The Patient Journey in a Hospital Environment

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ABSTRACT

Background and aim – Patients undergo one or more medical interventions in a hospital. In the hospital, patients are surrounded by spaces and services. The output in a hospital is the patients' outcome. To gain understanding about a holistic experience of patients, we assessed the experience and well-being of patients at specific focal points of the entire patient journey: from the arrival, to the diagnosis and the actual treatment in a hospital.

Methods – This article describes three field experiments that were conducted in a Dutch hospital. First, in an age-simulation study the effect of route complexity and physical ageing was assessed during 108 wayfinding tasks. Second, in a quasi-randomized experiment the use of a motion-nature projection was assessed during a diagnostic scan (N = 97) . Lastly, in a quasi-randomized experiment the effect of a non-talking rule during an outpatient infusion treatment was assessed (N = 263).

Results – A wide variety of patients visit a hospital and all patients of course bring an opinion of their own and experience their hospital visit differently. However, patients benefit from a simple building structure during wayfinding, inexpensive beamers to project nature during diagnostics, and a mix of treatment places with respect to social interest during infusion treatments.

Originality – There is little discussion about the holistic experience of patients, that concerns the cognitive, emotional, physical, and social well-being of patients. In our study we applied a holistic and patient-centered approach.

Practical or social implications – The well-being of patients can be significantly improved when the built, natural, and sound environment is taken into account with respect to individual differences.

Type of paper – Research paper.

KEYWORDS

Built environment, evidence-based design, hospital, environment, spaces and services, patient experience, multimethod.

BACKGROUND

For patients and their relatives, a hospital visit is often an anxious and uncertain event. Patients are often concerned for a diagnosis and/or treatment for their disease in an outpatient or inpatient setting. The process a patient is exposed to in a hospital can be seen as a chain of actions (Fitzsimmons & Fitzsimmons, 2006). This chain of actions is also called a journey and patients may encounter different healthcare spaces and services during a hospital visit. Understanding the holistic experience of patients will allow us to positively influence the well-being of patients.

An increasing demand and new technologies often require changes in the hospital building. Buildings costs for Dutch hospitals are expensive and amount approximately around €3,000 per square meter. Recent developments in the healthcare real estate funding system in the Netherlands have heightened the need that hospitals have to refund these building costs. Moreover, market forces create a competitive healthcare system. This 'pushes' healthcare providers to differentiate with spaces and services. However,

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building decisions are still mainly based on intuition and not on scientific evidence (Becker & Parsons, 2007). But how can hospitals be designed in a way that it actually improves patients' experiences and well-being?

Associated research to understand the patients' experience is conducted from a wide variety of perspectives like quality of healthcare, services, and spaces. According to the Donabedian model (Donabedian, 1988), the quality of healthcare contains contextual aspects in which healthcare is delivered (structure), the interaction between patients and healthcare providers by the delivery of healthcare (process), and the effect of healthcare on the health status of patients (outcome). Donabedian (1988) argues that a good structure (material resources, human resources, and organizational structure) positively influence the process, which in turn positively influences the patients' health.

In healthcare, the physical surroundings can potentially create hospital environments into healing environments (Dijkstra, Pieterse, & Pruyn, 2006; Stichler, 2001). When design solutions are based on scientific evidence it can be defined as evidence-based design (Ulrich, Quan, Zimring, Joseph, & Choudhary, 2004). The focus of evidence-based design is that environmental surroundings can influence patients both positively and negatively (Becker & Parsons, 2007; Ulrich et al., 2008; Ulrich, 1981). The hospital environment can potentially improve the healing process of patients, by reducing the length of stay, severity of pain, pain medication, levels of anxiety, levels of fatigue, and increasing the quality of sleep, mood, or overall satisfaction with healthcare (Dijkstra et al., 2006; Harris, Ross, McBride, & Curtis, 2002; Ulrich et al., 2004).

From a service perspective, it can be stated that in a hospital a variety of healthcare services are offered. The experience of a service is an offering as any service or good: service organizations are not solely delivering a service, but also create a memorable experience to sell them better (Pine II & Gilmore, 1998). However, a hospital visit is not primarily an experience to sell, but it is about the provision of good healthcare and the well-being of patients. In this sense, a hospital may need a different approach to create a different kind of positive experience and affect well-being, and may benefit from different designs.

So far, however, there has been little discussion about the holistic experience of patients, that concerns the cognitive, emotional, physical, and social well-being of patients. In our study we apply a holistic and patient-centered approach (Figure 1). Patients undergo one or more medical interventions in a hospital. In the hospital, patients are surrounded by spaces and services. The output in a hospital is the patients' outcome. To gain understanding about the holistic experience of patients, we assessed the experience and well-being of patients at specific focal points of the entire patient journey: from the arrival, to the diagnosis and the actual treatment in a hospital.

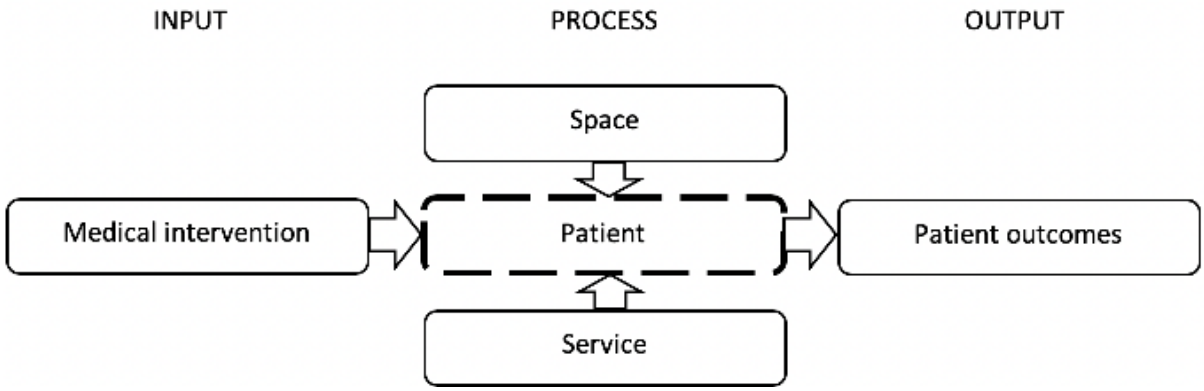

Figure 1 Patient-centered approach in a hospital environment

ARRIVAL AT THE HOSPITAL

The patients' journey in a hospital starts with entering the building and following a route to find the way in the built environment to the destination of the patients' appointment. This destination can be a diagnostic, outpatient, or inpatient clinic.

Zijlstra et al. (2016) have argued that hospitals are spacious in size due to the increasing demand of healthcare services. The population of the Netherlands is rapidly ageing and is expected to be doubled in 2050. Hospitals include many areas for patients and staff. In addition, university hospitals contain also areas for education and research. Wayfinding in such complex building settings might be particularly difficult for vulnerable people like elderly.

Wayfinding is a dual-task performance, which requires cognitive and sensorimotor skills (Li, Lindenberger, Freund, & Baltes, 2001). Memorizing the destination and actually moving through the building can be seen as a divided attention task. Elderly experience even basic movements as walking challenging (Davis, 2012). Patients may become (extra) stressed when lost during a hospital visit, better design may prevent such problems. Therefore, support from the built environment is most importantly for elderly persons to find their way in a hospital.

The built environment, like multi-level buildings or multi-building settings, affects the type of wayfinding strategy people use. For example, in multi-level buildings it seemed most efficient to firstly move to the correct floor to find the destination, while in multi-building settings it seemed most efficient to firstly move to the correct building to find the destination (Hölscher, Büchner, Meilinger, & Strube, 2008; Hölscher, Meilinger, Vrachliotis, Brösamle, & Knauff, 2006). Facilities such as signage can help people in wayfinding, but also hinder when not done appropriately (Rousek & Hallbeck, 2011).

It is unknown whether the effect of route complexity (i.e., number of building- and floor changes) on wayfinding differs for elderly people with ageing-related physical impairments in both sensory and motor skills.

DIAGNOSTIC SCAN

Diagnostic scans play a critically important role in the diagnosis and treatment of diseases. Therefore, after patients have entered the hospital, they often have to undergo a diagnostic scan.

A diagnostic scan is often an anxious event for patients because patients are usually concerned and anxious that they have a serious disease (Munn & Jordan, 2011). Not to mention that the medical technological development of medical devices and equipment continues to advance. In consequence, the hospital environment is becoming more unhuman from the patients' perspective and patients can become overwhelmed by these unknown technological innovations (Dantendorfer et al., 1997).

Various studies have shown that patients' experience elevated levels of anxiety for a diagnostic scan (Carlsson & Carlsson, 2013; Heyer et al., 2015; Katz, Wilson, & Frazer, 1994). A large percentage of patients (37%) experienced moderate to high levels of anxiety for a magnetic resonance imaging (MRI) scan. Although the level of anxiety for a CT scan is similar compared to MRI, this is still an underestimated problem, (Heyer et al., 2015). High levels of anxiety for a CT scan can become a major problem, because it may potentially influence the quality of images due to motion artifacts and may also increase health risks due to an increase in radiation exposure (Bischoff et al., 2009; Gerber, Kantor, & McCollough, 2010).

The physical surroundings and facilities of a diagnostic room may influence the patient experience. An increasing body of evidence showed that nature sights can positively influence people and can reduce psycho-physiological stress (Malenbaum, Keefe, Williams, Ulrich, & Somers, 2008; Monti et al., 2012; Tanja-Dijkstra et al., 2014; Ulrich, 1984; Vincent, Battisto, Grimes, & Mccubbin, 2010). However, it is unknown whether a projection of nature in a diagnostic room can mitigate anxiety and physiological arousal.

TREATMENT IN OUTPATIENT INFUSION CENTER

After diagnosis, a growing number and high variety of patients receive treatments for cancer or chronic diseases, such as muscle or vascular diseases, in outpatient infusion centers. The number of day care treatments has increased over five times in the last 20 years and the group of patients with the diag-

nosis cancer has grown the fastest (Dutch Hospital Association (NVZ), 2016). This increasing demand for day care treatments can be explained by rising healthcare costs year over year. Therefore, patients should stay as short as possible in hospitals and preferable do not stay overnight.

Patients may cope differently with this stressful situation. During these treatments, some patients may prefer a treatment environment that allows them to contemplate and rest (i.e., little noise), whereas others may prefer a treatment environment that distracts them and provides them with the opportunity to talk to fellow patients and visitors (Browall, Koinberg, Falk, & Wijk, 2013). According to the WHO, it is essential for patients to rest and recover without disturbances (Berglund, Lindvall, & Schwela, 2000). With this fact and the risks of infections, new hospital designs provide more single rooms or cubicles. However, the individual preference of patients with respect to social contact is of great interest.

Human-related sounds were reported the most by patients, like talking, laughing, and coughing (Mackrill, Cain, & Jennings, 2013; Park et al., 2014). However, some patients may not be disturbed by these human-related sounds and may feel safe and secure when they hear others, while others may experience it as annoying and may feel helpless because they cannot escape from the noise (Cohen, Evans, Stokols, & Krantz, 1986; Johansson, Bergbom, Waye, Ryherd, & Lindahl, 2012).

Quiet-time interventions may control the actual sound level by encouraging patients to rest and relax (Lower, Bonsack, & Guion, 2003). However, their study manipulated multiple variables, such as a restriction of visitors, reducing staff movements, encouraging of closing doors, reduced light intensity, and lowered volume of technical equipment.

It is still unknown which individual element of quiet-time intervention effectively reduced the sound level. Therefore, it is important to study specifically the influence of the sound of talking on the actual and perceived sound levels in a single intervention study.

METHODS

This article describes three field experiments for each journey step that were conducted at the University Medical Center of Groningen (UMCG) in the Netherlands. An overview of the methods are presented in Table 1.

RESULTS

Arrival at the hospital

The findings of the first study (Emma Zijlstra et al., 2016) revealed that persons on more complex routes (i.e., more floor and building changes) walked less efficiently than persons on less complex routes. In addition, simulated elderly participants performed worse in wayfinding than young participants in terms of speed. Moreover, results showed that simulated elderly persons had higher heart rates and respiratory rates compared to young people during a wayfinding task.

Diagnostic scan

The findings of the second study (Emma Zijlstra et al., 2017) showed that the use of motion nature projection in computed tomography (CT) imaging rooms was effective in mitigating psycho-physiological anxiety compared to no-intervention. Results showed that motion nature projection had a negative indirect effect on perceived anxiety through a higher level of perceived pleasantness of the room. In addition, heart rate and diastolic blood pressure were lower when motion nature was projected.

Treatment in outpatient infusion center

The findings of the last study (Emma Zijlstra et al., 2019) showed a statistically significant, but rather small reduction of the non-talking rule on the actual sound level at an outpatient infusion center, with an average of 1.1 dB(A). Half of the patients preferred a talking condition, around one-third of the patients had no preference, and the remaining group of the patients preferred a non-talking condition. The results suggest that patients who preferred non-talking, perceived the environment more negatively compared to the majority of patients and perceived higher levels of anxiety.

Table 1 Study characteristics and main results for each journey step

Study	Method	Participants and setting	Intervention	Outcome measures	Main results
Arrival at the hospital (Zijlstra et al., 2016)	Age-simulation field experiment Data retrieved by time and distance observations and physiological measurements	75 bachelor students studying Facility Management who performed wayfinding tasks (42 participants performed two wayfinding tasks, 33 performed one) Multi-level multi-building hospital setting	Nine routes with different levels of complexity (number of building and floor changes) 59 of the total 108 wayfinding tasks were performed wearing gerontologic ageing suits (simulated typical physical limitations of elderly, such as changes in sight, hearing and limited mobility of the whole body)	Wayfinding performance (route efficiency and walking speed) Physiological outcomes (heart rate and respiratory rate)	A significant effect of number of building changes on route efficiency ($p = 0.008$) Routes that required building changes were walked less efficient ($p < 0.001$) Simulated elderly performed worse in walking speed ($p < 0.001$) Simulated elderly had higher heart rates and respiratory rates ($p < 0.001$)
Diagnostic scan (Zijlstra et al., 2017)	Quasi-randomized experiment Data retrieved by medical observations and self-reported measurements	97 participants who underwent a cardiac Computed Tomography (CT) scan Radiology department	Intervention condition: Motion nature projection Control condition: No projection	Perceived anxiety Pleasantness room Physiological arousal (heart rate and blood pressure) Perceived contact with radiographer Administration of medication Patient characteristics	Motion nature projection indirectly affected perceived anxiety through a higher level of perceived pleasantness of the room ($p = 0.017$) Heart rate and diastolic blood pressure were lower when motion nature was projected ($p = 0.042$, $p = 0.040$)
Treatment in outpatient infusion center (Zijlstra et al., 2019)	Quasi-randomized experiment Data retrieved by sound observations and self-reported measurements	263 participants who received treatment for cancer (62%) or chronic illness (38%) Outpatient infusion center (shared room with 8 treatment places)	Intervention condition: Participants requested not to talk to fellow patients and visitors during treatment Control condition: Participants allowed to talk to fellow patients and visitors	Sound environment Perceived anxiety Perceived environment Perceived pleasantness of room Satisfaction with healthcare Patient preferences	Small reduction of non-talking rule on sound level with an average of 1.1 dB(A) ($p < 0.001$) Patients who preferred non-talking perceived the environment more negatively ($p = 0.038$)

DISCUSSION AND CONCLUSION

To gain understanding about the holistic experience of patients, the aim of this study was to investigate the influence of the physical environment (built, natural, sound, and psychosocial environment) on the patients' well-being during different aspects in a patient journey. First, results showed that the complexity of the built environment and simulated physical ageing negatively influenced wayfinding performance. Second, results showed that the influence of the natural environment positively affected the patients' well-being during diagnostic scans. Third, results showed that a rule of conduct had a minor influence on the sound environment and results showed that preferences for social interest differed between individuals.

First, the results of these studies showed that space influenced patient outcome. Individuals experienced the hospital environment differently depending on the stage of the patient journey. In addition, findings showed that patient outcome depends on a variety of individual factors, such as physical, medical, and psychosocial aspects.

During wayfinding, the built complexity (i.e., more floor and building changes) influenced the wayfinding performance (i.e., efficiency) of all participants (Emma Zijlstra et al., 2016). In addition, the physiological outcomes of simulated elderly were also negatively affected, by having higher heart rates compared to young participants. They suggest that physical aspects of individuals, such as physical ageing, influence the experience and well-being of patients. Understanding the influence of the built environment and physical ageing will improve the wayfinding interventions and design of hospital environments. Consequently, these improvements potentially will lead to more autonomy of elderly in finding their way.

During diagnostics, the natural environment positively influenced the patient outcomes (Emma Zijlstra et al., 2017). Patients perceived less anxiety and physiological arousal when motion nature was projected. In addition, a medical factor of patients influenced the effect of motion nature projection on the physiological patient outcomes. Patients who did not receive beta-blockers were positively affected by motion nature projection and had lower heart rates when motion nature was projected. Understanding the influence of the natural environment and associated influence of medical factors can improve the effective use of an inexpensive and simple solution as a beamer.

Moreover, during the treatment, the sound environment was only slightly influenced by a non-talking rule of conduct (Emma Zijlstra et al., 2019). However, they argue that a psychosocial factor of interest in social contact influenced the perceived level of anxiety. Results have shown that different subgroups in patients can be defined regarding this factor, such as patients who prefer talking, patients who prefer non-talking, and patients without a preference.

Findings of these studies of Zijlstra et al. (2020) showed that a wide variety of patients visit a hospital and all patients of course bring an opinion of their own and experience their hospital visit differently. These different outcomes in stage and individuals emphasize that one size does not fit all in a hospital environment. Each journey step and patient group requires different space solutions. For instance, patients benefit from a simple building structure during wayfinding, inexpensive beamers to project nature during diagnostics, and a mix of treatment places with respect to social interest during infusion treatments. The well-being of patients can be significantly improved when the built, natural, and sound environment is taken into account with respect to individual differences.

In addition to spaces, Zijlstra (2020) argues that solutions can also be found in the alignment of spaces with services. First, by moving service points to decision points to improve wayfinding performance. Second, to allocate space to patients according their needs. To fulfill the needs of patients they should have the opportunity to choose where to receive the treatment, for example, a place to rest in silence or to interact with others. When assigning patients to treatment places or rooms, the planning department should be aware of the different preferences of patients. The role of healthcare professionals is to gather this information from patients in advance.

The results of these studies (Emma Zijlstra et al., 2016, 2017, 2019) show that it is of great importance to listen carefully to patient needs, as many of the results raised questions about the differences in outcomes. A hospital environment can have great impact on patient outcomes, by remaining critical and creative during the building process, according to Zijlstra (2020).

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Deltapremie

The 'Deltapremie' or Delta Prize is a new leading research prize in the Netherlands focusing on practice-oriented research by professors. The prize is developed for professors who have managed to repeatedly make a special difference with the social impact of their research over the years. It shows where practice and research can come together in an innovative way. Practice-oriented research has acquired a solid place in Dutch society. Almost 700 professors and more than 3,000 teacher-researchers are currently involved. The starting point of the research is always to find solutions for practice-based problems, also by partnering with practice. In this way, practice-oriented research provides applicable solutions to societal challenges.

An independent selection committee selected the winners. The committee consisted of six experts from Erasmus University Rotterdam, Innofest, Delft University of Technology, Netherlands Study Centre for Technology Trends, and the Association of Netherlands Municipalities. In the report the selection committee tributes Mark Mobach and his research group for the impact that they have on the crossroads of various domains from public transport to mental health. Mobach: "We see the prize as enormous encouragement to continue our research into space and organisation in healthcare, education, offices, and cities together with our partners. We extend our research to areas where there are perhaps fewer financial possibilities, such as research with the arts and frailty."

Research focus area

With his research group, Prof. Mobach wants to contribute to the best buildings for people and organisations. He does so by devising better space and services in a multidisciplinary setting together with students, lecturer-researchers, Ph.D.-students, and postdocs. Better spaces and services for education, offices, and even cities that stimulate healthy behaviour, better healthcare buildings that reduce stress, but also prisons and stations that better meet the needs of society.