50.0

Key
1 Relevant
* Relevant if moved to another domain/construct
0 Not relevant
\- No reply

Items showing low CVI scores alongside experts' suggestions for refining and adding new items were extensively considered in revising the questionnaire items. Experts who provided most comprehensive feedback and showed commitment during the CVI phase, were further contacted with the modification attempts. One of them, in particular, continued to provide detailed feedback until arriving at a satisfactory level of the equivocal items and their wording formulation. In total, 3 items were deleted, 9 modified, 17 remained and 9 newly added, resulting in a total of 35 items (Table 8.2). It is worth noting that, although CVI is an important tool to test and provide objective figure to support a tool's content validity, it is also an essential method for the development process itself (Nordin et al., 2015) and to guide and enhance the 'construct validity' of the tool. Hence, its outcome should not be ultimate.

Table 8.2 Questionnaire items following CVI review

	In the TREATMENT AREA where the chemo session takes place:
PD	I feel connection to the outside.
PD	There are interesting features to look at.
PD	The room feels spacious.
PD	The interior feels bright.
PD	I find adequate amenities to occupy my time during the treatment session (e.g. TV/ soothing music/ internet).
Ctrl	There are choices I can make to maintain my privacy (e.g. curtains/choosing between private or shared treatment areas).
Ctrl	I can adjust and rearrange the surrounding conditions (e.g. furniture) as needed.
Ctrl	The design of the treatment area facilitates the calling of staff during the treatment session (e.g. visual sightlines/ means to call them).
Ctrl	The treatment area provides facilities that ease undertaking familiar activities as needed (e.g. using laptop/ reading).
Safe	The treatment area has adequate fresh air.
Ctrl	I am able to maintain adequate thermal comfort.
Ctrl	I am able to regulate sources of noise.
Com	I can feel a sense of ergonomic comfort (e.g. the treatment chair is comfortable).
SS	The setting facilitates the presence of family/friends during the treatment session.
SS	My family/friends feel comfortable when accompanying me during the treatment session.
	In the OVERALL HOSPITAL SETTING:
SS	There are places (e.g. lounges/cafeteria) to be with my family/friends.
SS	The design of the hospital gives me the chance to engage with fellow patients when desired.
Ctrl	I can find places to hold private conversations with staff.
Com	The patient waiting area is comfortable.
WF	I can clearly find my way in the hospital.
WF	The hospital is designed in a way that eases physical travel between destinations (e.g. ramps/ things are close by).
WF	I find the design features provided to aid navigation (e.g. visual signs/ colors) helpful to get around.
Safe	The hospital setting looks clean.
Safe	Corridors and spaces are tidy and uncluttered.

Safe	The place emphasizes infection prevention (e.g. availability of hand disinfection stations).
Safe	The hospital interior feels airy and fresh.
Inf	I can find sufficient facilities (e.g. library/ booklets) to search for illness-related information.
Inf	The hospital provides adequate support spaces for educational forums (e.g. conference/ seminar rooms).
Inf	There are options to access technologies to search for information.
CS	When interested, I can find adequate spaces to engage in optional complementary therapies (e.g. support group therapy/ aromatherapy/ art therapy/ massage, etc.).
CS	The spaces provided for complementary therapies facilitate the performed activity (e.g. single rooms for massage therapy vs shared spaces for group therapy).
CS	I can access different types of relevant amenities (e.g. beauty shop/ religious facilities/ etc.).
PD	The patient waiting area has interesting features to look at.
PD	I feel connected to the outside when I am in the waiting area.
PD	There are sufficient amenities to engage with in the waiting area.
PD	The hospital setting feels bright inside.

8.3 Consultation for readability and legibility

The next phase was to examine the interpretability and reading level of the devised items through several consultations with academic professors at the University of Melbourne, including a senior researcher at the University of Melbourne Statistical Consulting Centre and a Professor of Psychology. Health literacy staff members at one of the study's participating sites (the Health Literacy Manager at Peter Mac) provided further expert advice regarding the questionnaire's language and design. This was important to further tailor the questionnaire language to level suitable for patients in such a context. Linguistic and semantic-related issues for all aspects of the questionnaire, starting from the title and preamble to the essence of each question, were extensively discussed and simplified with the language experts over number of face-to-face meetings and follow up emails.

Despite being reviewed by native English speakers and experts in the field of healthcare facility design and research, many items were deemed ambiguous by the language experts as well as containing jargon terms. The use of technical vocabularies on a daily basis among researchers and their peer colleagues may result in overlooking the fact that these terms do not constitute part of everyday vocabularies of an average person (Streiner et al., 2015). This phase supported this possibility and accordingly, the language was revised and rewritten in plainer language at a year 8 reading level (12 to 13-year-old). Examples of the revisions are provided in Table 8.3.

Table 8.3 Example of the revised items following consultation with language experts

Old	Refined
I can find things in the place to occupy my time adequately during the treatment session (e.g. TV/soothing music/internet).	I can find things in the treatment area to keep me busy (e.g. soothing music/internet/TV).
There are effective choices I can make to maintain my privacy (e.g. moving screens/choice of private or shared treatment spaces).	The treatment area allows me to choose how private I want to be (e.g. moving curtains/ choice of private or shared treatment spaces).
The treatment area has facilities that help me do familiar activities when I want to (e.g. using laptop/reading).	The treatment area has things in place that help me do activities that I want to do (e.g. using laptop/reading/etc.).
The treatment area has adequate fresh air.	There is enough fresh air in the treatment area.
The hospital is designed in a way that eases physical travel between destinations (e.g. ramps/ things are close by).	The hospital is designed in a way that makes it easy to move from one place to another (e.g. things are close by/ provision of ramps).
I can clearly find my way in the hospital.	I can clearly find my way around the hospital.
I am able to control sources of noise adequately	I can control the level of noise around me.
I find the design features provided to aid navigation (e.g. visual signs/ colours) helpful to get around.	I find the design features provided to find directions (e.g. visual signs/colours) helpful.

8.4 Usability and clarity of the questionnaire – Pilot testing

The revised version was then subject to further testing during the interview phase. Following the end of each conducted interview, the questionnaire was administered to the participating patients and they were asked to complete it and comment on the clarity of its items and/or any typographical errors. All participants of the two focus groups (n=5) and 7 of the individual interviews completed the questionnaire, in which they were asked to consider whether the instructions are clear and easy to follow; whether there are any difficulties in understanding any of the questions; and if the questionnaire's items relate to all aspects of their experience with a hospital building. Participants were further encouraged to name any aspects that they think could be added to the questionnaire content (Gotlieb, 2000; Morag, Heylighen, & Pintelon, 2016; Panda, Garg, & Shah, 2015). All participants found the questionnaire easy to understand and follow. A number of them expressed further appreciation of the ability of the questionnaire to thoroughly capture most of their experience with the healthcare built environment (Walter, PMCC; Patrick, GICS).

8.5 Interview outcomes

The conducted focus groups and interviews, besides serving as a means to test the usability of the questionnaire with the intended population (or users), provided further in-depth understanding of patients' narrated experience with the built environment. This understanding hence pointed to other pertinent areas for consideration within the questionnaire, that were addressed as follows:

According to the interview results, as discussed in Chapters 5, 6 and 7, a critical role of the built environment was in its capacity to cultivate a sense of calmness and assurance for patients during their time in the hospital. Participants, invariably, highlighted how considerate design of the building can convey general feelings of calmness and peacefulness, hence we found that aspect important to add to the questionnaire. Another prominent environmental aspect outlined in the interviews was the opportunity to access outdoor spaces including gardens for some fresh air and change of scenery. Other layers of patients' experience were relevant to their essential treatment-related needs and how the space should be designed in ways to ease them (e.g. abundance of toilets with easy access). These were all considered as important additions to the questionnaire.

The interviews included also a discussion asking about the capacity of the built environment to facilitate access to spaces where patients can search for treatment-related information. Yet what was more important for patients was finding information about the building itself and its supportive amenities. The capacity of the building to reveal its amenities and communicate the different spaces or facilities that can be of interest to patients (e.g. outdoor gardens, wellbeing centre, kitchenette) was of more relevance to patients who expressed delayed knowledge of such opportunities of support. More ways to communicate the existence of such facilities, from the earliest visits, was therefore encouraged and hence considered as additional item in the questionnaire. In total five new questions were devised and replaced questions that were less developed or deemed vague during the previous readability and legibility phase (Table 8.4).

Table 8.4 Example of the revised items following interviews with patients

Eliminated or modified	Final edited or New items
The place emphasizes infection prevention (e.g. finding hand sanitizer/Debug is easy).	The design of the building allows me to find important facilities, such as toilets, easily.
I can easily find other technologies for getting information (e.g. touch screen kiosks).	Information about this building and what it offers, like outdoor garden/lounges/etc., is well advertised across the hospital.
When interested, I can find adequate spaces to engage in support services (e.g. acupuncture/aromatherapy/art therapy, etc.).	When interested, I know where to find spaces to take part in support/wellbeing activities (e.g. massage/meditation/etc.).
The spaces provided for support services work well for their purpose (e.g. single rooms for massage therapy vs shared spaces for group therapy, etc.).	The spaces provided for wellbeing services are set up so that I can easily engage in the activities that I want to (e.g. nap pods/ participate in group therapy/ do some work/ etc.).

The patient waiting area has interesting features to look at.	The inside of the hospital is designed in a way to feel relaxed/calm
	There are places in the hospital where I can go outside for some fresh air (e.g. garden).

The refined and new questions were then reviewed one more time by the health literacy manager to ensure clarity and avoid poorly worded items. A further and final level of assessment of the reading level was sought using computer software developed to check the grammar and style of one's writing by providing an overall indicator (score) of the text reading level. In that, the Flesch-Kincaid Index was calculated using an online platform which suggested an average grade level of about 7 – a score indicating a level of clarity suitable for 12 to 13-year-old children. The Flesch-Kincaid Index is a scoring algorithm that calculates the estimated US educational grade required to understand a piece of writing through a formula of "the average number of syllables per word and the average number of words per sentence" (Gesell & Gregory, 2004). This concluded the testing phase and the questionnaire was then deemed suitable to be taken to the next stage – expanded field testing, which will be the subject of the following chapter. An overview of the development process is provided in the flow chart of Figure 8.2.

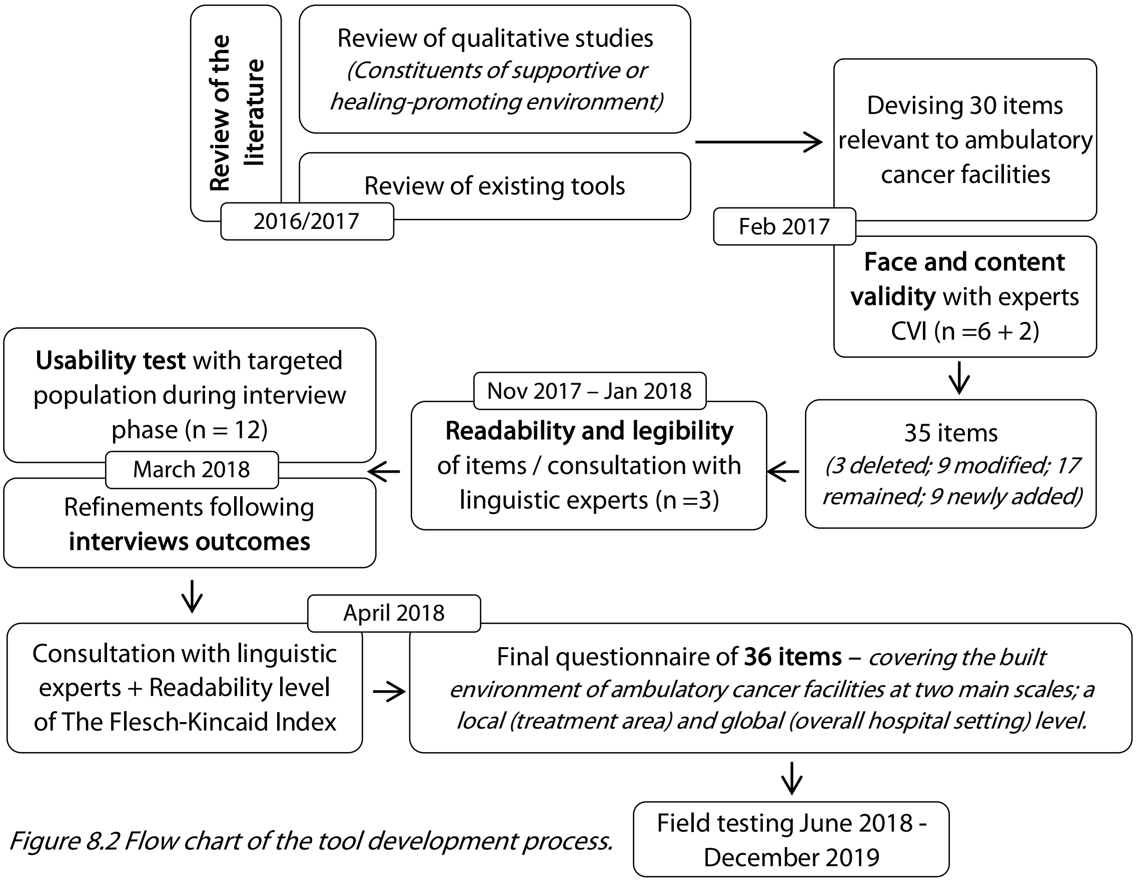


Figure 8.2 Flow chart of the tool development process.

In order to prepare the developed tool for the field testing, questionnaire items were structured into a survey format as held in Appendix A.5 and the example in Table 8.5 below. Based on the nature of the questions and variables of interest, an ordinal scale was deemed relevant in the choice of the scaling response (Streiner et al., 2015). Respondents were asked to specify their level of agreement to each statement on a symmetric 5-point Likert scale of agreement ranging from 1 (strongly disagree) to 5 (strongly agree). Both ends of the scale were labelled at the top of each page of the survey and the start of a new section. The preamble also encouraged participants to provide extra comments relevant to their experience by writing beside each statement or on the back of the page.

The resultant built environment tool included two main scales covering the treatment area (TA: 15 items) and the overall hospital setting (OHS: 21 items) including questions pertaining to generic aspects, such as wayfinding. The final questions (items) relevant to each of these two scales are provided in Table 8.5 and the full questionnaire in its printed format is provided in Appendix A.5. A further table is provided highlighting the questionnaire items relevant to the principal dimensions of a supportive environment as derived from the literature review of Chapter 2 (Table 8.6). This included the following domains: Positive Distraction (PD); Control (Ctrl); Social Support (SS); Physical and sensory support consisting of Comfort (Com), Accessibility (Access), and Safety (Safe); and Complementary Support consisting of Information Support (Inf) and Complementary therapy (CT).

8.6 Concluding remarks

In sum, this chapter elaborated on the development of a tool tailored to measure (quantify and characterise) user perception of the healthcare built environment for patients undergoing intravenous anti-cancer treatment within ambulatory settings. The chapter elaborated on the undertaken processes to establish initial credible properties of the tool's content following established criteria for developing valid and reliable measurement instruments (Streiner et al., 2015). The tool was devised following a comprehensive review of the conceptual basis of a supportive or healing-promoting environment as well as review of similar tools within this field. Items were systematically refined and enriched with new items that were more tailored to the context under investigation through a process involving interviews with the intended population, consultation with recognized experts in order to further establish and test the content, and investigation of the readability and usability aspects of the tool. The next chapter will further examine the tool's psychometric properties through field-testing among a larger sample of the targeted population and the application of relevant statistical techniques.

Table 8.5 The final questionnaire items represented in the survey format

	In the TREATMENT AREA where the chemotherapy session takes place:	Strongly Disagree 1	2	3	4	Strongly Agree 5
1	I feel connected to the world outside the building.	○	○	○	○	○
2	There are interesting features to look at.	○	○	○	○	○
3	The treatment area feels spacious.	○	○	○	○	○
4	I can easily see plants or vegetation while I am in the treatment area.	○	○	○	○	○
5	I can find things in the treatment area to keep me busy (e.g. soothing music/internet/TV).	○	○	○	○	○
6	The treatment area allows me to choose how private I want to be (e.g. moving curtains/ choice of private or shared treatment spaces).	○	○	○	○	○
7	I can move/rearrange furniture around to make myself comfortable.	○	○	○	○	○
8	The design of the treatment area makes it easy for me to call staff if I need them (e.g. I can see them or there are ways to call them).	○	○	○	○	○
9	The treatment area has things in place that help me do activities that I want to do (e.g. using laptop/reading/etc.).	○	○	○	○	○
10	There is enough fresh air in the treatment area.	○	○	○	○	○
11	I am able to maintain a comfortable temperature.	○	○	○	○	○
12	I can control the level of noise around me.	○	○	○	○	○
13	The treatment chair is comfortable.	○	○	○	○	○
14	The setting supports the presence of family/friends during the treatment session.	○	○	○	○	○
15	My family/friends would feel comfortable when accompanying me during the treatment session.	○	○	○	○	○

	In the OVERALL HOSPITAL SETTING:	Strongly Disagree 1	2	3	4	Strongly Agree 5
16	There are places (e.g. lounges/cafeteria) to be with my family/friends.	○	○	○	○	○
17	The design of the hospital gives me the chance to engage with fellow patients when I want to.	○	○	○	○	○
18	If needed, I can find places to hold private conversations with staff.	○	○	○	○	○
19	The patient waiting area is comfortable.	○	○	○	○	○
20	I can clearly find my way around the hospital.	○	○	○	○	○
21	The hospital is designed in a way that makes it easy to move from one place to another (e.g. things are close by/ provision of ramps).	○	○	○	○	○
22	I find the design features provided to find directions (e.g. visual signs/colors) helpful.	○	○	○	○	○
23	The hospital setting looks clean.	○	○	○	○	○
24	Corridors and spaces are tidy and uncluttered.	○	○	○	○	○
25	The design of the building allows me to find important facilities, such as toilets, easily.	○	○	○	○	○
26	The inside of the hospital feels airy and fresh.	○	○	○	○	○
27	I know where to find resources (e.g. library/booklets) to look for cancer-related information.	○	○	○	○	○
28	Information about this building and what it offers, like outdoor garden/lounges/etc., is well advertised across the hospital.	○	○	○	○	○

	In the OVERALL HOSPITAL SETTING:	**Strongly Disagree 1**	**2**	**3**	**4**	**Strongly Agree 5**
29	When interested, I know where to find spaces to take part in support/wellbeing activities (e.g. massage/meditation/etc.).	○	○	○	○	○
30	The spaces provided for wellbeing services are set up so that I can easily engage in the activities that I want to (e.g. nap pods/ participate in group therapy/ do some work/ etc.).	○	○	○	○	○
31	The hospital design makes it easy to find other relevant resources for looking after my needs (e.g. religious facilities/ wig service/ exercise spaces/ etc.).	○	○	○	○	○
32	I feel connected to the world outside the building when I am in the waiting area.	○	○	○	○	○
33	There are sufficient things to engage with in the waiting area.	○	○	○	○	○
34	There are places in the hospital where I can go outside for some fresh air (e.g. garden).	○	○	○	○	○
35	The inside of the hospital is designed in a way to feel relaxed/calm.	○	○	○	○	○
36	The hospital setting in general feels bright inside.	○	○	○	○	○

Table 8.6 Questionnaire items classified relevant to the principal dimensions of a supportive environment

	Category	**In the TREATMENT AREA where the chemotherapy session takes place:**
1	PD	I feel connected to the world outside the building.
2	PD	There are interesting features to look at.
3	PD	The treatment area feels spacious.
4	Ctrl	The treatment area allows me to choose how private I want to be (e.g. moving curtains/ choice of private or shared treatment spaces).
5	PD	I can easily see plants or vegetation while I am in the treatment area.
6	Com	The treatment chair is comfortable.
7	PD	I can find things in the treatment area to keep me busy (e.g. soothing music/internet/TV).
8	Ctrl	I can move/rearrange furniture around to make myself comfortable.
9	Ctrl + Safe	The design of the treatment area makes it easy for me to call staff if I need them (e.g. I can see them or there are ways to call them).
10	Safe	There is enough fresh air in the treatment area.
11	Ctrl	I am able to maintain a comfortable temperature.
12	Ctrl	I can control the level of noise around me.
13	Ctrl	The treatment area has things in place that help me do activities that I want to do (e.g. using laptop/reading/etc.).
14	SS	The setting supports the presence of family/friends during the treatment session.
15	SS	My family/friends would feel comfortable when accompanying me during the treatment session.
		In the OVERALL HOSPITAL SETTING:
16	SS	There are places (e.g. lounges/cafeteria) to be with my family/friends.
17	Ctrl	If needed, I can find places to hold private conversations with staff.
18	SS	The design of the hospital gives me the chance to engage with fellow patients when I want to.
19	Access	I can clearly find my way around the hospital.
20	Access	The hospital is designed in a way that makes it easy to move from one place to another (e.g. things are close by/ provision of ramps).
21	Access	I find the design features provided to find directions (e.g. visual signs/colors) helpful.

22	Safe	The hospital setting looks clean.
23	Safe	Corridors and spaces are tidy and uncluttered.
24	Access	The design of the building allows me to find important facilities, such as toilets, easily.
25	Safe	The inside of the hospital feels airy and fresh.
26	Inf	I know where to find resources (e.g. library/booklets) to look for cancer-related information.
27	Inf	Information about this building and what it offers, like outdoor garden/lounges/etc., is well advertised across the hospital.
28	Inf	When interested, I know where to find spaces to take part in support/wellbeing activities (e.g. massage/meditation/etc.).
29	CT	The spaces provided for wellbeing services are set up so that I can easily engage in the activities that I want to (e.g. nap pods/ participate in group therapy/ do some work/ etc.).
30	CT	The hospital design makes it easy to find other relevant resources for looking after my needs (e.g. religious facilities/ wig service/ exercise spaces/ etc.).
31	Com	The patient waiting area is comfortable.
32	PD	I feel connected to the world outside the building when I am in the waiting area.
33	PD	There are sufficient things to engage with in the waiting area.
34	PD	There are places in the hospital where I can go outside for some fresh air (e.g. garden).
35	PD	The inside of the hospital is designed in a way to feel relaxed/calm.
36	PD	The hospital setting in general feels bright inside.

Chapter 9

Survey tool testing and field study results

This chapter aims to empirically test the tool developed to measure cancer patients' perception of the healthcare built environment, through a larger sample of the targeted population, in order to establish further levels of reliability and validity of the tool's construct. The tool's psychometric properties (Streiner et al., 2015) are examined through a number of statistical analytical techniques including: examination of the tool's predictive validity (exploring the tool's sensitivity to detect differences between users' perception of different environmental conditions, e.g. older and newer facilities); concurrent criterion validity (through a correlation with a question evaluating the global quality of the built environment); and convergent and discriminant validity. Factor analysis is also considered to explore and validate the underlying scales (constructs) of the tool. This allows comparison of the scales envisioned in the previous chapter (spatially-based and conceptually-based) against the pattern of the collected data in order to explore the degree to which they fit or correspond to the preconceived conceptual framework. Internal consistency reliability measures using Cronbach's coefficient alpha is also considered for the developed scales.

The chapter also extends the qualitative investigation of patient experience carried out through the interviews considered in Chapter 5 by utilizing the developed tool to quantify and characterise patients' perception of the built environment within more hospital settings in Victoria, Australia and across wider sample of the population (responding to the **fourth research question**: to what extent do cancer patients perceive the built environment of ambulatory treatment and support spaces to be supportive of their needs?). Through a series of correlational analyses, the chapter highlights the architectural aspects that play a leading role in patients' overall experience (extending the response to the **third research question** carried out in Chapters 5, 6 and 7: what are the salient architectural design features that elevate cancer patient perceptions of a supportive environment and what others may hinder that?). The chapter also examines the relationship between patient perception of a supportive built environment and their perception of care centeredness (extending the response to the **fifth research question** articulated in Chapter 7: to what extent is the physical environment in outpatient cancer facilities conducive to a climate of patient-centred care?).

9.1 Study design

9.1.1 The overall content of the questionnaire

For the purpose of this phase of the thesis, patients were asked to complete a questionnaire that collected information about their experience of the built environment, as well as their received care, alongside relevant demographic information. The full questionnaire is included in Appendix A.5 and is organized in three sections as described below:

Section (1), The Built Environment questionnaire (BE): this section consisted of the 36 closed-ended questions developed in the previous chapter to assess (from the patient perspective) the extent to which a healthcare built environment possesses the qualities that contribute to the creation of a supportive or healing environment. An additional 10 generic questions were included to elicit definitive ideas about the design of the relevant treatment centre. This included open-ended questions and two questions derived from Andrade, Lima, Pereira, Fornara, and Bonaiuto (2013) asking participants to rate their global satisfaction with the built environment.

Section (2), Patient Experiences of Care (satisfaction and wellbeing): this section consists of 32 items that are proposed to explore patients' impressions of the built environment in relation to their satisfaction and wellbeing. It includes a series of previously developed tools, namely: the Person-centred Climate Questionnaire (Edvardsson, Sandman, & Rasmussen, 2008) to capture patient experience of care-centeredness; tolerability of the treatment (adopted from Mullaney et al., 2016); and willingness to return and recommend the facility as indicators of patient satisfaction (Andaleeb, 2001).

Section (3): this section covers potential confounding variables through a collection of demographic information, such as age and gender, in addition to patient perception of few aspects of their mental health through a scale adopted from the Mini-Mental Adjustment to Cancer Scale (Mini-MAC) (Pereira & de Brito Santos, 2014; Watson et al., 1994). In total 14 items are introduced in this section.

9.1.2 Data sources and data collection

9.1.2.1 Context

The objective of testing the developed tool, as well as expanding the understanding of patient perception of the built environment, entailed covering experiences of patients attending both contemporary and traditional building designs (older settings). Similar to the selection criteria of the interview phase, metropolitan, as well as regional locations, were considered in order to maintain a level of diversity. The Victorian Comprehensive Cancer Centre (VCCC), housing PMCC, continued to be a study site representing large-scale hospital that provide outpatient services (opened June 2016), while the Ballarat Regional Integrated Cancer Centre (BRICC) served as smaller-scale building offering similar services (opened 2013). Two additional hospitals were considered to enable broad coverage of existing conditions, including the Olivia Newton-John Cancer Wellness & Research Centre (ONJ) representing other contemporary design with different treatment area setup (opened 2012), and Alfred Health (ALFRED) representing the traditional category as an older building design (mid-20th century).

9.1.2.2 Participants and recruitment method

Adult patients (aged 18 and over) undergoing intravenous anti-cancer treatment (e.g. chemotherapy) in outpatient or day therapy units were considered for this phase of the research. In order to avoid any disruption to the treatment practice of each participating department, consultation with the Nurse Unit Manager at each site was sought as a first step to arrange for data collection. Following agreement on the process, the researcher attended one of the morning staff meetings in order to communicate the study objectives to the nursing team and inform staff members of his presence in the medical unit.

All participants were randomly approached by the researcher during their treatment session. Contact with patients was avoided during nurses' administration of any treatment-related procedures. Some participants were also endorsed by nurses as part of their routine admission of patients and were accordingly approached by the researcher. At BRICC, distribution of the questionnaire was assisted by the Day Oncology reception desk through offering the questionnaire to every second patient on the day's treatment list.

The researcher's background and a brief description of the study objectives were first communicated to each potential participant. Upon initial approval, the Participant Information Statement (PIS) in the form of a flyer that invites patients to participate in the study (Appendix A.6), along with the printed questionnaire (Appendix A.5) were further explained and handed to each participant. Patients were informed that filling and returning a completed questionnaire would indicate a voluntary consent to participate in the study, hence no separate consent form was required. The preamble also clearly stated that participation was voluntary and that if they did not wish to participate to please not complete or return the questionnaire.

Time commitment for filling the questionnaire was estimated to not exceed a maximum of 30 minutes, however most patients finished within15 to 20 minutes. Participants were also provided with the option to fill the questionnaire in intervals during their whole stay (waiting for and receiving treatment) at their convenience, to decrease any potential cognitive burden due to the length of the questionnaire. All participants were provided with a pen, an envelope, and a clipboard to facilitate the filling-out process. They were advised to return the questionnaire by the end of their day stay, at an agreed collection point in the hospital (a dedicated box placed at the reception desk and/or nurse station, depending on each hospital setup) or hand it directly to the researcher.

9.1.3 Privacy and confidentiality

The questionnaire did not request the names of the patients completing them, thus the responses remained anonymous (non-identifiable) and the privacy of patients is accordingly maintained. The questionnaire was also sealed into an envelope by the participant on completion and remained sealed until the data is processed outside the spaces of the hospital. Hard copies of the research data were held in a locked filing cabinet at the University of Melbourne. All collected questionnaires were then digitally scanned and retained on a password protected computer in databases requiring password access only accessible to the responsible researchers. Any data collected in this study will be kept securely in the Faculty of Architecture, Building and Planning for five years from the date of last publication, and it will then be destroyed via secure document destruction services at the University of Melbourne.

9.2 Results

Data was collected progressively, depending on the ethics clearance at each site, between June 2018 and September 2019, commencing at PMCC and BRICC and ending with ONJ and ALFRED, with a roughly three-month timeframe at each hospital. Patients were contacted during normal working days between 9 am and 5 pm. As detailed in Table 9.1, two hundred and seventy-five patients were approached and invited to participate across the four sites, of which 22 refused to participate for reasons such as not being interested in the topic, finding the questionnaire long or being non-English speakers. A total of 222 patients filled in and returned the questionnaire out of the 253 distributed, contributing to an 87.7% response rate (80.7% if considering patients who refused to participate in the first place). Fifteen questionnaires had missing pages and were therefore excluded from the data set resulting in 207 valid questionnaires for the upcoming analysis. Statistical analyses were conducted using SPSS package version 25.

Table 9.1 Record of distributed and collected questionnaires

	PMCC	BRICC	ONJ	ALFRED	Total
Approached	128	47	50	50	275
Distributed	116	45	45	47	253
Returned	105	37	41	39	222
Complete	100	35	36	36	**207**

Demographic-related variables were descriptively analysed and their frequencies and percentages reported in Table 9.2. The sample was relatively balanced across variables such as gender and education. Among the 207 participants, 98 (47.3%) were males and almost half of the respondents completed a university degree or higher (45.9%, N = 95). Types of cancer was also fairly represented, with haematological-related cancer (e.g. blood, bone marrow, lymph nodes) scoring the highest percentage (30%, N = 62). Some participants reported other types of cancer than the ones provided in the list and were mainly related to lung cancer (14 out of 24 reporting other types of cancer). In terms of age, the sample was composed of relatively older population with almost 65% (N = 136) of the participants aged above 50 years and only 8.2% (N = 17) aged between 18 and 30 years. Participants were predominantly from English-speaking backgrounds, with only 16 respondents (7.3%) reporting other cultures including three Italians, two Greeks, two Vietnamese, and one of each of the following languages: Malay, Arabic, Tagalog, Portuguese, Sri Lankan, Mandarin, Turkish, Spanish and Dutch.

A general comparison of participants' rating of the built environmental 36 questions relevant to their reported demographic characteristics was then carried using the Mann–Whitney U test for the gender variable and the Kruskal-Wallis test for age, education, type of cancer, and number of previous treatment sessions (indicator of familiarity with the hospital spaces). Some variables were rescaled to simplify data analysis as reported in Table 9.2. No significant differences in participants' responses was found relevant to their age, gender, or type of cancer. On the other hand, the Kruskal-Wallis test showed significant differences in 24 questions out of the 36 when comparing participants responses relevant to the full range of their reported educational levels, with a pattern highlighting potential association between higher rating (higher satisfaction with the built environment) and lower educational levels. To investigate this further, and for simplification reasons, education categories were grouped in three levels: participants who attained education up to high school, participants who completed TAFE and/or Trade/apprenticeship, and participants who completed graduate and/or postgraduate degrees.

The level of differences in participants' responses, using the Kruskal-Wallis test, increased to 29 questions out of the 36 in which participants with lower educational level were more likely to select higher numbers on the agreement scale. When looking at this notion in particular between the 'school' category and the 'higher degree' one, using the Mann–Whitney U test in this case, the items with statistically significant differences increased to 31 questions indicating a clear tendency for individuals with higher levels of education to be more critical in their evaluation of the built space.

The other variable that showed a level of difference was relevant to the number of previous treatment sessions (familiarity with the space). In that, data showed differences in number of items (7 questions) across the 5 categories represented in Table 9.2, which prompted further investigation between pair groups (two at a time) in order to detect the pattern in which difference exists. Following several iterations, data started to show an apparent pattern between participants with relatively lower number of previous visits and others with extremely high number (over 20 to 100 visits). Categories were therefore reduced to two: less than 20 visits and more than 20 visits. Participants with less than 20 visits ranked the space higher than participants with more than 20 visits in all the 36 questions, with 17 of the questions exhibiting significant level of difference at $p<0.05$ and additional 5 questions at $p<0.095$. It was also noted, through another question asked about time since starting the treatment, that participants who reported above 20 treatment sessions visited the hospital for a period longer than a year, indicating that patients, whose time in the hospital was less than one year were still evaluating the spaces higher. When their presence was longer than one year, participants' responses started to be more critical in their evaluation. That being said, this difference was significant for almost half of the questionnaire items, but not all.

Table 9.2 Detailed description of participants' background – survey phase

Variable	Scale/category	Site				Total
		PMCC N (%)	BRICC N (%)	ONJ N (%)	ALFRED N (%)	N (%)
Participants	Total number	100	35	36	36	207 (100)
Gender	Male	48 (48.0)	12 (34.3)	18 (50.0)	20 (55.6)	98 (47.3)
	Female	52 (52.0)	23 (65.7)	18 (50.0)	16 (44.4)	109 (52.7)
Age	Young (18–30)	14 (14.0)	1 (2.9)	1 (2.8)	1 (2.8)	17 (8.2)
	Middle aged (31–40)	8 (8.0)	3 (8.6)	1 (2.8)	8 (22.2)	20 (9.7)
	Above middle (41–50)	16 (16.0)	4 (11.4)	6 (16.7)	7 (19.4)	33 (15.9)
	Old (51–65)	44 (44.0)	13 (37.1)	18 (50.0)	11 (30.6)	86 (41.5)
	Pensioner (66–above)	18 (18.0)	13 (37.1)	10 (27.8)	9 (25.0)	50 (24.2)
	missing	*0*	*1 (2.9)*	*0*	*0*	*1 (0.5)*
	Mean Age	M 52.14 SD (15.1)	M 59.35 SD (13.4)	M 58.61 SD (12.7)	M 53.78 SD (13.3)	
Education	Primary school or below	0 (0.0)	1 (2.9)	1 (2.8)	0	2 (1.0)
	Did not complete high school	15 (15.0)	9 (25.7)	11 (30.6)	2 (5.6)	37 (17.9)
	Year 12 or equivalent	12 (12.0)	8 (22.9)	6 (16.7)	7 (19.4)	33 (15.9)
	TAFE or Trade/apprenticeship	18 (18.0)	8 (22.9)	6 (16.7)	6 (16.7)	38 (18.3)
	Undergraduate diploma/degree	32 (32.0)	6 (17.1)	8 (22.2)	14 (38.9)	60 (29.0)
	Postgraduate qualification	21 (21.0)	3 (8.6)	4 (11.1)	7 (19.4)	35 (16.9)
	missing	*2 (2.0)*	*0*	*0*	*0*	*2 (1.0)*
Type of Cancer	Brain/Central Nervous System	2 (2.0)	1 (2.9)	0	1 (2.8)	4 (1.9)
	Upper Gastro-Intestinal	4 (4.0)	5 (14.3)	3 (8.3)	1 (2.8)	13 (6.3)
	Sarcoma and bone	4 (4.0)	0	0	0	4 (1.9)
	Gynaecological (e.g. endometrial, cervical)	13 (13.0)	2 (5.7)	0	0	15 (7.2)
	Skin	10 (10.0)	2 (5.7)	0	5 (13.9)	17 (8.2)
	Colorectal/Lower Gastro-Intestinal	7 (7.0)	4 (11.4)	7 (19.4)	2 (5.6)	20 (9.7)
	Head and Neck	3 (3.0)	0	2 (5.6)	0	5 (2.4)
	Genitourinary	1 (1.0)	2 (5.7)	0	1 (2.8)	4 (1.9)
	Breast	13 (13.0)	6 (17.1)	11 (30.6)	0	30 (14.5)
	Haematological	26 (26.0)	9 (25.7)	6 (16.7)	21 (58.3)	62 (30.0)
	Selected more than one	5 (5.0)	0	1 (2.8)	2 (5.6)	8 (3.9)
	Others	11 (11.0)	4 (11.4)	6 (16.7)	3 (8.3)	24 (11.6)
	missing	*1 (1.0)*	*0*	*0*	*0*	*1 (0.5)*
Language	English	86 (86.0)	33 (94.3)	35 (97.2)	35 (97.2)	189 (91.3)
	Other	13 (13.0)	1 (2.9)	1 (2.8)	1 (2.8)	16 (7.3)
	missing	*1 (1.0)*	*1 (2.9)*	*0*	*0*	*2 (1.0)*
Number of previous sessions	First time	9 (9.0)	2 (5.7)	1 (2.8)	4 (11.1)	16 (7.7)
	1-5	40 (40.0)	14 (40.0)	19 (52.8)	11 (30.6)	84 (40.6)
	6-10	17 (17.0)	8 (22.9)	6 (16.7)	3 (8.3)	34 (16.4)
	11-20	19 (19.0)	5 (14.3)	4 (11.1)	8 (22.2)	36 (17.4)
	More than 20	14 (14.0)	3 (8.6)	6 (16.7)	10 (27.8)	33 (15.9)
	missing	*1 (1.0)*	*3 (8.6)*	*0*	*0*	*4 (1.9)*
Number of family members	0	35 (35.0)	8 (22.96)	12 (33.3)	11 (30.6)	66 (31.9)
	1	53 (53.0)	21 (60.0)	19 (52.8)	17 (47.2)	110 (53.1)
	2	8 (8.0)	3 (8.6)	3 (8.3)	4 (11.1)	18 (8.7)
	Between 3 and 6	3 (3.0)	1 (2.9)	2 (5.6)	3 (8.3)	9 (4.3)
	missing	*1 (1.0)*	*2 (5.7)*	*0*	*1 (2.8)*	*4 (1.9)*

9.3 Data analysis

9.3.1 Predictive criterion validity

Initial empirical indicators of the tool's validity were examined by testing the difference of patients reported perception across the study sites. It was hypothesized that patients' evaluation of older facilities (represented by ALFRED) will be relatively low and that the difference between patients' perception of ALFRED and the other contemporary settings will meet statistical significance as indicator of the tool's sensitivity to detect differences between sites with different spatial conditions.

Participants' responses across the four sites were compared and the significance of the differences between their evaluation of the built environment was examined using both the Kruskal-Wallis H and one-way ANOVA tests. The Test of Normality (Shapiro-Wilks test for normality & Kolmogorov-Smirnov test) showed that the data were not normally distributed. Although this suggests the use of non-parametric tests such as the Kruskal-Wallis H test, previous studies argue that ANOVA is robust to violation of normality and hence can be also used for such exploration (Andrade et al., 2012). Both tests were computed and yielded highly similar results as shown in Table 9.3. Descriptive statistics including means and standard deviations (SD) on the individual items and scale-level (treatment area – TA; and overall hospital settings – OHS) were also computed and represented in the same table, where higher scores indicate greater satisfaction with aspects of the built space (score range 1 – 5).

Patients at both PMCC and BRICC were generally satisfied, with only two items (BE7 and BE12) scoring below 3 (the neutral mark). The overall mean of TA and OHS for PMCC was M = 3.84 (SD = 0.62) and M = 4.16 (SD = 0.54) respectively, whereas for BRICC was M = 4.18 (SD = 0.58) and M = 4.36 (SD = 0.57) respectively. Participants at ALFRED, on the other hand, were predominantly dissatisfied, with 20 questions out of the 36 scoring below 3, resulting in an overall mean of 2.92 (SD = 0.57) for the treatment area and 2.99 (SD = 0.62) for the overall hospital setting. These results are consistent with the *a priori* hypothesis, except for the treatment area of the fourth site (ONJ) in which patients were moderately satisfied (M = 3.35, SD = 0.63) despite being a newer facility.

The test of differences was performed for both the individual items and the overall scale levels (mean of TA and OHS). ANOVA's overall results pointed to statistically significant difference between the four sites at $p < 0.01$. Scheffé's post-hoc test was then used to determine which items were significantly different, particularly exploring the difference between ALFRED (the older facility) and the three newer ones. *P* values of the mean difference between ALFRED and PMCC, BRICC and ONJ are represented respectively in Table 9.3 and the ones meeting the significance level ($p < 0.05$) are highlighted in grey.

Table 9.3 Tests of differences between participants' responses across the four study sites

					One-way ANOVA			*Kruskal-Wallis test Adj.Sig. by the Bonferroni correction for multiple test*		
	Site				*p* value of the mean difference between ALFRED and:			*p* value of the mean difference between ALFRED and:		
	PMCC	BRICC	ONJ	ALFRED						
Item	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	PMCC	BRICC	ONJ	PMCC	BRICC	ONJ
BE 1	3.94 (1.07)	3.74 (1.29)	3.60 (0.88)	2.89 (1.19)	0.000	0.016	0.064	.000	.009	.172
BE 2	3.78 (1.18)	3.50 (1.15)	2.89 (1.10)	2.31 (1.12)	0.000	0.000	0.216	.000	.001	.373
BE 3	4.43 (0.81)	4.57 (0.74)	3.41 (0.99)	2.50 (1.03)	0.000	0.000	0.000	.000	.000	.086
BE 4	4.13 (0.99)	4.26 (1.04)	2.77 (1.35)	2.58 (1.16)	0.000	0.000	0.914	.000	.000	1.000
BE 5	3.31 (1.44)	3.43 (1.38)	3.11 (1.13)	2.42 (1.30)	0.011	0.022	0.200	.005	.013	.274
BE 6	4.23 (0.86)	4.74 (0.57)	4.43 (0.61)	3.86 (0.93)	0.131	0.000	0.031	.146	.000	.062
BE 7	2.59 (1.16)	4.34 (0.87)	2.08 (1.18)	2.44 (1.08)	0.934	0.000	0.591	1.000	.000	1.000
BE 8	3.78 (1.00)	4.11 (0.99)	2.43 (1.01)	2.67 (0.86)	0.000	0.000	0.789	.000	.000	1.000
BE 9	4.52 (0.63)	4.80 (0.47)	4.31 (0.92)	4.00 (0.89)	0.004	0.000	0.355	.010	.000	.344
BE 10	3.97 (0.99)	4.60 (0.81)	4.00 (1.01)	2.97 (1.13)	0.000	0.000	0.000	.000	.000	.001
BE 11	3.99 (0.83)	4.51 (0.92)	3.69 (1.05)	3.28 (1.00)	0.002	0.000	0.324	.003	.000	.464
BE 12	2.62 (1.09)	2.91 (1.27)	2.11 (1.18)	2.36 (1.07)	0.711	0.242	0.840	1.000	.342	1.000
BE 13	3.84 (1.06)	4.23 (1.00)	3.43 (1.19)	3.22 (1.04)	0.035	0.002	0.883	.015	.000	1.000
BE 14	4.25 (0.89)	4.54 (0.70)	3.89 (1.08)	3.00 (1.17)	0.000	0.000	0.002	.000	.000	.012
BE 15	4.18 (0.94)	4.46 (0.66)	3.89 (1.03)	3.31 (0.93)	0.000	0.000	0.074	.000	.000	.061
BE1-15	3.84 (0.62)	4.18 (0.58)	3.35 (0.63)	2.92 (0.57)	0.000	0.000	0.032	.000	.000	.144
BE 16	4.67 (0.57)	4.60 (0.65)	4.33 (0.93)	3.80 (0.96)	0.000	0.000	0.026	.000	.000	.021
BE 17	4.24 (0.83)	4.54 (0.74)	4.17 (0.77)	3.28 (1.14)	0.000	0.000	0.000	.000	.000	.005
BE 18	4.14 (0.88)	4.34 (0.87)	3.81 (1.06)	3.44 (0.97)	0.002	0.001	0.437	.002	.000	.568
BE 19	4.35 (0.78)	4.26 (0.82)	3.78 (1.02)	3.56 (0.88)	0.000	0.008	0.746	.000	.006	1.000
BE 20	4.32 (0.74)	4.34 (0.80)	3.72 (1.03)	3.31 (1.01)	0.000	0.000	0.239	.000	.000	.510
BE 21	4.27 (0.81)	4.40 (0.77)	3.89 (0.98)	3.51 (1.01)	0.000	0.001	0.352	.000	.001	.685
BE 22	4.74 (0.44)	4.74 (0.50)	4.44 (0.65)	3.57 (0.92)	0.000	0.000	0.000	.000	.000	.000
BE 23	4.76 (0.47)	4.66 (0.72)	4.43 (0.61)	3.61 (0.93)	0.000	0.000	0.000	.000	.000	.003
BE 24	4.59 (0.62)	4.49 (0.78)	4.25 (0.84)	3.67 (0.93)	0.000	0.000	0.014	.000	.000	.032
BE 25	4.55 (0.63)	4.43 (0.70)	4.17 (0.77)	2.86 (1.07)	0.000	0.000	0.000	.000	.000	.000
BE 26	3.87 (1.10)	4.60 (0.69)	4.39 (0.87)	2.91 (1.12)	0.000	0.000	0.000	.000	.000	.000
BE 27	3.77 (0.97)	3.79 (1.04)	3.56 (0.94)	2.28 (1.00)	0.000	0.000	0.000	.000	.000	.000
BE 28	3.83 (1.13)	4.56 (0.66)	4.28 (0.74)	2.11 (0.93)	0.000	0.000	0.000	.000	.000	.000
BE 29	3.85 (1.11)	4.53 (0.75)	4.03 (0.82)	2.03 (0.86)	0.000	0.000	0.000	.000	.000	.000
BE 30	3.77 (1.09)	4.24 (0.95)	3.44 (1.05)	2.34 (1.00)	0.000	0.000	0.000	.000	.000	.002
BE 31	3.94 (0.96)	4.57 (0.65)	3.83 (0.94)	2.83 (1.00)	0.000	0.000	0.000	.000	.000	.001
BE 32	3.00 (1.16)	3.60 (1.29)	3.28 (0.97)	2.17 (0.74)	0.002	0.000	0.000	.001	.000	.000
BE 33	3.46 (1.08)	4.06 (1.07)	3.19 (0.89)	2.50 (0.94)	0.000	0.000	0.044	.000	.000	.067
BE 34	4.19 (0.90)	4.15 (0.99)	4.19 (0.75)	3.61 (1.02)	0.015	0.114	0.065	.010	.080	.104
BE 35	4.44 (0.71)	4.26 (0.86)	3.94 (0.83)	2.58 (0.84)	0.000	0.000	0.000	.000	.000	.000
BE 36	4.65 (0.52)	4.41 (0.78)	4.08 (0.84)	2.81 (0.89)	0.000	0.000	0.000	.000	.000	.000
BE 16-36	4.16 (0.54)	4.36 (0.57)	3.96 (0.64)	2.99 (0.62)	0.000	0.000	0.000	.000	.000	.000

An item-level analysis indicated that only four items out of the 36 did not show statistically significant differences between ALFRED, PMCC and BRICC (the two sites at which interviews were conducted). Question BE6 queried the level of comfort experienced from the treatment chair which, regardless of the building condition, was generally positive and received a high rating across all hospitals. Although ALFRED occupies a relatively old building, medical equipment and furnishings are fairly standard between the sites, which may explain such similarities in the results. BE7 on the other hand, asked about the presence of setups to help occupy patient time during the treatment session and this was rated mostly low at all hospitals, except at BRICC. The extended treatment hours make it challenging for the built space to provide effective options to positively occupy patient time. Basic entertainment systems, such as a personal display or screen, was not provided at any of the four hospitals. Internet provision was also criticized by the interviewees' of PMCC and BRICC and considered to be slow due to heavy use by the many visitors to the hospital (this was affected by order of arrival as well). Accordingly, the built space did not really provide concrete ways to occupy patients' time and patients mostly depended on bringing their own things (e.g. books, tablets). It is therefore plausible to observe similar ratings across old and new settings for such an aspect.

Question BE12, targeting the ability to control noise level within the treatment space, also received a low rating across all sites, with no significant difference. The design of the treatment spaces across the participating hospitals was based predominantly on an open-ward typology with the existence of a couple of private rooms for patients with critical conditions. In such shared spaces, being able to control the level of noise is quite challenging and finding similarities between participants evaluation is supportive of the tool's sensitivity to detect not only differences but also aspects that perform similarly, despite existing in notably different spatial conditions.

The last item that did not show significant differences was BE34. Availability of places within the hospital to get outside for some fresh air (BE34), despite being rated relatively high by participants at the four sites, showed slight differences between ALFRED and PMCC but no difference at BRICC and ONJ. All hospitals had a number of greenery areas within their sites, hence the relatively high rating. However, rooftop gardens were more common at PMCC which may explain the slight difference in participant responses. BRICC, in particular, did not feature accessible rooftop gardens.

The unforeseen results in this section were predominantly in the comparison between ONJ and ALFRED. ONJ is a relatively new building and it was expected to perform similarly to PMCC and BRICC. However, in looking at the results of the individual questionnaire items, the level of difference with ALFRED was predominantly not statistically significant, mainly at the treatment area (TA) level. Given that interviews were not carried out with patients at ONJ it is tricky to clearly comprehend the reason behind this relative lack of difference. However, a general observation of the spatial conditions can provide justification for some of the reported similarities between ONJ and ALFRED.

As mentioned earlier, the treatment area at all hospitals was based on an open-ward typology in which patients receive treatment in the same shared room. At PMCC, the treatment area was divided into separated zones of an average of six treatment recliners each, with availability of curtains as options for privacy. BRICC had similar setups but at a relatively smaller scale with retractable partitions to support privacy options. The treatment area at ONJ, on the other hand, despite featuring interesting non-clinical materials and colours, was relatively crowded with around 30 patients sharing one open treatment space. The arrangement was also not supported with any options for privacy (e.g. curtains). As noted from the interviews' results in Chapters 5, 6, and 7, patients considered spaciousness, not feeling packed in or crowded, and the availability of adequate personal space as non-negotiable qualities that a treatment space needs to provide. Furthermore, options for privacy, despite not constituting a significant dissatisfactory condition, were considered important to tolerate specific situations such as negative reaction to treatment and stresses from seeing potential emergencies in the treatment room.

One of the questionnaire's additional items asked about patients' preference for privacy and the extent to which they prefer to find privacy options within the treatment space to meet potentially changing needs. Close to half of the participants (43.5%, N = 90) preferred to receive their treatment in a shared space with privacy options (e.g. curtains or partitions), with 15.9% (N = 33) preferring a completely private room. The rest had either no preference (28%, N = 58) or did not mind being in a totally shared space (12.6%, N = 26) without privacy options. In a complementary question, almost 70% of the participants indicated a preference to be presented with a choice of private and shared treatment spaces, with almost 50% of the participants indicating a high level of interest for such a choice (scoring between 8 and 10 in a 10-point response scale). This may explain why BE4 received quite a low evaluation at both ONJ and ALFRED which did not support such options, even at a curtain scale.

Furthermore, being presented with such a number of treatment chairs at ONJ makes the space feel quite condensed and provides challenges to easily accommodate accompanying family members, which may further explain the other low rating obtained for item BE15.

At the overall hospital setting, all questions showed significant differences except for BE18, 19, 20, and 21. The latter three items relate to navigation and finding the way inside the hospital. From an architectural point of view, ONJ's building is relatively compact and navigation should not be particularly challenging. However, the building can be also accessed through the adjacent Austin hospital, which, on the other hand, is a collection of buildings (older and newer) that feature long corridors that can be easily disorienting. This may explain the similarities between ALFRED and ONJ regarding these three questions. That being said, participants' mean satisfaction with the navigation aspects at ALFRED and ONJ were not poor and gained relatively moderate scores. Comprehension of the results of the remaining questions that did not show significant difference would need further in-depth exploration of the specific site conditions to understand such discrepancies.

9.3.2 Design aspects leading patient experience

In order to further explore the relevance of the individual design aspects (represented by the individual items of the BE questionnaire) to patients' overall satisfaction with the hospital built space and to also understand the specific design aspects that had a leading influence on patients' experience across the explored sites, participants' individual response to each item of the BE questionnaire were correlated with their global satisfaction with the built space using the bivariate Pearson Correlation test (Andrade et al., 2012; Varni et al., 2004).

As mentioned in the discussion of the overall contents of the questionnaire, after the detailed 36 items of the Built Environment section, participants were asked to rate their overall satisfaction with the hospital design using two single questions capturing patients' global evaluation of both the treatment area (TA) and the overall hospital settings (OHS) – Q9 and Q8 respectively. Intercorrelations between each of the 36 items and participants' global satisfaction with the built environment were computed in order to get an overview of the design aspects that led patient experience. Items that exhibited a higher correlation with the global satisfaction questions would indicate a greater potential to influence patient experience and their overall appraisal of the built environment (Gesell & Gregory, 2004).

Effect sizes (the magnitude of the correlation) was interpreted following Cohen's (2013) classification of the degree of association strength (0.1 to 0.3 small; 0.3 to 0.5 medium; 0.5 to 1 large). As can be seen in Table 9.4, all items were significantly correlated with participant global satisfaction of the built space at $p < 0.01$ and with positive correlation coefficient ranging between 0.26 to 0.69. In other words, all correlations ranged between having medium to large effect size, except for one item (BE12, $r = 0.26$), suggesting considerable relevance of all the questionnaire items to patient global satisfaction and experience with the healthcare built space.

As can be noted in Table 9.4, items BE35 and BE36 (relating to the calming and relaxing qualities of a space) were the most correlated items with patients' global evaluation of the built environment ($r = 0.69$ and 0.68, $p < 0.01$, respectively) suggesting a leading role played by such aspects in patients' overall experience of the hospital spaces. As outlined by the interview results, an overall calming and relaxing atmosphere was considered immensely important for patient wellbeing and as a general quality that should lead hospital design. Participants described how design features that promote welcoming and calming experience induced positive sentiments, rendered the space less-alienating, and helped counter the daunting and negative expectation of patient time in the hospital – conveying reassuring messages that things can be alright. The importance of such experience can't be emphasized enough given the significant worries and fears associated with cancer and its treatment.

Finding these two items topping the correlational list in consistency with patients' narrated experiences give further support to the importance of considering such aspects in the design of hospital spaces. Despite being abstract and subjective qualities, the consistency between the design intention for PMCC and BRICC (as narrated by their architects) and patients actual narrated experience of the positive sentiments they experienced within the hospital spaces points to the feasibility of communicating such abstract impressions in a universal manner, subject to being thoughtfully considered and articulated in the design of the physical space. Although it is challenging to outline definitive design approaches to facilitate such experiences, according to patient reflection, simple design consideration that aim to break up the clinical atmosphere with thoughtful use of non-traditional forms, materials, colours, and large fenestration can facilitate such an atmosphere.

Other design aspects that appeared high in the list were relevant to the level of cleanliness and orderly appearance of the hospital spaces (BE22, 23, and 25) as well as the comfortable level of the waiting spaces (BE31). Factors that associate with safe and efficient delivery of a service, such as cleanliness, has been stressed as important in the literature, not only to contain hospital-acquired infection but also to deliver messages of safety and being in safe hands (Mourshed & Zhao, 2012). This is further congruent with the interviews in which participants expressed conscious awareness of the effect of cancer treatment on their immune system and considered a clean environment essential for their health and wellbeing. On the other hand, the relatively high correlation of the item describing the comfort level of the waiting spaces is also plausible given the considerable amount of time that patients spend in such spaces, which was equally mentioned by the interview participants.

The fifth-highest item on the list was the availability of information about the building and the amenities that it offers (BE27). As noted in the results of the interviews, the presence of breakout spaces such as the kitchenette, rooftop garden, wellbeing centre, and others were considered important opportunities to offload and break up the intensity of the treatment day. However, as outlined by participants of PMCC (Chapter 5), lack of information about the existence of such spaces may hinder their positive effect. Finding information about the building itself and what it affords was quite challenging at PMCC, with number of participants highlighting the long passage of time they spent in the hospital before getting to know of the existence of such spaces. This was slightly supported in the patients' moderate evaluation of this aspect at PMCC (M = 3.77, SD = 0.97).

In the section concerning the treatment area, items that topped the list were mainly relevant to the spaciousness and availability of choice to maintain privacy if needed; setups to facilitate following individual activities; well-thought space for family members; the ease of calling nurses; and connection to the world outside the building. As discussed earlier, spaciousness (to not feel crowded in the space), having adequate personal space (one that is not overly close to other patients), and finding options to seek privacy when needed were frequently stressed during the interviews as highly important characteristics of the treatment space design. Similarly, being able to maintain a level of comfort by slightly re-arranging the space to pursue individual activities (e.g. using laptop, reading) and facilitating the comfortable presence of family members (without feelings of being in the way of the treatment processes) were considered by interviewees as important for long treatment session or presence in the room. Eye-sighting nurses and ease of calling them when needed was also, moderately, mentioned by the interview participants as well as addressed in the literature review in Chapter 2 as important for patient safety and a sense of assurance that help is within reach in case of negative events or reaction to the treatment.

A connection to the outside world, while seventh in the list, was still highly correlated and within small effect size difference compared to the top items (BE1, $r = 0.43$). As outlined in the interview results, visual connections to the outside world were one of the design qualities that participants regarded as most important for the treatment space (following basic safety and personal space aspects). Participants' narrated experience highlighted how such feature facilitated a wide range of experiences, including opportunities to positively distract patients' minds from melancholic thoughts, lessening feelings of being cut off from the rest of the world, prompting a sense of 'normality' by connecting patients back to the real world in situations where every aspect of their normal life is disrupted, and rendering a general calming, peaceful and comforting feeling. An overall design aspect, to increase spatial continuity with the outside environment, is to increase window size by providing floor-to-ceiling views. However, this should be considered alongside other contributing design aspects such as configuration of the space that allow proximity to windows as well as orientation of the treatment chair to facilitate unobstructed views. Finding these discussed items topping the correlational list in congruence with patients narrated experience gives additional support to the interview findings as well as a degree of reliability of the tool to detect the actual experiences of patients.

The mean score of each of the 36 items at each investigated hospital was recorded in the same correlational table (Table 9.4). Items scoring below a mean of 3.5 were marked to highlight a potential degree of dissatisfaction with that design aspect. A gradual increase in the concentration of the highlighted items can be noted across the columns and toward ALFRED hospital, thus explaining the low global satisfaction noted at this site. At PMCC and BRICC, despite exhibiting items with lower level of satisfaction, these items were located lower in the list, suggesting less influence on patients' overall satisfaction with the built space. On the other hand, items that topped the list (supposed to be the most influential items in patients' overall experience) were the ones that showed aspects of dissatisfaction at ALFRED as well as ONJ. This may explain why the treatment area (TA) at ONJ, despite showing a balanced number of satisfied items, had an overall low satisfaction score.

Table 9.4 Bivariate Pearson Correlation: BE individual items and participants global satisfaction

Item	**Correlation with Q9**	PMCC Mean (SD)	BRICC Mean (SD)	ONJ Mean (SD)	ALFRED Mean (SD)
BE 3	**0.612****	4.43 (0.81)	4.57 (0.74)	3.41 (0.99)	2.50 (1.03)
BE 4	**0.521****	4.13 (0.99)	4.26 (1.04)	2.77 (1.35)	2.58 (1.16)
BE 10	**0.501****	3.97 (0.99)	4.60 (0.81)	4.00 (1.01)	2.97 (1.13)
BE 14	**0.467****	4.25 (0.89)	4.54 (0.70)	3.89 (1.08)	3.00 (1.17)
BE 13	**0.451****	3.84 (1.06)	4.23 (1.00)	3.43 (1.19)	3.22 (1.04)
BE 9	**0.440****	4.52 (0.63)	4.80 (0.47)	4.31 (0.92)	4.00 (0.89)
BE 1	**0.430****	3.94 (1.07)	3.74 (1.29)	3.60 (0.88)	2.89 (1.19)
BE 15	**0.419****	4.18 (0.94)	4.46 (0.66)	3.89 (1.03)	3.31 (0.93)
BE 2	**0.406****	3.78 (1.18)	3.50 (1.15)	2.89 (1.10)	2.31 (1.12)
BE 11	**0.403****	3.99 (0.83)	4.51 (0.92)	3.69 (1.05)	3.28 (1.00)
BE 5	**0.367****	3.31 (1.44)	3.43 (1.38)	3.11 (1.13)	2.42 (1.30)
BE 8	**0.354****	3.78 (1.00)	4.11 (0.99)	2.43 (1.01)	2.67 (0.86)
BE 6	**0.321****	4.23 (0.86)	4.74 (0.57)	4.43 (0.61)	3.86 (0.93)
BE 7	**0.306****	2.59 (1.16)	4.34 (0.87)	2.08 (1.18)	2.44 (1.08)
BE 12	**0.260****	2.62 (1.09)	2.91 (1.27)	2.11 (1.18)	2.36 (1.07)

** Correlation is significant at the 0.01 level (2-tailed).

Item	**Correlation with Q8**	PMCC Mean (SD)	BRICC Mean (SD)	ONJ Mean (SD)	ALFRED Mean (SD)
BE 35	**0.692****	4.44 (0.71)	4.26 (0.86)	3.94 (0.83)	2.58 (0.84)
BE 36	**0.681****	4.65 (0.52)	4.41 (0.78)	4.08 (0.84)	2.81 (0.89)
BE 25	**0.640****	4.55 (0.63)	4.43 (0.70)	4.17 (0.77)	2.86 (1.07)
BE 22	**0.638****	4.74 (0.44)	4.74 (0.50)	4.44 (0.65)	3.57 (0.92)
BE 27	**0.608****	3.77 (0.97)	3.79 (1.04)	3.56 (0.94)	2.28 (1.00)
BE 23	**0.595****	4.76 (0.47)	4.66 (0.72)	4.43 (0.61)	3.61 (0.93)
BE 31	**0.591****	3.94 (0.96)	4.57 (0.65)	3.83 (0.94)	2.83 (1.00)
BE 29	**0.582****	3.85 (1.11)	4.53 (0.75)	4.03 (0.82)	2.03 (0.86)
BE 24	**0.569****	4.59 (0.62)	4.49 (0.78)	4.25 (0.84)	3.67 (0.93)
BE 30	**0.554****	3.77 (1.09)	4.24 (0.95)	3.44 (1.05)	2.34 (1.00)
BE 21	**0.538****	4.27 (0.81)	4.40 (0.77)	3.89 (0.98)	3.51 (1.01)
BE 28	**0.531****	3.83 (1.13)	4.56 (0.66)	4.28 (0.74)	2.11 (0.93)
BE 20	**0.499****	4.32 (0.74)	4.34 (0.80)	3.72 (1.03)	3.31 (1.01)
BE 16	**0.483****	4.67 (0.57)	4.60 (0.65)	4.33 (0.93)	3.80 (0.96)
BE 33	**0.481****	3.46 (1.08)	4.06 (1.07)	3.19 (0.89)	2.50 (0.94)
BE 17	**0.465****	4.24 (0.83)	4.54 (0.74)	4.17 (0.77)	3.28 (1.14)
BE 26	**0.460****	3.87 (1.10)	4.60 (0.69)	4.39 (0.87)	2.91 (1.12)
BE 32	**0.429****	3.00 (1.16)	3.60 (1.29)	3.28 (0.97)	2.17 (0.74)
BE 18	**0.418****	4.14 (0.88)	4.34 (0.87)	3.81 (1.06)	3.44 (0.97)
BE 19	**0.412****	4.35 (0.78)	4.26 (0.82)	3.78 (1.02)	3.56 (0.88)
BE 34	**0.367****	4.19 (0.90)	4.15 (0.99)	4.19 (0.75)	3.61 (1.02)

** Correlation is significant at the 0.01 level (2-tailed).

As suggested earlier, higher correlation indicates that items had higher association with participants' global satisfaction with the built environment, hence potential to be more important in shaping patient overall experience and satisfaction. However, the order of the list should not be considered absolute, rather it needs to be carefully interpreted as it is particularly relevant to the conditions of the investigated hospitals and their associated services and systems. This order may change if carried out at either the individual sites-level or expanded to cover a bigger sample in terms of number of hospitals and participants. More hospital settings with various environmental conditions and increased number of participants are therefore important to arrive at a more generalizable priority order, if it is ever need.

A final level of validation in this section was sought by comparing participants global satisfaction with the built environment (Q8 and Q9) to the mean score of their satisfaction with the individual items combined as an indicator of concurrent criterion validity (Andrade et al., 2012). A mean satisfaction score was computed for questions targeting the treatment area and another one for questions targeting the overall hospital setting by averaging the mean of the contributing items in each scale. Correlations between the average for the questionnaire two scales (TA & OHS) and participants response to the global satisfaction questions (Q8 & Q9) were then computed and showed high and significant correlation supporting further the concurrent criterion validity of the tool as suggested by Andrade et al. (2012). This strong correlation as well as the close similarity in the averaged means (Table 9.5) gives support to the tool's sensitivity to predict patients' overall satisfaction with the built space.

Table 9.5 Bivariate Pearson Correlation: concurrent criterion validity

	Site				Correlation coefficient
	PMCC	BRICC	ONJ	ALFRED	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
TA (M = BE1 to BE15)	3.84 (0.62)	4.18 (0.58)	3.35 (0.63)	2.92 (0.57)	0.641**
Global satisfaction with TA (Q9)	4.1 (0.61)	4.38 (0.72)	3.74 (0.73)	2.54 (1.04)	
OHS (M = BE16 to BE36)	4.16 (0.54)	4.36 (0.57)	3.96 (0.64)	2.99 (0.62)	0.725**
Global satisfaction with OHS (Q8)	4.54 (0.55)	4.60 (0.52)	4.03 (0.67)	3.21 (0.98)	
M = all 36 items	4.03 (0.53)	4.29 (0.54)	3.70 (0.58)	2.97 (0.53)	0.759**
Global satisfaction (M = Q8-Q9)	4.32 (0.56)	4.49 (0.58)	3.89 (0.63)	2.88 (0.94)	

9.3.3 Factor analysis

The study administered factor analysis as an additional step to explore the underlying structure of the built environment (BE) questionnaire items and to further demonstrate the tool's construct validity. Different statistical techniques were explored including principal component analysis (PCA) and principal axis factoring or factor analysis (FA) using two rotation techniques, orthogonal and oblique rotations (Mourshed & Zhao, 2012; Streiner et al., 2015). Both PCA and FA are data reduction techniques aiming to capture the variance in the data in a smaller set of components (Suhr, 2005). The difference is that FA assumes the existence of a causal model (having idea about the latent variable and accordingly how the items may load) whereas PCA is more of a linear combination of variables without preconceived assumptions of the data (Bryant & Yarnold, 1995). Given the attempt carried out in the previous chapter to conceptualize the latent components of the BE tool, both techniques were employed in order to explore as many options as possible. Following several iterations, the results were fairly similar with very slight differences around the factorial loading of three to four items out of the 36. Thus, and for simplification and demonstration purpose, the study opted to report the results of the PCA as the basic and initial test for such factorial exploration.

PCA was conducted on the 36 questionnaire items using varimax rotation, one of the most popular orthogonal rotation methods (Mourshed & Zhao, 2012). Eigenvalues were set to be equal or greater to 1 (Kaiser,1974). Bartlett's test for Sphericity produced a statistically significant value ($\chi^2 = 5015.09$, $p = 0.000$) and Kaiser-Meyer-Olkin measured at (KMO = 0.94) demonstrating suitability of the data to carry factor analysis. The analysis extracted 6 components with eigenvalues over Kaiser’s criterion of 1, explaining together 66.58% of the variance in the data. In that, almost half of the total variance (44.87 %) was explained by the first component. This is consistent with outcomes of similar tools reviewed in Chapter 3 (Mourshed & Zhao, 2012). Items’ factorial loadings after rotation are reported in Table 9.6. Items with loading values equal or above 0.50 were considered acceptable (Andrade et al., 2012). Values below 0.4 were deleted for simplification unless the item did not load in any of the extracted components with a value greater than 0.4. In that case, the highest loading was retained even if it is lower than 0.4. Internal consistency reliability using Cronbach’s coefficient alpha was further computed for each generated component as an indicator of scale reliability (Cronbach, 1951). All components’ alpha had values greater than 0.70, the threshold recommended by Nunnally and Bernstein (1994), except component six ($\alpha = 0.57$). The overall alpha value for all questionnaire items combined scored (0.96) indicating high level of internal consistency between the tool’s items.

Table 9.6 Rotated component matrix of the questionnaire items

Original classification	Item	Components					
		1	2	3	4	5	6
Inf.	BE 28	0.843	–	–	–	–	–
CT	BE 29	0.842	–	–	–	–	–
CT	BE 30	0.731	–	–	–	–	–
Inf.	BE 27	0.724	–	–	–	–	–
Inf.	BE 26	0.686	–	–	–	–	–
Com	BE 31	0.626	–	–	–	–	–
PD	BE 32	0.611	–	–	–	0.404	–
Ctrl	BE 17	0.600	–	–	–	–	–
PD	BE 33	0.550	–	–	–	–	–
PD	BE 35	0.550	0.546	–	–	–	–
Safe.	BE 25	0.524	0.512	0.415	–	–	–
Safe.	BE 10	0.505	–	–	0.416	–	–
SS	BE 18	0.447	–	–	–	–	–
SS	BE 16	0.380	–	–	–	–	–
ACCESS	BE 19	–	0.758	–	–	–	–
ACCESS	BE 24	–	0.730	–	–	–	–
ACCESS	BE 21	–	0.712	–	–	–	–
Safe.	BE 23	–	0.667	–	–	–	–
ACCESS	BE 20	–	0.663	–	–	–	–
Safe.	BE 22	–	0.646	–	–	–	–
PD	BE 36	0.511	0.562	0.462	–	–	–
Ctrl	BE 8	–	–	0.708	–	–	–
Ctrl	BE 4	–	–	0.690	–	–	–
PD	BE 3	–	–	0.669	–	–	–
SS	BE 14	–	–	0.601	0.411	–	–
SS	BE 15	–	–	0.507	0.441	–	–
Ctrl	BE 9	–	–	–	0.629	–	–
Ctrl	BE 11	–	–	–	0.601	–	–
Com	BE 6	–	–	–	0.576	–	–
Ctrl	BE 13	–	–	–	0.514	–	–
PD	BE 1	–	–	–	–	0.762	–
PD	BE 5	–	–	–	–	0.682	–
PD	BE 2	–	–	0.488	–	0.523	–
PD	BE 34	–	–	–	–	0.503	–
PD	BE 7	–	–	–	–	–	0.715
Ctrl	BE 12	–	–	–	–	–	0.667
Percentage of explained variance (66.58)		44.87	6.22	5.01	4.05	3.41	3.01
Cronbach's alpha coefficient (0.96)		0.95	0.92	0.86	0.71	0.77	0.57

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

As can be noted, two of the generated factors, namely components 2 and 5, contained items relevant to the conceptualization attempt of the latent attributes of the built environment carried out in the previous chapter (classifying items relevant to the conceptual basis of a supportive or healing-promoting environment). However, the rest of the factors exhibited a mix of items that deviate from the conceptual classification. None of the explored factorial analytical techniques produced any closer classification. This takes us back to the argument postulated in the literature review of Chapter 3 which was further supported in the outcomes of the interview phase. Architectural elements can hold multidimensional attributes and may convey different experiences, rendering challenges to conceptualize them as exclusive contributors to a single (unique) latent experience. For example, a space for family members, according to Ulrich's theory of supportive design and subsequent studies (Andrade et al., 2017), is a main source of social support. Looking at patients' experiences in the conducted interviews, such space was also considered as a source for positive distraction (by chatting to family members) and also contributor to a sense of control over the surrounding space to accommodate activities that patients like to do (having family members without feelings of them being in the way of treatment). The items relevant to this spatial aspect (BE14 & BE15) had their highest loading on component 4 alongside items tapping a clear sense of control over the surrounding space (BE4 and BE8).

Another outstanding example of the multidimension nature is the window view, which besides facilitating opportunities for positive distraction, helped promote other experiences such as a sense of 'normality' and an overall calming and relaxing atmosphere, balancing the inevitable clinical appearance of the treatment room. This might explain why some items may exhibit multiple loadings on different components (scales) and accordingly result in further challenges to reproduce and attain similar classification when reusing the tool in other settings (as also highlighted in the reviewed tools in Chapter 3).

The results of the factor analysis and the high intercorrelation between the individual items of the built environment questionnaire suggest that the whole set of items measure one construct – the built space. If the built space is contributing to any latent attributes (such as the ones synthesized out of the interview results, e.g. flipping negative expectations, promoting opportunities to escape, etc., they should be measured as such with questions formulated to depict the expressed experiences by the targeted population (patient). Questions that measure the explicit experience or evaluation of the architectural aspects of the built environment on the other hand, continue to be problematic if the latent attribute is the objective to be measured. Thus, such explicit satisfaction with the built space components are more logically suited to be classified from a spatial/physical point of view (e.g. the treatment space, waiting area, etc.).

This consideration of the questionnaire items to be measuring one explicit construct (the built environment) rather than a collection of latent attributes was also supported when exploring the convergent-discriminant validity of the tool's items. This test explores the extent to which each item of the questionnaire belongs to the scale it loads at (the one resulting from the factor analysis). The magnitude of correlation between each item and the scale it belongs to (convergent validity) should be substantially higher than the magnitude of correlation between the same item and the other generated scales (discriminant validity) (Pereira & de Brito Santos, 2014). All items showed strong correlation with all the six, previously generated, scales with small difference (slightly higher score) toward the scale it belongs to, indicating further the challenges to extract unique latent attributes of the tool.

With that in mind, another factor analysis was computed to explore the chances that the questionnaire would reveal components relevant to the spatial arrangement of the hospital spaces. As was indicated in Chapter 8, the questionnaire items were developed to represent two spatial-related scales (the immediate treatment area and the overall hospital setting). Factors to extract in this iteration of PCA was accordingly set to produce only two components. As seen in Table 9.7, this iteration showed more promising outcomes with all item loadings similar the preconceived spatial-related scales except for item BE10, which gives a good support for considering architectural aspects from their spatial perspective rather than any latent attributes.

Table 9.7 Rotated component matrix of the questionnaire items, two components

Item	Components	
	Spatial aspects of OHS	Spatial aspects of TA
BE 28	0.811	–
BE 27	0.807	–
BE 29	0.805	–
BE 30	0.778	–
BE 35	0.745	–
BE 26	0.734	–
BE 36	0.715	0.407
BE 25	0.706	0.404
BE 31	0.683	–
BE 22	0.640	0.413
BE 24	0.640	–
BE 20	0.640	0.436
BE 17	0.612	–
BE 33	0.609	0.440
BE 32	0.604	–
BE 23	0.588	0.448
BE 34	0.577	–
BE 16	0.577	–
BE 21	0.565	–
BE 18	0.536	–
BE 10	0.532	–
BE 19	0.527	–
BE 4	–	0.758
BE 8	–	0.743
BE 3	–	0.653
BE 14	–	0.650
BE 2	–	0.630
BE 15	–	0.624
BE 7	–	0.603
BE 5	–	0.576
BE 1	–	0.573
BE 13	–	0.569
BE 11	–	0.566
BE 12	–	0.510
BE 9	0.438	0.454
BE 6	–	0.361
Percentage of explained variance (51.1)	44.87	6.22
Cronbach's alpha coefficient (0.96)	0.96	0.89

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

9.3.4 The built environment and participants' impression of Patient-centred care and tolerability of the treatment

As highlighted in the beginning of the chapter, the distributed questionnaire contained pre-developed tools in order to explore patients' impressions of the built environment in relation to other factors related to their experience and wellbeing. Two tools were adopted measuring aspects related to the atmosphere of care and tolerability of the treatment. The Person-centred Climate Questionnaire (PCQ), developed by Edvardsson et al. (2008), was used to measure the extent to which patients perceive the climate of care to be patient-centred and as a proxy for service quality. The tool has established acceptable psychometric properties and consists of 17 items covering three main scales of care quality including: the climate of safety (relates to the social and environmental aspects of safety); everydayness (refers to the de-institutionalized environments that promote feeling of relaxation and recognizing of oneself); and hospitality (relates to the feelings of being welcome and receiving the best treatment and care).

The other included tool was developed by Mullaney et al. (2016) to measure the degree to which patients tolerate the treatment challenges. The tool covers two scales of tolerability, namely: (1) tolerability of the treatment processes; and (2) tolerability of other treatment-related sensory sensitivities (e.g. sensitivity to temperature, odours). A couple of modifications to this tool were necessary to tailor the scale to infusion-related special needs as the original one was developed to cover radiotherapy-related treatment. Factor analysis of this tool revealed the same two scales by the original study, which gave further support to the use of the two scales. Higher satisfaction with the built environment was hypothesized to associate with greater perception of care-centeredness and higher level of tolerating both the treatment process and treatment-related sensitivities. Through a series of correlation analysis using bivariate Pearson Correlation test the study explored the relationship between patient perception of a supportive environment and their perception of care centeredness.

As recorded in Table 9.8, patient satisfaction with the built environment, represented in their evaluation of the treatment area design (TA) and the overall hospital setting (OHS) was significantly associated with the different scales of PCQ and tolerability of the treatment at $p < 0.01$. Most of the correlation's magnitude averaged between medium to slightly large effect size as deemed by Cohen (2013), indicating a fairly strong association, as anticipated. The correlation coefficient between the combined BE scales and the overall PCQ and overall tolerability of the treatment averaged at $r = 0.54$ and $r = 0.\ 45$ respectively. The least correlated sub-scale was the one relevant to tolerating the treatment processes ($r = 0.28$) suggesting a small level of association. This scale was relevant to the level to which patients tolerate aspects related to the treatment process such as waiting time and overall duration of the treatment. This indicates that even with a better built environment, long waiting and treatment sessions continued to receive lower levels of toleration. It should be noted though that this analysis remains at the basic correlational level and should be interpreted as such without postulating any causational relations between the correlated factors, for both small or large magnitudes – "correlation does not prove causation" as outlined by Shadish, Cook, and Campbell (2002). Further sophisticated level of analysis including the use of multiple regression analysis and structure equation modelling may help establish these relations further alongside studies that employ further control over the investigated variables through experimental and quasi-experimental research designs.

Table 9.8 The built environment and participants' impression of Patient-centred care and tolerability of the treatment

	Built Environment scales		
	BE TA	BE OHS	BE ALL
PCQ-Safety (Q 1 to Q10)	0.351**	0.333**	0.362**
PCQ-Everydayness (Q 11 to Q14)	0.667**	0.560**	0.642**
PCQ-Hospitality (Q 15 to Q17)	0.430**	0.349**	0.406**
PCQ ALL	0.552**	0.484**	0.544**
Tolerability 1 (Q 1 to Q6)	0.278**	0.254**	0.280**
Tolerability 2 (Q 7 to Q11)	0.545**	0.473**	0.535**
Tolerability All	0.456**	0.403**	0.452**

** Correlation is significant at the 0.01 level (2-tailed).

9.4 Concluding remarks

This chapter elaborated on the field testing of the developed survey tool, expanding its construct validity and reporting on patients expanded evaluation of four hospitals in Victoria, Australia. The findings of this chapter, as well as the previous one, provide a preliminary level of support to the measurement properties of the survey tool to adequately quantify and characterise the qualitative aspects of the healthcare built environment for patients undergoing cancer infusion-based treatment. Through such tool patients perceived needs and satisfaction with the built space can be rigorously and reliably assessed. The alignment between the findings of this phase and the outcomes of the qualitative research investigations (interviews of chapter 5) support the feasibility of quantifying such subjective views of the built space. However, it also points that using such quantitative methods remain at the outer layer and additional in-depth interviews continue to be critical to understand the meanings and nuance differences behind such experiences.

Chapter 10

Conclusion

The concept of a supportive or healing-promoting environment has been a topic of interest and research over the past few decades, where studies demonstrate how the considerate design of hospital spaces can affect patient satisfaction and wellbeing and may have a positive impact on a variety of health-related outcomes such as stress, length of stay, and analgesic intake. Consequently, many of the contemporary healthcare settings in the Western world are designed in contrast to and to offer remedy for older hospital environments, the latter of which may trigger feelings of inhibition and being processed. Yet there have been only a few in-depth explorations of the significance, thoughts, feelings and meanings that patients attribute to their experiences in receiving treatment and support in such contemporary settings. It is rare for sensitive healthcare settings such as oncology care to be investigated, and even rarer for the context under investigation in this thesis (outpatient facilities).

Patients attend ambulatory cancer facilities for various reasons, including receiving different types of treatment as well as follow-up care appointments. Due to the complexity of the disease and its treatment regimens, these visits extend over a long period of time comprising both frequent presence at the hospital and potentially long treatment sessions, particularly for infusion-based treatments such as chemotherapy. Treatment settings thus become part of patients' lives and architectural features and spaces that have the capacity to support patients along their treatment journey can have considerable impact. With the increasing shift towards delivering treatment on an outpatient basis, exploring patients' experiences of the built space of such settings is timely and warranted. The lack of studies considering such a context is coupled with a limited number of validated instruments (survey tools) that are developed to measure patient perception of the healthcare built environment and have the capacity to assess the extent to which such spaces possess the qualities that contribute to the creation of a supportive or healing-promoting environment.

This study therefore aimed to research the role that the built environment of ambulatory cancer facilities plays in supporting the experience of cancer patients undergoing intravenous anti-cancer treatment (e.g. chemotherapy) and the impact of such impressions on their satisfaction and wellbeing. Through a mixed-methods approach, including qualitative (in-depth) interviews and the development and testing of a survey tool to measure patient perception of healthcare built spaces, the study also aimed to determine salient architectural design features (or qualities) that elevate patients' sense of a supportive environment and explore how such a level of support may contribute to experiencing a climate of patient-centred care.

The thesis started by reviewing the literature in order to document previous attempts to explore patient experience of the built environment within oncology-based settings. Two sets of systematic reviews were conducted in line with the thesis objectives. The first, explored preceding qualitative studies that tackled cancer patient experience of the built environment with the purpose of furnishing the conceptual grounds for the investigation of this thesis. The review demonstrated a gap in the literature, with only one study (among the eleven relevant primary studies identified) focusing on the built space of outpatient infusion centres in the United States. The chapter concluded with the development of a conceptual framework synthesising the major, wellbeing-related, architectural design qualities that contribute to the notion of supportive or healing-promoting healthcare environments.

The second review researched the previously developed tools to measure patient perception of the healthcare spaces. Similarly, the outcome pointed to the lack of validated tools to measure patient perception of the healthcare built environment in general and cancer facilities in particular. In that, no tools dedicated to measure patient perception of the ambulatory built environment of cancer care facilities were found and the detected tools exhibited number of shortcomings such as lack of a clear conceptual basis in their development and dependence on statistically-derived classifications of their constructs, resulting in imprecise classification of the tool's items as well as elimination of architectural elements that are considered of general importance to the healthcare context. The chapter synthesised the methodological quality of the detected tools, the consequences of applying psychometric testing methods for tools developed to measure non-health related aspects (architectural qualities in this case), and the extent to which these tools cover the architecture domain of ambulatory cancer facilities as a starting point for the development of this thesis own tool.

10.1 Conducted fieldwork

10.1.1 Interview phase

A qualitative inquiry was an essential first step to explore the role that the hospital built environment plays in cancer patient experience as well as unravel the significance and meanings people attribute to such experiences. In-depth, face-to-face, interviews guided by the methodological grounds of a phenomenological investigation was planned and conducted for this phase. A purposive sampling strategy guided the selection of the study sites as well as potential patients participating in this research. A central focus of this thesis was to account for experiences in healthcare settings that are designed following established principles of supportive and healing-promoting environments. Interviewing patients attending contemporary healthcare settings was therefore fundamental. Considering experiences in less developed settings was also important in order to maintain a degree of comparability and explore the potential impact that different building conditions may have on patients' satisfaction and wellbeing.

Accordingly, patients undergoing intravenous anti-cancer treatment, including number of former patients, were recruited from outpatient cancer care facilities across two contexts, Australia and Egypt, including two major treatment centres and two consumer groups in Victoria, Australia, and one health centre in Egypt. Australia served as a context in which contemporary hospitals are designed following established principles of evidence-based design and healing-focused environments, enabling the exploration of firsthand lived experiences in such newer settings. Patients' experience of older settings was also considered through former patients in the two consumer groups, as well as the deliberate exercise of asking participating patients (at the two Australian health sites) about their past experiences of older healthcare settings. On the other hand, the consideration of the Egyptian context expanded the diversity of the study sample and facilitated an additional level of exploration of buildings in relatively poorer physical conditions and the potentially extreme impact they may have on patient experience and wellbeing.

Interviews were guided by a semi-structured framework comprising a combination of content mapping and content mining questions in order to keep the discussion flexible and allow participants to lead the discussion with topics, and in the order, most relevant to them. The recruitment of patients followed number of strategies, involving the nursing team and treating doctors, in order to recruit a sample set of patients with relative interest in the study, which, as per a phenomenological approach, is important to maximise the potential to achieve thorough and accurate descriptions of the lived experience under investigation. That being said, a number of participants were approached following a convenient sampling strategy, during their waiting time, contributing further breadth to the study in representing wider perspectives. In total, twenty-four patients or former patients participated in this phase, in addition to a general discussion with six architects expert in the design of such spaces.

Data was systematically analysed following established guidelines for conducting qualitative research in the fields of social and health sciences. This included a structured process, starting with the transcription of the recorded interviews followed by several iterations of reading and coding the text in order to search for patterns and themes within the data, as outlined in Chapter 4. The content was comprehended progressively by working inwards from a basic to a global interpretation of the text. This included initial identification and description of the explicit or semantic meanings of the data, while progressively shifting to a more comprehensive interpretation by developing conceptual ideas of the potential latent or implicit signification of the data. NVivo software, alongside manually-based methods (such as sticky notes) were used to aid the analytical process.

Meticulous records of the interview conduct and detailed documentation of the analytical processes were maintained to ensure an acceptable level of rigor and credibility in the analysis of subjective data. Using the consolidated criteria for reporting qualitative research (COREQ) checklist, the thesis reported a detailed account and description of the study design, assumptions, analytical framework, and findings in order ensure that important aspects of the research are appropriately considered while minimizing potential bias.

10.1.2 Survey phase

Alongside the interviews, a further quantitative investigation was considered to cover the other gap noted in the literature by developing a survey tool tailored to measure patients perception of the ambulatory built environment of cancer care facilities and the extent to which the built spaces possess the qualities that contribute to the creation of a supportive environment. The development was guided by established principles for developing valid and reliable measurement scales in the field of health sciences and was processed in two main stages. Basic credible properties of the tool’s content was first sought through a process involving reviewing the literature and previously developed tools, consultation with recognized experts to explore the tool's face and content validity, examination of the readability of the devised items, and pilot testing to explore the usability and legibility of the tool during the interview phase. Items were systematically refined throughout this process, resulting in a tool consisting of 36 items (questions) covering different aspects of the ambulatory built environment at two scales (the treatment area and the overall hospital setting).

An expanded field testing then followed, in which the questionnaire was distributed to patients across four hospitals in Victoria, Australia, including the two settings in which the interviews were conducted. Two-hundred and seven surveys were collected in this stage and analysed using SPSS software to further examine the tools psychometric properties and explore its construct validity. This included number of statistical analytical techniques such as examination of the tool's predictive validity (sensitivity to detect differences between users' perception of different environmental conditions), concurrent criterion validity and the convergent and discriminant validity of the tool's items. Factor analysis and internal consistency reliability measures were also considered to explore and validate the underlying constructs of the tool. The tool was then used to empirically quantify and characterise patients' perception of the built environment by undertaking relevant descriptive and inferential analytical techniques of the collected data. This included basic descriptive analysis reporting on the mean and standard deviation of the questionnaire items as well as correlational analysis using subscales of the survey tool to highlight architectural aspects leading patients' overall experience and examine the relationship between patient perception of a supportive built environment and their overall wellbeing and perception of care centeredness.

10.2 Main outcomes

10.2.1 Roles of the built space

Participants' accounts in this thesis highlighted some of the distinct roles that a hospital's built space can play in shaping cancer patient experience and wellbeing. Besides the commonly established roles that have been identified in the literature of architectural features that have the capacity to divert focus from melancholic thoughts as well as being sensitive to patient illness-related vulnerabilities (e.g. in case of cancer, being attentive to the potential for physical fatigue by considering designs that eliminate unnecessary walking distances and maintain patient ergonomic comfort at different levels), a number of additional pronounced roles appeared in the capacity of the built space to shift or convert patients' potentially negative expectations of their time in the hospital, help break up the intensity of the treatment day at times of feeling overwhelmed, and provoke engaging in activities beyond treatment and being sick (all discussed in detail in Chapters 5 and 6, responding to the thesis **first research question**: what are the roles that the built environment of ambulatory cancer facilities play in patient experience?).

The importance of such roles of the built environment was evident when examining the implicit signification of patient narrated experiences in Chapter 7 (responding to the **second and fifth research questions**: what impacts do different healthcare environmental conditions have on patients' satisfaction, wellbeing and other health-related outcomes?; and, to what extent is the physical environment in outpatient cancer facilities conducive to a climate of patient-centred care?). Patients in general, and participants of this study as well, express how visiting hospitals is usually combined with preconceived ideas about the design characteristics of such spaces, recognizing them as alienating, sterile and institutional environments that feature rudimentary conditions characterised by narrow corridors, cramped and crowded spaces, and dull colours. Compounded with that, is the widely known deleterious effects of cancer treatment modalities and how sick patients can get as a consequence of a treatment such as chemotherapy. It is therefore not unusual for patients to develop fears and negative ideas about their time in the hospital, thinking of it as a place of gloom and sadness. When participants were asked to describe their experience when first walking through the hospital building they invariably described the design of the spaces with words such as impressive, positive, uplifting and captivating. The considerate design of the contemporary hospital spaces within the Australian context not only shifted patient expectations of a typical hospital space as drab and dull, but also induced positive, welcoming and calming impressions that things can be alright.

Pre-treatment anxiety and stresses, specifically during first treatment sessions, can be of significant challenge to cancer patients. Anxiety may amplify the severity of the treatment's side effects, causing patients to experience additional symptom distress. Patients' accounts in this study pointed to how a less intimidating design of the built space and its role in conveying feelings of reassurance may help alleviate some of the worries and fears associated with a visit to such a place, potentially contributing to less experience of symptom distress. This was noticeable not only in participants' reflection on how specific design features of the space helped 'passively' stimulate relaxation sentiments, but also on other 'active' levels where, for instance, a flexible design and affording options to adjust the surrounding space may mitigate, and give patient further level of support to cope with, some of the contextual sources of stress such as potential emergencies of the shared treatment space and conditions of being witnessed at their sickest (e.g. during potential anaphylactic reaction to the treatment).

Affording opportunities to break up the intensity of the, potentially, long treatment day through features and spaces that facilitate possibilities to mentally, as well as physically, escape the treatment routine, were prominent in giving patients a sense of ease and opportunities to tolerate the overwhelming, inevitable time spent in a place hosting aversive and disliked procedures – the cancer hospital. The presence of intermediate spaces such as a kitchenette, the rooftop garden and the wellbeing centre at the Australian hospitals not only provided opportunities to attain a desired sense of escape and break up the clinical routine at times of feeling exhausted and overwhelmed, but also contributed to a unique sense of attachment, provoking future commitment to the place, as one of the study participants indicated, reflecting on her and other patients volunteering position at the wellbeing centre.

This notion of **balancing the unavoidable presence** in the hospital through stimulus and less intimidating design features, as well as spaces that provoke engaging in activities beyond treatment and being sick (wellness-based activities), should be considered very significant to cancer patients as they not only come to the hospital with a diagnosis that is overwhelming, disrupting almost every aspect of their life and imposing physiological and psychological stresses, but they are also faced with the contradictory situation of getting treatment that is toxic in the first place, which (according to participants' accounts) may prompt fear and potential resistance to the treatment and its associated spaces.

Another level of the implicit importance of the built space was apparent when comparing patients' experience in old and new hospitals. Australian patients' past experience in older hospital settings varied between an uncomfortable experience that rendered the space unpreferable to an awful, horrible experience that patients hated and negatively remembered. On the other hand, some of the Egyptian participants, who were interviewed in a relatively traditional facility, had the chance to attend other, more advanced, facilities where they expressed how positive their experience was and how they continue to desire returning to such settings.

The capacity of the hospital space **to contribute to** such **positive memories**, or more importantly, the risk of contributing to negative memories was also evident when understanding Egyptian participants extreme experience with their current hospital. Egyptian participants repeatedly highlighted how the rundown conditions of the built space, in which they were interviewed, contributed to negative experiences that built up a substantial barrier between them and the place, to the extent that number of them expressed instances of refraining from coming back (e.g. supplicating to treating doctors to allow them to receive treatment in other healthcare centres, postponing medical appointments and missing a number of treatment sessions). Egyptian participants continually expressed how the built space could have helped them develop positive memories to balance the inevitable hard times in the hospital and, above all, find reasons to return and continue the treatment. The absence of any positive values in the built space added up to an overwhelming experience and made it unbearable at some points in their treatment.

The importance of the Australian participants' pronounced positive experiences with the hospital spaces, as well as the Egyptian participants' aspiration for maintaining hope and a positive attitude through aspects of the place and its design, is in line with Lazarus and Folkman's theory of stress and coping and points to how considerate design of hospital built spaces may give patients opportunities to regulate their emotional responses to a significant problem such as cancer, potentially fostering the affective strategies that individuals might adopt to cope with the burden of such disease. Through the elevation of positive values of the space design, the built environment appeared to play a complementary role by either motivating patients to stay with their treatment and **encouraging reasons to return**, potentially improving compliance with the treatment, or acting as an object that alienates and discourages patient from returning in case they build up extremely negative experiences with the place.

Cancer-related studies, as well as the Victorian Department of Health and Human Services (DHHS) in Australia, advocate the importance of emotional and wellbeing support as a core component of attaining and maintaining optimal care for cancer patients. In that, placing patients' needs and expectations at the centre of care are considered important to support and empower them with a sense of control and a chance to readjust in such intense situation. This is also the basis of the concept of patient-centred care which rests on the notion of facilitating opportunities for individuals to: "i) possess considerable qualities, ii) draw strength from available resources; and iii) find a way to remedy difficulties" (Morgan & Yoder, 2012).

Through exploiting the power of emotions in place design, the built environment can complement patient-centred care. Participants' experiences, as detailed in this thesis, pointed to the additional role of the built space in complementing an overall level of emotional support and sense of empowerment beyond mere accommodation of basic treatment, complementary and supportive services. The role of the hospital spaces to induce interest and promote positive memories and values in the midst of the potential negativities and contraries experienced of a disease such as cancer and its associated treatment place showed the potential to cultivate and extend an extra level of support. The design of the built environment, through its consideration of and attention to patient needs contributed, collectively, to an overall emotional connection with the space, establishing a comprehensive sense of support that connects across all aspects of the hospital entity (people and place) – conveying a level of care for the whole person.

10.2.2 Quantifying the subjective experience

The perspectives aggregated throughout the survey phase at the Australian hospitals asserted users' broader positive impressions of the design of the hospital spaces in which patients were interviewed (providing further response to the **fourth research question**: to what extent do cancer patients perceive the built environment of ambulatory treatment and support spaces to be supportive of their needs?). Participants' rating of the 36 built environment items was relatively high with only two items receiving dissatisfactory assessment (below the neutral mark). Following further inferential exploration of participants' responses, the study was able to generate a list of architectural aspects in the order relevant to their potential in leading patients' overall experience of the built environment. Items that topped the list were in congruence with patient-narrated experiences in the interview phase. In that, design aspects that promote an overall welcoming, calming and relaxing atmosphere, alongside maintaining an acceptable level of cleanliness and orderly appearance of the hospital spaces, were aspects that topped the list at the overall hospital design scale. The level of comfort experienced in the waiting spaces, as well as the availability of information about the amenities that the building offers, were also aspects that came high in the list for design considerations related to the overall hospital setting. Similar congruence with patient-narrated experiences appeared at the treatment area level. A sense of spaciousness at the place of receiving the treatment and availability of options to regulate privacy when needed were aspects that headed the priority list. The analysis also highlighted aspects such as setups to facilitate following individual activities; well-thought space for family members; the ease of calling nurses; and connection to the world outside the building as main qualities that a treatment space needs to provide. Detailed discussion of such design factors is outlined in Chapter 5, with further reflection across Chapters 6, 7 and the survey results of Chapter 9 (responding to the **third research question**: what are the salient architectural design features that elevate cancer patient perceptions of a supportive environment and what others may hinder that?).

Patient satisfaction with the built environment was also significantly associated with other subscales introduced in the questionnaire to measure their perception of the climate of patient-centred care and the degree to which patients tolerate some factors of the treatment challenges such as treatment-related sensory sensitivities (e.g. sensitivity to temperature, odours). This aligned with the interpretation conducted in the interview phase suggesting a further relation between positive perception of the built environment and chances of perceiving the climate of care to be patient-centred (complementing the response to the **second and fifth research questions**). That being said, other subscales of the tolerability factor (relevant to the treatment processes such as waiting time, length of the treatment sessions) exhibited small level of association. It is worth noting that these analyses remained at the basic correlational level and hence do not claim any causational relations between the correlated factors.

Following number of psychometric (statistical) testing analysis, the study established further promising properties of the developed built environment tool. Subsequent to demonstrating the face, content and readability aspects, the tool showed positive attributes of predictive validity, concurrent criterion validity and an acceptable level of internal consistency reliability, supporting further the tool's construct validity. On the other hand, factor analysis continued to point to the challenges of extracting architectural-related scales able to depict latent attributes of the built environment. As discussed in the review of previous tools (Chapter 3) as well as the outcome of the conducted interviews (Chapter 7 and 9), architectural elements can hold multidimensional attributes highlighting possibilities to shape different experiences and rendering challenges to conceptualize them as exclusive contributors to a single (unique) latent experience.

Although a very careful process was adopted to classify the devised items of the built environment tool relevant to the conceptual basis of a supportive environment (e.g. contribute to positive distraction, sense of control), factor analysis continued to produce scales that align in part and differentiate in others similar to what has been noted in the review of previous tools, where difficulties to reproduce and attain consistent classification when some tools were reused was apparent (Chapter 3). What was consistent was the scales extracted in the attempt to classify the questionnaire items relevant to the basic spatially-related qualities they belong to, such as the spatial arrangement of the hospital spaces (the treatment area and overall hospital setting), in which factor analysis produced identical scales as per the preconceived classification. This suggested that questions inquiring about the explicit experience, satisfaction or evaluation of the architectural aspects of the built environment remain problematic to frame or limit them to specific latent experiences, rather they appear to be more suited to represent the explicit spatially-related qualities to which they hold or belong.

If the latent experience (such as the affective contribution of a built space or the emotion-inducing quality, feelings or attitude towards a built space) is the one of interest, then it might be better to measure it as such through questions formulated to depict the expressed experiences by the targeted population (patients in this case), akin to how tools in the field of health sciences are developed. In that, interviews with the targeted population to highlight the depth of the phenomena under investigation are essential. The synthesized outcomes (similar to the ones developed in this thesis, e.g. the conceptual role of the built environment in flipping negative expectations, promoting opportunities to escape, etc.) can then be used to develop a pool of items depicting the expressed experiences that can be then screened in expanded field testing.

10.3 Thesis contribution

10.3.1 Contribution to the field of research

Patient experiences as outlined in this thesis support the importance of the built environment to the human dimension of illness and healing. The outcome expands the existing theoretical propositions of a supportive healthcare built environment with further rich and in-depth understanding of its potential constituent elements. It points to a refined, and more comprehensive, conceptual understanding of the way the built environment may promote wellbeing through rigorous documentation and interpretation of patients' subjective experiences of such spaces within both contemporary and old settings. It also facilitates a platform for designers to empathise, intellectually and emotionally, with such firsthand lived experiences – potentially influencing their design concepts and decisions. Such detailed account of patient experience, following established guidelines for conducting credible research, holds further potential to facilitate communication between disciplines characterised by a rigid positivist scientific stance on one side and architectural practice on the other, which tends to rely on intuition and experience with few credible research findings to back up the negotiating of their design decisions with relevant stakeholders and the medical profession.

The outcome of this thesis also sheds additional light on the extent to which the hospital built design may affect aspects related to patient health and wellbeing. It highlighted the distinctive effect of the built space not only in balancing the compelling and unavoidable presence in the hospital but also in contributing to positive values that can be of support to patient coping strategies with the overwhelming situation of cancer and its treatment: encouraging reasons to return and continue the treatment, potentially enhancing patient compliance with the treatment. The findings pointed also to the potential role of the built environment to go beyond just easing patient presence in the hospital, to potentially contribute to the severity of patient experience of symptom distress. The role of the built environment in flipping negative expectations and avoiding exposing patients to contextual sources of stress, rather promoting a welcoming and calming atmosphere, may help alleviate some of the worries and pre-treatment anxiety which has showed (in previous research) to have significant effect on the severity of symptom distress in patients. Patients' experience pointed to several instances in which the built environment, through exploiting the power of emotions, can subtly and latently empower patients and heighten their perceived sense of support, potentially contributing to experiencing a comprehensive level of patient support.

On the other hand, the developed survey tool provides further opportunities for both architects and the scientific field to adequately quantify and characterise the qualitative aspects of the healthcare built environment for patients undergoing cancer infusion-based treatment. The exploration of the tool's measurement properties following established psychometric testing techniques gives a preliminary level of support to the tool's construct validity, through which patients perceived needs and satisfaction with the built space can be rigorously and reliably assessed. It also provides a sound platform for acquiring rigor and valid data to test hypothesis-based studies and investigate the nexus between the built environment and patient health-related outcomes, as well as assessing design commitments to provide patients with appropriate levels of environmental support across similar building typologies – an essential approach to improve evidence-based design model. Through simple correlational analysis, potential implications for future design and renovation can be attained through the deployment of such tool among the targeted users of the space.

The study contributed further understanding to the intricate challenges of applying psychometric testing techniques to evaluate tools developed to measure non-health-related aspects such as architectural attributes. In that, the study demonstrated, through the review of available tools as well as the empirical examination of the developed tool's construct properties, the basis on which such tools can be developed, distinguishing and asserting two main approaches in formulating and classifying items of such tools. These include spatially-related approaches (covering explicit architectural qualities relevant to the spatial arrangement of hospital spaces such as the treatment area, waiting spaces, etc.) and emotion-inducing qualities (covering latent feelings or attitudes attributed to the built space).

The findings of the statistical exploration of the developed tool pointed to the plausibility to classify items based on their spatially-related qualities and expect that to reflect on the statistical analysis outcome. However, using the same items to measure latent attributes (as many of the previous tools do) can be misleading, even if showing some congruence it can be difficult to attain similar classification when the tool is reused with other samples of the population. It is more rational and statistically valid in this case to classify the items based on their architectural spatial essence (treatment space, waiting space, etc.).

10.3.2 Contribution to architectural practice

In addition to the rich narrative contributed by this thesis for architects to empathise with patients' circumstances, potentially provoking their thinking about innovative design ideas that are able to enhance patients sense of support, the thesis contributes to a pool of wellbeing-related design principles that have the capacity to guide the planning and conceptualization of infusion-based treatment settings toward a more comprehensive supportive environment. A reflection on number of distinct approaches is highlighted in the following:

An overarching impression that a healthcare space needs to realize through its architectural design was the creation of environments that promote a welcoming and relaxing atmosphere. An overall calming atmosphere was considered important for patient wellbeing and as a general quality that should lead hospital design agendas. Participants described how such environments induced positive sentiments, rendered spaces less alienating, and helped counter the daunting and negative expectation of patient time in the hospital. Despite being abstract and subjective qualities, according to participants' reflections, simple design considerations that aim to break up the clinical atmosphere and eliminate signs of traditional hospital settings were key to achieve such experiences. The thoughtful integration of unusual, less hospital-like, design characteristics such as: the open feel of the foyer; the generous central atrium with abundance of natural light; the contemporary colour schemes, artwork and music; the incorporation of natural materials and large fenestration; accommodating spaces that facilitate everyday scenes to take place within the hospital setting (e.g. amphitheatre, café, public art galleries); and even the precise functionality of the space, contributed collectively to such a tranquil, familiar, less intimidating atmosphere and played a prominent role in shifting patient expectations of their time in hospital.

Although many of these approaches are common sense and align with architects' intuitions, a less adopted architectural approach relevant to the detailed design and visual character of the entrance hall stands out in participants' reflection in this thesis. The consciously architectural approach in shaping the form and appearance of the atrium space, including the introduction of unique geometric forms and soft 'organic' curves at one of the study sites and the reinvigoration of a historic building within the atrium space at another site, contributed to a strong visual character of the space that further impressed and inspired visitors as well as afforded various moments of exploration and reflection. Participants' wide reflection on the role of the unique architectural form in shaping such a stimulating, uplifting and peaceful experience point to the importance of exploring innovative ideas to improve the detailed design of such points of 'first encounter' to patients.

Providing healthcare settings with spaces that offer opportunities to break up the intensity of the treatment day within non illness-related settings that rather encourage engagement in activities that promote health, wellbeing and continuation of life outside of cancer helped enrich patient experience with further positive moments. Intermediate spaces such as kitchenettes, lounge areas, rooftop gardens, and the wellbeing centres sparked motivation to go for a walk and break up the clinical routine – giving patient an 'excuse' to attain a desired sense of escape or retreat at times of feeling exhausted. The rooftop garden, in particular, was a prominent feature in shaping patient experience and providing an appreciated opportunity to both mentally as well as physically escape the intensity of the treatment day and detach for a while. The stimulation of a multi-sensory experience, including visual as well as olfactory and auditory senses, was what distinguished such a feeling of escape, in comparison to other indoor destinations. Its grounding nature that connects patients back to real life and promotes a sense of normality to balance the artificial clinical routine gave patients an appreciated opportunity to unwind and recharge.

The prominent contribution of the rooftop garden to patient experience, and the way patients all stressed its importance, suggests that such breakout spaces do not have to be exclusive for the time before or after treatment (e.g. during waiting) but can be stretched to enrich patient experience during the treatment itself. With the advancement in treatment delivery techniques (e.g. portable infusion pumps), patients do not have to be confined to the treatment chair. Options to move during treatment or take the treatment in outdoor space (weather permitting) hold promising directions for pushing space design, as well as the care model, in favour of patient wellbeing. Exploring the integration of such spaces in close proximity to patient treatment areas can be further opportunities for architectural experiment.

Today’s practice provides examples of such potential integration. In a project named Chemotuin, at the Tergooi Hospital in Hilversum in the Netherlands, a wooden pavilion is placed in an outdoor garden surrounded by grass, flowers and shrubs to provide a protected, yet open air environment for chemotherapy treatment. Another example can be observed at the St. Charles Bend Cancer Center in Oregon, USA, where the infusion bay is designed with a connection to an outdoor deck so that patients can receive their treatment outside when desired. The Memorial Sloan-Kettering Cancer Center in Brooklyn New York provides another example where treatment pods are integrated with a central garden that contains a series of divided activities zones, within which, patients who feel well can choose to leave their treatment pods and gather or engage with other patients and caregivers. Of these provided zones are conversation areas, library, and a communal “farm table” that allows for wide range of shared activities.

In a complementary question in the distributed survey, participants were asked to express their interest to receive the treatment in an outdoor setting (porch or garden – weather conditions permitting) and the extent to which they think this might help improve their treatment session time. Around 60% of the participants (N = 121) responded yes, indicating interest to have such an option and considered it to “help a great deal” with a mean score 8.3 out of a 10-point Likert scale response. This points to an interesting area for architects to explore ways to increase the integration of breakout spaces within close proximity to the treatment space.

Whether such breakout spaces are presented within the treatment area or other parts of the hospital building, exploring effective ways to communicate the existence of such supportive amenities is important as participants of this study expressed the long period of time they spent in the hospital before getting to know of the existence of such spaces. An area for architects to explore would be novel ways to facilitate access to such spaces as well as integrate subtle reminders of their existence in their designs.

In the treatment space, participants’ experiences not only supported the importance of maintaining visual connection to the outside environment as most of the literature and common sense recommend but also highlighted a preference for expanded spatial continuity through enlarged window sizes (e.g. floor-to-ceiling views). Such connections not only facilitated a less intimidating feel about the treatment space by rendering a general calming and comforting sentiment but also was important in lessening feelings of being cut off from the rest of the world and prompting a sense of “normality” by connecting patients back to the real world. Maintaining proximity to windows as well as orientation of the treatment chair to facilitate unobstructed views were also highlighted. It is worth noting that increasing window sizes, although beneficial to promote humanistic values in design, may have environmental consequences specifically in hot-arid climates which places further challenges for architects to explore novel ideas to balance the potential heat gain and energy demand of such design attribute.

Another standout requirement in the design of the treatment spaces was relevant to maintaining an adequate sense of a personal space, even if the treatment is received in a shared room. Participants invariably criticized the idea of being crowded and packed in a space with repeated rows of chairs and rather preferred smaller groupings of patient (between 3 to 6 chairs). The potential situational sources of stress such as negative reaction to treatment and stresses from seeing potential emergencies in the treatment room pointed further to the importance of exploring ways to give patients additional options to regulate their privacy when needed. Such choice was important for patients whose outlook is affected by the treatment (e.g. hair loss) or felt sick and wanted not to be seen at their most ill.

Besides providing options for individual treatment rooms, the design of the shared treatment space through aspects such as: layout spatial configuration and arrangement of the treatment chairs; the capacity of changing the chair's orientation away from the central activities of the room; the use of partitions and furniture that allow a level of adjustment to the space to be relatively private; and the integration of technologies that allow for adaptable and flexible spaces (similar to the design shifts discussed in Figures 5.19 and 5.20 in Chapter 5), provide examples of how design approaches can afford subtle improvements to facilitate patient needs. It also provokes architects to use their creativity to explore innovative design options that can push the boundaries of accepted practice in this area and achieve a greater level of flexibility in the design of such spaces.

Another potential subtle shift in the design of the treatment space was relevant to patients' pre-treatment anxiety and the potentially heightened stress during their first treatment session. This raises another design challenge to minimize encounters with frail patients whose potentially pale and hairless appearance may be quite confronting for new patients, as it challenges their potential hope to get through the treatment and survive. Designating spaces for new patients in separated treatment zones as well as arrangement of chairs into small groupings, in addition to increasing choices for individual treatment rooms, may help minimize such encounters and alleviate the initial daunting feeling felt by many patients at the prospect of infusion treatment.

Such design considerations raise empathy to the forefront of the design process, help architects adopt experiential approach to their conceptual ideas and inspire design thinking to achieve both creative outcomes and sound improvements in the quality of treatment spaces. An attempt to compile the different design features leading patient experience is presented in Table 10.1 and, as indicated earlier, detailed discussions are incorporated in Chapters 5, 6 and 7.

Table 10.1 Architectural qualities elevating patient sense of a supportive environment

At the hospital entrance level (foyer design and atrium space)

- sense of openness.
- visual connectivity.
- natural light.
- unique visual character (detailed design):
  considering features such as curved architecture, organic form, blend with heritage building, colour palette, artwork, painting, patterns developed by different wall textures and finishing materials, timber cladding, wall angles, and the like.
- background music.
- integration of communal facilities (e.g. café, amphitheatre steps, unique and consciously designed seating spaces).
- affording opportunities for people to gather, sit and engage in everyday activities.

The treatment space

- expanded views and connection to the outside world through large fenestration directed to:
  - views to nature (aspects of interest include trees, leaves and greenery, sky, play of natural light, and the changing weather).
  - views to street environment (aspects of interest include traffic and antics of cars, people moving on the street, site-specific conditions such as construction work).
- configuration of the space and layout arrangement to facilitate:
  - chair orientation toward windows.
  - chair orientation away from the clinical activities of the treatment space (through movable and able-to-rotate chairs).
  - precise functionality of the space.
- consideration of various options for privacy when needed:
  - avoiding repetitive rows of chairs.
  - avoiding orientation toward the centre of the room.
  - provision of variety of chairs setups and groupings.
  - use of retractable partitions or other flexible technologies.
  - partitions with engraved figures/drawings (e.g. etched glass).
  - flexible tables (easy to adjust and flip).
  - internal windows between treatment pods.
  - designated treatment zones for new patients separated from already started or frail patients.
- facilities to help occupy session time:
  - setups to help adjusting the surrounding space.
  - chairs with slide-out table.
  - dedicated table and a storage space easy to reach while sitting on the chair.
  - basic fittings such as power points close to hand.
  - options for personal display with controlled content.
- spaces equipped to accommodate family members (enough space and chairs).
- attention to patient sensitivity and treatment-related vulnerabilities:
  - position of air-conditioning fins; use of deflectors or any type of diffusion; higher rates of air change per hour; air filtering technologies.
  - multiple HVAC control zones; over-hanging radiant heaters; recliners with heated-seats; storages for blankets close-at-hand.
  - noise reducing finishes; noiseless paging systems; integration of pleasant sounds (e.g. soothing music).

Overall hospital setting

- accessibility and wayfinding:
  - shorter walking distances.
  - options to rest along corridors.
  - compact (block-like) design of the overall building.
  - openness-based design (e.g. use of atrium).
  - visual connection (e.g. between different floor levels).
  - clear and visible positioning of signage.
  - appropriate scale of signage text.
  - reducing identical architectural character of different floor levels.
  - integration of recallable landmarks (distinctive colours or decorative objects at major intersections).
  - detailed explanation of integrated technologies (e.g. automated lifts).

- waiting spaces:
    - location of waiting spaces away from public users of the hospital.
    - integration of corners and alcoves / visual privacy partitions.
    - private meeting rooms for communicating sensitive information.
    - variety of engaging setups within the waiting spaces.
    - use of recalling technologies to liberate waiting location.
- integration of other non-traditional spaces beyond the welcome hall (e.g. rooftop garden, wellbeing centre)
- information about the building and the amenities it affords.

Breakout spaces (promoting health and wellbeing)

- intermediate spaces within the treatment space (e.g. kitchenette, lounge area).
- chapel.
- access to outdoor spaces (rooftop garden):
    - setups for different levels of engagement (individuals and group gatherings): e.g. individual nooks; communal tables and integration of café space; protected outdoor spaces from wind and weather change; easy access.
- wellbeing centre:
    - mixture of complementary services (e.g. workshops, dietitian consultation, support groups, massage therapies, art therapy, etc.).
    - various individual and group sitting areas.
    - couches around a fireplace.
    - cushions and throws.
    - individual sleeping and consultation pods.
    - books area/ shelves.
    - cooking demonstration area with communal table.
    - areas with other shared activities such as jigsaw puzzles.
    - computer access.
    - kids play area.
    - noticeboards or digital displays to communicate relevant information related to health and wellbeing.
- Spaces tailored to different age groups:
    - e.g. options for young adults to frame their (waiting) time in activities that are not necessarily disease-related. Lounge areas accommodating options for group activities and individual retreat (small pods and booth); dedicated areas for school and study; entertaining rooms with latest movies, communication and gaming technologies, and the like.

10.4 Limitations

Although the conduct of this research has followed rigorous, systematically structured, process, it is still prone to the researcher’s own bias, particularly for the interview phase. Comprehension of subjective data is never ultimate, rather a step requiring continual progression to enhance the understating of the bigger picture, as Seamon (2000) framed it reflecting on analysing textual data: “interpretation is never complete but always underway.”

Although the interviews sample size was guided by the saturation approach, the number of participants at the Egyptian site remained small in comparison to the Australian group which might have hindered the exploration of wider perspectives at the Egyptian context. Additionally, most of the participants were from a relatively young age group (20 to 30 years old). These patients, despite attending a public hospital, were interviewed in the private department which can be in a slightly better condition than the remaining free-of-charge (publicly-funded) services of the hospital. On the other hand, Australian participants’ experience of less developed settings was limited to their narrated past experience and no ongoing lived experience was obtained in the interview phase which highlights a potential limitation to rigorously account for such experiences in the western culture.

Even though there are noticeable differences in the culture and model of care between the Egyptian and the Australian contexts, which makes the comparison and synthesis of the data challenging, the alignment between Egyptian participants' aspirations for and expressions about the built conditions that would facilitate positive time in the hospital and the Australian patients actual experience of such thoughtfully-designed spaces supports the consideration of the Egyptian context as a tentative comparable experience. Although different at the outset, the circumstances of the disease and its treatment was a common ground that could have led to such comparable experiences, supporting further a degree of generalizability of the thesis findings.

The survey phase, despite being helpful in complementing the qualitative data, was limited to the Australian context due to time limitation of translation requirements. Furthermore, the collected data in this phase for the category that represents old facilities was limited to one site and with relatively small number of participants (N = 36) pointing to potential limitation in accounting for wider perspectives. Previous studies in the field of testing tools' validation aspects recommend 10 to 1 ratio for subjects to questionnaires items in order to maintain a credible level of factor analysis (Watson & Homewood, 2008). The overall sample size collected in this study (N = 207, targeted 360) fell short in meeting this recommendation which highlight possibilities for less accurate outcomes.

10.5 Future work

The outcome of this thesis points to future opportunities to explore the role of the built environment in affecting patients' health and wellbeing beyond the commonly explored stress-related measures. According to patients' experiences, exploring ways to quantify the effect of thoughtfully designed environments on patient pre-treatment anxiety and how this may alleviate the severity of symptom distress is a compelling area to consider. Basic performance indicators such as overall number of anaphylactic incidences or negative reaction to the infusion treatment across hospitals with different environmental conditions (e.g. old vs new) can be key to such exploration. Observation can be also limited to first treatment sessions given the unique anxieties associated with that day.

The concept of patient adherence and compliance with the treatment and how a better built environment may affect patients' behaviour to hold to the treatment is another area that can be quantitively explored. Considering statistical performance measures that can be indicative to such issue, such as total number of missed treatment sessions in a year time or overall number of cases who dropped treatment, can furnish the ground to such investigation while indeed being considerate of potential confounding variables (e.g. the care model, staff cohort).

Future exploration of the developed survey tool within expanded and diverse number of settings and participants is important for both additional testing of the tool's construct as well as consideration of wider perspectives of the targeted population. The outcome of the survey phase points also to the potential to expand such attempt by developing a tool to measure the emotion-inducing qualities of the hospital spaces beginning with the built environmental roles conceptualized during the interview phase of this thesis.

Exploration of the possibility to introduce and integrate prominent questions able to depict patients experience of the built environment to the Victorian Healthcare Experience Survey (VHES) is an additional area for consideration in order to better account for such experiences within the overall VHES. The outcome of this thesis can be also considered as a starting step for future investigations targeting potential update to the Health Facility Briefing and Planning guides and Standard Components of the AusHFG guidelines.

With that in mind, it is worth noting that future studies in this context need to take into consideration the certain procedures required to obtain ethical approval from such specialized healthcare settings, which can be quite time-consuming. Although general hospitals in Melbourne, Australia may incorporate ethical approvals obtained from the University of Melbourne and only demand additional agreement letters to proceed with the proposed study, cancer facilities had their own ethical measures that require additional and separate processes. Furthermore, each cancer facility requires a resident principal investigator (PI) from its own employees to volunteer his/her time to supervise the study if the research proposal is planned by a researcher from outside the hospital. Again, this is not a common practice in other general hospitals in Melbourne where researchers can approach hospitals and conduct research without the need to have such arrangements of PIs to take responsibility of the study. This may indeed prolong the process as ethics committee will not proceed with the study assessment until appointing an appropriate PI. For this thesis, a PI was sought for each participating site with number of unsuccessful attempts that stretched the timespan before obtaining ethical approval.

Other considerations are with regard to the agreements that some hospitals require between the researcher's academic institution and the healthcare institution. These agreements are separate to the ethics process and require the involvement of legal department at the participating institutions which adds to the timeframe. Although no additional agreements were required at both PMCC and BRICC, special agreements were mandatory at ALFRED and ONJ. In sum, and as per Figure 10.1, the ethical journey for this thesis commenced in October 2016 and first data collection was not until March 2018 with the last two hospitals (ALFRED and ONJ) granting approvals by June and August 2019 respectively. This is not meant to discourage researchers from embarking in future research in such contexts, rather it shed light on essential matters that could help save time and efforts if planned ahead.

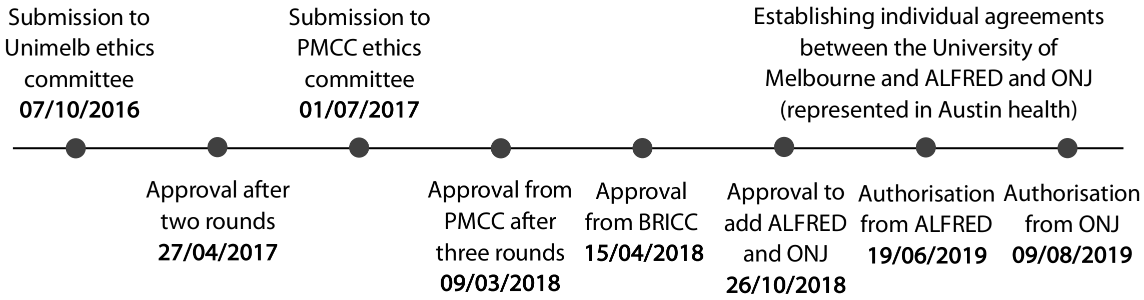


Figure 10.1 Timeline for ethical approval at the Australian participating hospitals.

10.6 Concluding remarks

Information collected and analysed in this thesis contribute to the existing body of knowledge by providing an evidence-base model for developing future healthcare facilities that aim to meet patient needs and improve their experiences, and such findings are essential to support healthcare stakeholders' decision making. The approach sought in this research demonstrates how multiple data sources, including in-depth interviews and the deployment of a rigorously developed survey tool, support the feasibility of quantifying and characterising the intricate subjective views of the built space while furnishing the ground to a crucial understanding of the meanings and nuance differences behind such experiences – contributing to a model of generic and detailed comprehension of these experiences.

In-depth exploration and assessment of patient experience, in the light of the two complementing modes of investigations conducted as part of this thesis, facilitated not only the identification of key architectural qualities elevating patients' sense of a supportive environment but also highlighted the important role that supportive healthcare settings may play in shaping cancer patients experience and wellbeing. The thesis found that considerate architectural design of spaces for the treatment and support of oncology patients resulted in shifting negative expectations and providing opportunities to break up the intensity of the treatment day, in addition to the notion of provoking engagement in activities beyond treatment and being sick and avoiding intensifying an inherently stressful situation by being sensitive to patient individual needs and treatment-related vulnerabilities.

Further in-depth interpretation of the implicit signification of patient narrated experiences shed light on other potential distinctive impacts of the built environment and the extent to which such spaces may influence patient wellbeing and other health-related outcomes, such as pre-treatment anxiety and treatment-induced sensitivities and stresses. Three overarching themes were identified, including: the capacity of the built environment to contribute to incidences of positivity; balancing the unavoidable presence in the hospital; and encouraging reasons to return – potentially enhancing compliance with treatment. Although the thesis contributed to expanding the pool of detailed architectural design features shown to have the capacity to elevate patient sense of support, it has found that it is not just one characteristic or element that translates into positive experiences, rather it is the constant, empathetic, consideration of patient needs and the desire to subvert the idea of the hospital that can be achieved through wide range of thoughtful designs that is particularly important to latently convey the intangible, yet powerful, emotional connection with the place, potentially complementing a comprehensive level of patient support.

The careful development of a survey tool to assess cancer patient perception of supportive healthcare environments provides a common platform to explore the successes of current healthcare environments and point to areas that require additional improvements. It also provides the basis for conducting comparisons between different healthcare facilities which enables the detection and sharing of best-demonstrated practices in oncology health care environmental design. The continuous evaluation of design decisions and exploration of patient experiences in existing hospital environments is key to improving healthcare settings and sustaining an appropriate level of environmental support, and thus contributing to comprehensive climate of patient-centred care.

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Appendix A Fieldwork materials

Appendix A.1 Interview flyer

MASTER Information Flyer_Patient interview_Version1_251018

We want your feedback

My name is Ahmed Sadek, I am an architect and PhD student at the University of Melbourne. I am working with INSERT SITE on a research project that aim to find out how the building and its design may affect patients and their experience of care. For that, we are running a series of **interviews** to learn more about patients opinions of the overall hospital design with additional focus on spaces for chemotherapy treatment.

Please express your interest to participate in this talk to INSERT SITE CONTACT DETAILS HERE.

Insert site-specific logo

THE UNIVERSITY OF
MELBOURNE

Appendix A.2 Interview Participant Information Statement (PIS)

INSERT SITE-SPECIFIC
LOGO HERE

Attachment D: Participant Information Statement (patient interview)

Project: "Effects of hospital building design on patient experiences of care"

INSERT SITE wants to find out how our building and its design may affect how patients feel during chemotherapy treatment. Understanding your ideas and how you feel about our hospital design helps us think about how we can make things better in the future.

You are invited to participate in this research project, which is being conducted by Mr Ahmed Sadek, a PhD student at the Faculty of Architecture, Building and Planning of the University of Melbourne, and led by INSERT INVESTIGATOR AND SITE HERE. Mr Sadek and INSERT INVESTIGATOR are running a series of **interviews** to better understand how a building design can affect patients during their treatment. We are seeking the opinion of patients undergoing chemotherapy about the architectural design features that this hospital provides and ways in which these can be improved to support the delivery of the best cancer care. The answers from the interviews will be used as part of Mr Sadek's PhD who will aim to publish the research findings as scholarly articles for others to learn from.

(1) What does the study involve?

Should you agree to participate, you would be interviewed by Mr Sadek. This interview would last approximately **30 to 45 minutes** and we would talk about your thoughts and perceptions of good and poor design qualities and what you see as beneficial design features for patients' experience. You may ask questions about anything you don't understand or want to know more about. With your permission, the interview will be digitally recorded.

At the conclusion of the interview, you will be asked to read through and provide comments on a questionnaire being developed to measure patient perception of the architectural design of cancer treatment facilities.

If you feel any distress when talking or reflecting on your cancer experience, please let Mr Sadek know straight away or contact your cancer specialist or nurse for further assistance if needed.

(2) How do you agree to participate?

First you will need to read and understand this information sheet. Then we will ask you for your permission to take part; this is called **'consent'**. The consent will be in the form of **your signature** on the accompanying form. If you would like to participate, please indicate that you have read and understood this information by signing the consent form and returning it in the envelope provided. If you agree to your interview being audio recorded (not compulsory), please also mark this on the consent form. Your consent form, once returned, will be stored confidentially and securely along with all interview related information.

(3) Can you withdraw (stop taking part) from the study?

Being in this study is **completely voluntary -** you are not under any obligation to participate and even if you do consent you can withdraw (stop taking part) at any time without affecting your relationship with your health service. **Your choice to take part or not, will NOT impact on your care now or in the future**.

If you choose to withdraw from an interview the information collected will not be used and any recordings will be destroyed.

(4) How are your answers and privacy protected?

Your identity, consent form and answers will be secure and protected as required by the law. We will not ask your name or any other personal information. All collected information will be stored on a computer that is securely protected by a password that only the Student Researcher (Mr Sadek) and his supervisor can access. All answers will be further coded and only Mr Sadek and his supervisor can understand these.

Responses/answers may be published in for public viewing, discussion or research publication (such as education or scholarly articles) but individual people's answers will not be identifiable. Pseudonyms will be used in any case where we need to refer to the opinions of a particular participant, though in most cases opinions will be discussed in general terms (for example, "most patients agreed that …"). Any data collected in this study will be kept securely at the University of Melbourne for five years from the date of last publication, and it will then be destroyed via a trusted document destruction service.

(5) Who can you contact for further information about the study?

When you have read this information, the Student Researcher, Mr Sadek will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact the Principal Investigator INSERT SITE CONTACT DETAILS HERE.

(6) What if you have a complaint or any concerns?

Reviewing Human Research Ethics Committee (HREC) approving this research and HREC Executive Officer details

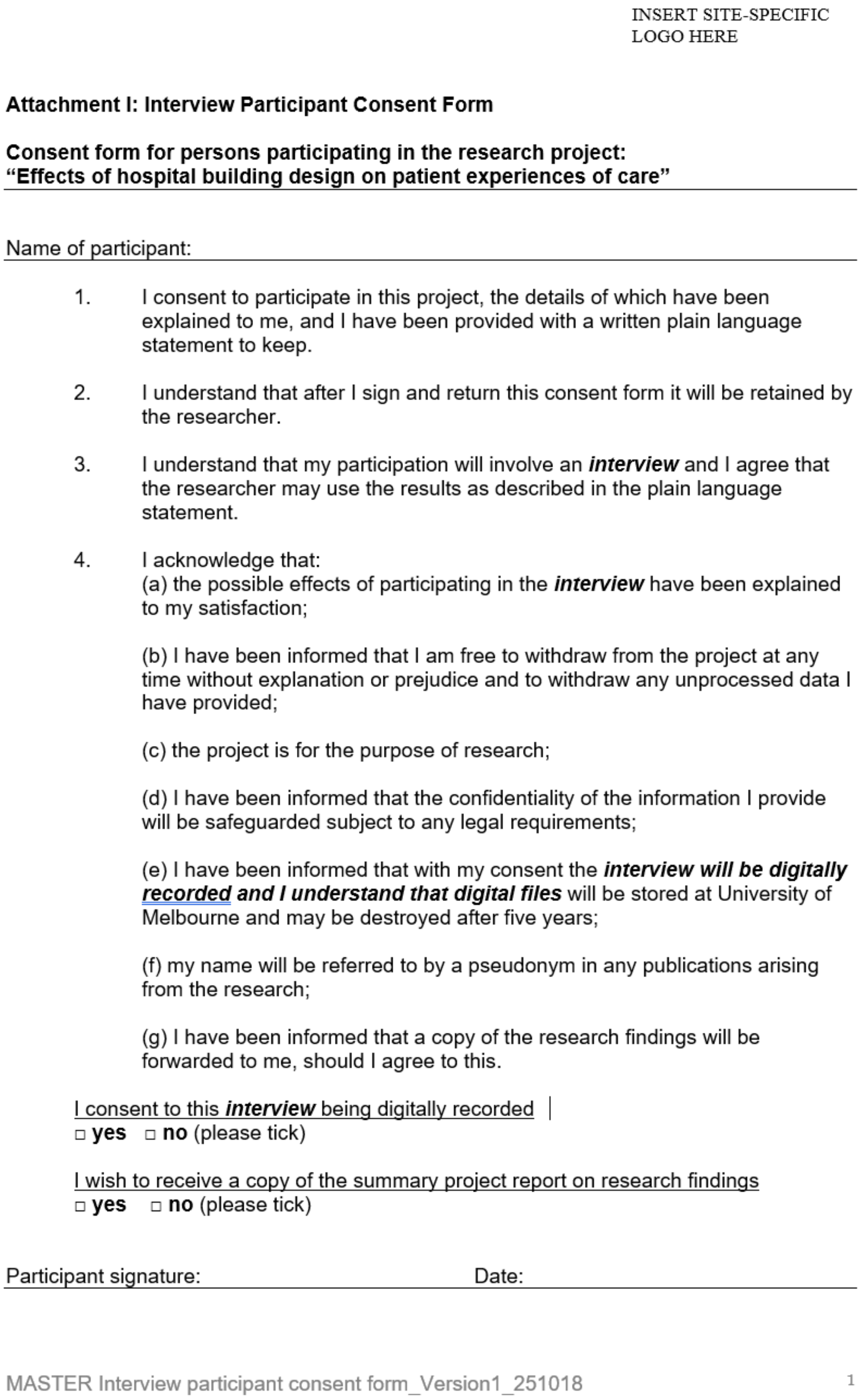
Reviewing HREC name	Peter MacCallum Cancer Centre Ethics Committee
HREC Executive Officer	Ethics Coordinator
Telephone	03 8559 7540
Email	ethics@petermac.org

Complaints contact person

Name	*Delete this row*
Position	INSERT SITE DETAILS HERE
Telephone	INSERT SITE DETAILS HERE
Email	INSERT SITE DETAILS HERE

This information sheet is for you to keep

Appendix A.3 Interview Consent form



INSERT SITE-SPECIFIC
LOGO HERE

Attachment I: Interview Participant Consent Form

Consent form for persons participating in the research project:
“Effects of hospital building design on patient experiences of care”

Name of participant:

1. I consent to participate in this project, the details of which have been explained to me, and I have been provided with a written plain language statement to keep.

2. I understand that after I sign and return this consent form it will be retained by the researcher.

3. I understand that my participation will involve an ***interview*** and I agree that the researcher may use the results as described in the plain language statement.

4. I acknowledge that:
   (a) the possible effects of participating in the ***interview*** have been explained to my satisfaction;

   (b) I have been informed that I am free to withdraw from the project at any time without explanation or prejudice and to withdraw any unprocessed data I have provided;

   (c) the project is for the purpose of research;

   (d) I have been informed that the confidentiality of the information I provide will be safeguarded subject to any legal requirements;

   (e) I have been informed that with my consent the ***interview will be digitally recorded and I understand that digital files*** will be stored at University of Melbourne and may be destroyed after five years;

   (f) my name will be referred to by a pseudonym in any publications arising from the research;

   (g) I have been informed that a copy of the research findings will be forwarded to me, should I agree to this.

I consent to this ***interview*** being digitally recorded
☐ **yes** ☐ **no** (please tick)

I wish to receive a copy of the summary project report on research findings
☐ **yes** ☐ **no** (please tick)

Participant signature: Date:

Appendix A.4 Content validity index form

Content validity for measuring perception of supportive healthcare environments

This tool focuses on measuring patient perception of **support** communicated by the hospital **physical environment**. The focus is on cancer patient undergoing chemotherapy treatment in ambulatory settings. **Six main constructs** (represented by groups of questions below) are conceptualized based on Roger Ulrich's theory of supportive design and extensive literature review of studies relevant to this particular context. The suggested constructs are: positive distraction, control, social support, safety & comfort, information support, and complementary support. They cover the built environment at two levels; a local (immediate treatment environment) and global (overall setting) level. Comments on the understandability of the items will be highly appreciated as well…. Note: the questions will be randomly ordered and the domains' title will not be included in the **patient version.**

Please specify (on a scale from 1 to 4) the extent to which each of the following items (questions) is relevant to the underlying construct, where (1) is not relevant, (2) somewhat relevant, (3) quite relevant, and (4) highly relevant.

CONSTRUCT (1): sense of **Positive Distraction** communicated by the built environment:

	Not relevant	Somewhat relevant	Quite relevant	Highly relevant
IN THE TREATMENT AREA where the chemo session takes place:	**1**	**2**	**3**	**4**
I can feel connection to the outside.	○	○	○	○
There are objects that distract me in a positive, supportive way.	○	○	○	○
The setting has interesting features to look at.	○	○	○	○
There is plenty that I want to linger on.	○	○	○	○
The room feels spacious.	○	○	○	○

CONSTRUCT (2): sense of **Control** communicated by the built environment:

IN THE TREATMENT AREA where the chemo session takes place:	**1**	**2**	**3**	**4**
There are choices I can make to maintain my privacy (e.g. curtains/choosing between private or shared treatment areas).	○	○	○	○
I can adjust and re-arrange the surrounding conditions (e.g. furniture) as needed.	○	○	○	○
When I need staff, I can easily find means to call them.	○	○	○	○
During the treatment session, there are **facilities** that allow me to undertake familiar activities as needed (e.g. reading/ using laptop/ watching TV/ or the like).	○	○	○	○
I feel I have control over the surrounding physical environment.	○	○	○	○
I am able to maintain adequate thermal comfort.	○	○	○	○
I can reduce sources of noise.	○	○	○	○
I smell fresh air.	○	○	○	○

CONSTRUCT (3): sense of **Social Support** communicated by the built environment:

	Not relevant	Somewhat relevant	Quite relevant	Highly relevant
IN THE TREATMENT AREA where the chemo session takes place:	**1**	**2**	**3**	**4**
The setting facilitates the presence of family/friends during the treatment session.	○	○	○	○
My family/friends feel comfortable when accompanying me during the treatment session.	○	○	○	○
IN THE OVERALL HOSPITAL SETTING:	**1**	**2**	**3**	**4**
There are places (e.g. lounges/cafeteria) to be with my family/friends.	○	○	○	○
When desired, the hospital setting facilitates engaging in social activities (e.g. with fellow patients).	○	○	○	○
When I need confidentiality, I can find places to hold private conversations with staff.	○	○	○	○

CONSTRUCT (4): sense of **Safety & Comfort** communicated by the built environment:

IN THE OVERALL HOSPITAL SETTING:	**1**	**2**	**3**	**4**
I can feel a sense of ergonomic comfort (e.g. the furniture is comfortable).	○	○	○	○
I can clearly find my way in the hospital.	○	○	○	○
I can easily access different locations in the hospital (e.g. things are close by).	○	○	○	○
The place maintains high hygiene standards.	○	○	○	○
The hospital setting looks neat and clean.	○	○	○	○

CONSTRUCT (5): sense of **Information Support** communicated by the built environment:

IN THE OVERALL HOSPITAL SETTING:	**1**	**2**	**3**	**4**
I can find sufficient facilities (e.g. library/materials) to search for illness-related information.	○	○	○	○
The hospital provides support spaces for educational forums (e.g. learn about the disease or its consequences)	○	○	○	○
I can find spaces to access previous survivor experiences (e.g. in person or documented).	○	○	○	○
I can find spaces to consult with staff on disease-related information.	○	○	○	○

CONSTRUCT (6): sense of **Complementary Support** communicated by the built environment:

IN THE OVERALL HOSPITAL SETTING:	**1**	**2**	**3**	**4**
When interested, I can find different opportunities to engage in optional complementary therapies (e.g. support group therapy, aromatherapy, art therapy, acupuncture, etc.).	○	○	○	○
The spaces provided for complementary therapies are appropriate.	○	○	○	○
I can access different types of relevant amenities (e.g. beauty shop, religious facilities, etc.).	○	○	○	○

- Does the sample of questions provided for the "**Positive Distraction**" construct, taken together, adequately represent that domain? ☐ **YES** ☐ **NO**
  If NO, please specify other aspects that needs extra items consideration
  ....
  ....
  ....
- Does the sample of questions provided for the "**Control**" construct, taken together, adequately represent that domain? ☐ **YES** ☐ **NO**
  If NO, please specify other aspects that needs extra items consideration
  ....
  ....
  ....
- Does the sample of questions provided for the "**Social Support**" construct, taken together, adequately represent that domain? ☐ **YES** ☐ **NO**
  If NO, please specify other aspects that needs extra items consideration
  ....
  ....
  ....
- Does the sample of questions provided for the "**Safety & Comfort**" construct, taken together, adequately represent that domain? ☐ **YES** ☐ **NO**
  If NO, please specify other aspects that needs extra items consideration
  ....
  ....
  ....
- Does the sample of questions provided for the "**Information Support**" construct, taken together, adequately represent that domain? ☐ **YES** ☐ **NO**
  If NO, please specify other aspects that needs extra items consideration
  ....
  ....
  ....
- Does the sample of questions provided for the "**Complementary support**" construct, taken together, adequately represent that domain? ☐ **YES** ☐ **NO**
  If NO, please specify other aspects that needs extra items consideration
  ....
  ....
  ....

- If you have any comments or advices please provide them below:

Thank you very much for your insights and collaboration.

Best Regards,

Ahmed**SADEK**

PhD Candidate | Faculty of Architecture, Building and Planning | Melbourne School of Design
University of Melbourne VIC 3010
AUSTRALIA

Appendix A.5 Survey tool

Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia

Effects of hospital building design on patient experiences of care

This survey asks for your views about the building design of the current hospital and your satisfaction with some aspects of the care you receive. We are interested in your real views regardless of whether they are negative or positive. There are no "right" or "wrong" answers.

SECTION (1) *Architectural design of the current hospital*

On a scale from 1 to 5 (where 1= *Strongly Disagree* and 5= *Strongly Agree*), please tick one circle that best describes your opinion about the building design of the Peter MacCallum Cancer Centre. If you have other comments about the design of the hospital (for example, how the design can be improved), please write beside the statements or on the back. The following are questions about the **chemotherapy treatment area** followed by questions about the **whole building**.

In the TREATMENT AREA where the chemotherapy session takes place:	**Strongly Disagree 1**	**2**	**3**	**4**	**Strongly Agree 5**
1. I feel connected to the world outside the building.	○	○	○	○	○
2. There are interesting features to look at.	○	○	○	○	○
3. The treatment area feels spacious.	○	○	○	○	○
4. The treatment area allows me to choose how private I want to be (e.g. moving curtains/ choice of private or shared treatment spaces).	○	○	○	○	○
5. I can easily see plants or vegetation while I am in the treatment area.	○	○	○	○	○
6. The treatment chair is comfortable.	○	○	○	○	○
7. I can find things in the treatment area to keep me busy (e.g. soothing music/internet/TV).	○	○	○	○	○
8. I can move/rearrange furniture around to make myself comfortable.	○	○	○	○	○
9. The design of the treatment area makes it easy for me to call staff if I need them (e.g. I can see them or there are ways to call them).	○	○	○	○	○
10. There is enough fresh air in the treatment area.	○	○	○	○	○
11. I am able to maintain a comfortable temperature.	○	○	○	○	○
12. I can control the level of noise around me.	○	○	○	○	○
13. The treatment area has things in place that help me do activities that I want to do (e.g. using laptop/reading/etc.).	○	○	○	○	○
14. The setting supports the presence of family/friends during the treatment session.	○	○	○	○	○
15. My family/friends would feel comfortable when accompanying me during the treatment session.	○	○	○	○	○

In the OVERALL HOSPITAL SETTING:	**Strongly Disagree 1**	**2**	**3**	**4**	**Strongly Agree 5**
16. There are places (e.g. lounges/cafeteria) to be with my family/friends.	○	○	○	○	○
17. If needed, I can find places to hold private conversations with staff.	○	○	○	○	○
18. The design of the hospital gives me the chance to engage with fellow patients when I want to.	○	○	○	○	○

In the OVERALL HOSPITAL SETTING:

(Continued)

	Strongly Disagree 1	2	3	4	Strongly Agree 5
19. I can clearly find my way around the hospital.	○	○	○	○	○
20. The hospital is designed in a way that makes it easy to move from one place to another (e.g. things are close by/ provision of ramps).	○	○	○	○	○
21. I find the design features provided to find directions (e.g. visual signs/colors) helpful.	○	○	○	○	○
22. The hospital setting looks clean.	○	○	○	○	○
23. Corridors and spaces are tidy and uncluttered.	○	○	○	○	○
24. The design of the building allows me to find important facilities, such as toilets, easily.	○	○	○	○	○
25. The inside of the hospital feels airy and fresh.	○	○	○	○	○
26. I know where to find resources (e.g. library/booklets) to look for cancer-related information.	○	○	○	○	○
27. Information about this building and what it offers, like outdoor garden/lounges/etc., is well advertised across the hospital.	○	○	○	○	○
28. When interested, I know where to find spaces to take part in support/wellbeing activities (e.g. massage/meditation/etc.).	○	○	○	○	○
29. The spaces provided for wellbeing services are set up so that I can easily engage in the activities that I want to (e.g. nap pods/ participate in group therapy/ do some work/ etc.).	○	○	○	○	○
30. The hospital design makes it easy to find other relevant resources for looking after my needs (e.g. religious facilities/ wig service/ exercise spaces/ etc.).	○	○	○	○	○
31. The patient waiting area is comfortable.	○	○	○	○	○
32. I feel connected to the world outside the building when I am in the waiting area.	○	○	○	○	○
33. There are sufficient things to engage with in the waiting area.	○	○	○	○	○
34. There are places in the hospital where I can go outside for some fresh air (e.g. garden).	○	○	○	○	○
35. The inside of the hospital is designed in a way to feel relaxed/calm.	○	○	○	○	○
36. The hospital setting in general feels bright inside.	○	○	○	○	○

The following are other general questions about the chemotherapy treatment area as well as the whole building design, please **tick/circle one answer where appropriate**:

1. In general, **where** do you mostly prefer to undertake the chemotherapy session?
   ○ Private room ○ Shared space with privacy options (e.g. moving curtains)
   ○ Completely shared space ○ No preference
2. In what setting did you receive your treatment **today**?
   ○ Private room ○ Shared space with privacy options ○ Completely shared space
3. Thinking about the previous question, how much are you interested in having variety of choices for each session?
   *Very **un**interested* 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Very interested*

4. Weather conditions permitting, would you be interested in having the chemotherapy session outdoors (in a porch or garden)? ○ Yes ○ No

   If "YES", to what extent do you think receiving chemotherapy in an outdoors setting would help improve your session?

   Would not help at all 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Would help a great deal*

5. Some hospitals provide optional complementary therapies (e.g. support groups, aromatherapy, art therapy, acupuncture). Do you have previous experience of these services? ○ Yes ○ No

6. To what extent would you be interested **in using** such services in your hospital visit?

   *Very **un**interested* 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Very interested*

7. What services would you be interested in? Please **check all that apply**

○ Support group therapy
○ Virtual reality
○ Massage
○ Therapeutic garden
○ Yoga/meditation
○ Music therapy
○ Acupuncture
○ Naturopathy &
○ Art therapy
○ Aroma therapy
○ Reiki (healing touch)
○ Others (…………………...……………..…)
○ Expressive writing
○ Herbal medicine

8. Considering your **overall** experience with the design of this hospital, how satisfied are you?

   Very Dissatisfied 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Very Satisfied*

9. Imagine a perfectly designed **chemotherapy unit**. How far do you think the current space is from a perfect care unit?

   Very Distant 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Very Close*

10. Please name 3 design features/elements that are **most important** for you to find in the chemotherapy treatment unit.

    1) .... 2) .... 3) ....

SECTION (2) *satisfaction with different aspects of the care and service*

Please **CIRCLE** one number that best describes your **experience** with the following:

1. The treatment overall is?

   Easy to tolerate 1 : 2 : 3 : 4 : 5 *Difficult to tolerate*

2. The duration of waiting the treatment to start is?

   Easy to tolerate 1 : 2 : 3 : 4 : 5 *Difficult to tolerate*

3. The duration of the treatment session is?

   Easy to tolerate 1 : 2 : 3 : 4 : 5 *Difficult to tolerate*

4. Not being allowed to move around during treatment is?

   Easy to tolerate 1 : 2 : 3 : 4 : 5 *Difficult to tolerate*

5. I feel bored during my treatment?

   Not at all 1 : 2 : 3 : 4 : 5 *Very much so*

6. I feel isolated when I lie in the treatment room?

   Not at all 1 : 2 : 3 : 4 : 5 *Very much so*

7. I feel the treatment area is crowded?

   Not at all 1 : 2 : 3 : 4 : 5 *Very much so*

8. I experience discomfort from my chair/couch during treatment?
Not at all 1 : 2 : 3 : 4 : 5 *Very much so*

9. I experience discomfort from the environmental odors/smell?
Not at all 1 : 2 : 3 : 4 : 5 *Very much so*

10. I experience discomfort from the noise level?
Not at all 1 : 2 : 3 : 4 : 5 *Very much so*

11. The temperature during treatment is?
Easy to tolerate 1 : 2 : 3 : 4 : 5 *Difficult to tolerate*

Please tell us the extent to which you agree or disagree with the following:

I EXPERIENCE THIS UNIT AS:	**Strongly Disagree 1**	**2**	**3**	**4**	**Strongly Agree 5**
1. A place where the staff is knowledgeable.	○	○	○	○	○
2. A place where I rely on receiving the best care.	○	○	○	○	○
3. A place where I feel in safe hands.	○	○	○	○	○
4. A place where I feel welcome.	○	○	○	○	○
5. A place where it is easy to talk to the staff.	○	○	○	○	○
6. A place where the staff take notice of what I say.	○	○	○	○	○
7. A place where the staff come quickly when I need help.	○	○	○	○	○
8. A place where the staff use language I can understand.	○	○	○	○	○
9. A place which is neat and clean.	○	○	○	○	○
10. A place where the staff have time for the patients.	○	○	○	○	○
11. A place where there is something nice to look at.	○	○	○	○	○
12. A place which feels homely even though I am in an institution.	○	○	○	○	○
13. A place where it is possible to get unpleasant thoughts out of your head.	○	○	○	○	○
14. A place where people talk about ordinary things, not just illness.	○	○	○	○	○
15. A place where the staff make a little extra effort on my behalf.	○	○	○	○	○
16. A place where I have choices, for example, what to wear.	○	○	○	○	○
17. A place where I can get "that little bit extra."	○	○	○	○	○

In the following statements, please **CIRCLE one number** that best describes your **OVERALL satisfaction with the SERVICE you received at this hospital:**

1. Overall, how satisfied were you with the treatment you received at this hospital?
Very Dissatisfied 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Very Satisfied*
2. The overall quality of service you received from this hospital was?
Poor 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Excellent*
3. How willing would you be to recommend the hospital to a friend?
Very unwilling 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Very willing*
4. How willing would you be to return to the hospital in future if needed?
Very unwilling 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 *Very willing*

SECTION (3) *General information*

Please tell us a bit about yourself:

- **Gender:** ○ Male ○ Female ○ Other
- **Age:** (please write in box) ☐
- **Residential postcode** ____________________ **OR** **Town/Suburb** ______________________
- **Education:**
  ○ Primary school or below ○ Did not complete high school ○ Year 12 or equivalent
  ○ Trade/apprenticeship ○ TAFE/technical certificate
  ○ Undergraduate diploma/degree ○ Postgraduate qualification
- **Time since the beginning of cancer treatment** (approximately in weeks)**:**
  (please write in box) ☐
- **Number of previous chemotherapy sessions:**
- (please write in box) ☐
- **Number of family members or friends joining you during the treatment today:**
  (please write in box) ☐
- **What type of cancer were you told you have:**
  ○ Brain/Central Nervous System
  ○ Gynaecological (e.g. endometrial, cervical)
  ○ Colorectal/Lower Gastro-Intestinal (e.g. bowel)
  ○ Genitourinary (e.g. urinary tract, bladder, kidneys)
  ○ Haematological (e.g. blood, bone marrow, lymph nodes)
  ○ Upper Gastro-Intestinal (e.g. oesophagus, stomach, liver, pancreatic, bile ducts)
  ○ Other (please write in box) ☐
  ○ Sarcoma and bone
  ○ Skin
  ○ Head and Neck
  ○ Breast
  ○ Eye
- **Do you identify as Aboriginal and/or Torres Strait Islander?**
  ○ No ○ Yes, Aboriginal ○ Yes, Torres Strait Islander
  ○ Yes, Aboriginal and Torres Strait Islander ○ Prefer not to answer
- **What language do you usually speak at home?**
  ○ English ○ Other (please write in box) ☐
  ○ Prefer not to answer

Please mark one circle indicating how far each statement applies to you **at present:**	**Definitely does *not* apply to me** 1	**Does *not* apply to me** 2	**Applies to me** 3	**Definitely applies to me** 4
1. I am determined to beat this disease	○	○	○	○
2. I am very optimistic	○	○	○	○
3. I see my illness as a challenge	○	○	○	○
4. I try to fight the illness	○	○	○	○

Thank you very much for your valuable cooperation

Appendix A.6 Survey tool cover page

Effects of hospital building design on patient experiences of care

We want your feedback

Taking part in this study is **completely voluntary** and **anonymous** - you are not under any obligation to participate

INSERT SITE wants to find out how our building and its design (the way it looks and feels) affects our patients during treatment. Understanding your ideas and how you feel about our hospital design helps us think about how we can make things better in the future.

You are invited to participate in this research project, which is being conducted by Mr Ahmed Sadek, a PhD student at the Faculty of Architecture, Building and Planning of the University of Melbourne. Mr Sadek is running a **survey** to better understand how a building design can affect patients during their treatment. Hence, we are seeking your **opinion about the architectural design features that this hospital provides** in addition to your **satisfaction with some aspects of the provided care**.

What does the study involve?
The study involves **completion of an anonymous (non-identifiable) questionnaire** that you will find attached to this sheet. The questionnaire consists of three sections and we estimate that it would not take more than 30 minutes to complete. You are welcome to complete it over the course of your day stay if more convenient. When completed, please place your questionnaire in the box provided at the **reception desk or nurse station.**.

Returning a completed questionnaire is an indication of your permission to participate in the study. If you do not want to participate, you are free NOT to fill or return the questionnaire. We will not ask for your name or any other personal information. Your answers will be kept and stored securely.

Who can you contact for further information about the study?
Mr Sadek will be present at the INSERT DEPT NAME waiting area if you have any questions. Alternatively you can contact the Principal Investigator, INSERT SITE CONTACT DETAILS HERE.

This research has been approved by the Human Research Ethics Committee (HREC). Executive Officer details are: Peter MacCallum Cancer Centre Ethics Committee, Ethics coordinator, Telephone: 03 8559 7540 Email: ethics@petermac.org **Complaints** contact person INSERT SITE CONTACT DETAILS HERE.

Note. If you feel any distress when reflecting on your cancer experience, please let your nurse/cancer specialist know straight away or contact Mr Sadek for further assistance if needed.

INSERT SITE-SPECIFIC LOGO

THE UNIVERSITY OF MELBOURNE