

Spatial Correlates of Patients' Travel Experience & Satisfaction in Hospital Outpatient Department

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ABSTRACT: Designing a physical environment that is safe, accessible and easy to use can significantly improve patients' satisfaction and the quality of healthcare experience. Literature shows that difficulties in wayfinding cause delay in patients' movement, together with loss of time, decreased safety, and increase environmental stress. However, less is known concerning how wayfinding difficulties affect patients' satisfaction and travel experience. In this research it is assumed that an easily accessible and visible spatial layout may have direct or indirect positive effects on patients' movement, travel time, and way finding; and, as a result, it may have positive effects on patients' travel experience and satisfaction. The data was collected through systematic behavioral observation, patient survey, and floor layout analysis that included the measurement of actual route distance, travel distance, and spatial network distance using space syntax techniques. Findings of the study include the following: 1) patients' satisfaction depends on age, number of visits, frequency of visits, signage system, overall layout, and design quality; 2) patients' travel behavior is positively affected by route attributes; 3) overall patients' satisfaction does not seem to have any relation with the patients' travel behaviors and syntactic attributes of the layout; and 4) male and female patients' satisfaction and travel behavior show different association with syntactic properties of the layout. It is hoped that the study will contribute to an improvement of the design of the spatial layout of the outpatient department so that patients may receive their services in the least amount of time without becoming lost or missing an appointment due to wayfinding problems; and an increase in patients' satisfaction and travel experience.

KEYWORDS: Patients' Travel Experience, Patients' Satisfaction, Space Syntax, Spatial layout, Wayfinding.

INTRODUCTION

Patient satisfaction is a useful measure in assessing patient's experience in health care. This multidimensional concept focuses on the technical and interpersonal aspects of care, accessibility, and the outcome of the health intervention (Sitzia & Wood 1997). The purposes of measuring patient satisfaction are to understand patient experiences of health care, to promote co-operation with treatment, to identify problems in health care, and to make evaluation of health care (Fitzpatrick 1984). Traditionally, the design of hospital was more focused on arranging a functional layout for the delivery of service rather than meeting the expectation of the user. Compared with the traditional concepts, the current design is more focused on creating an environment that meets and exceeds patients' needs for safety, security, support, competence, and physical and psychological comfort (Fottler, Ford, Roberts, Ford, & Spears Jr 2000).

Patient experience in the healthcare environment is an important factor in overall patient satisfaction and care outcomes. In hospital, patients get their first impression of the healthcare experience from the environment. This interaction with the environment can influence a patient's experience and satisfaction level even before he or she receives any services. Spatial design, ambient condition, and signage system are the three environmental components that patients usually perceive when they first enter in the hospital settings (Fottler, et al. 2000). Due to complex spatial layout patients sometimes experience long travel distance that may adversely affect their satisfaction level. Literature shows that difficulties in wayfinding cause delay in patient movement through the buildings along with loss of time, decrease in safety, and increase in environmental stress (Carpman, Grant, & Simmons 1993). In this case, designing efficient spatial layout and signage system may have a significant beneficial effect on patients' perception of care received (Ulrich, et al. 2004, Harris, et al. 2002). However, less effort has been made to understand patients' satisfaction and travel experience in relation to wayfinding in outpatient department. Therefore, the purpose of this research study is to find out if an easily accessible and visible spatial layout, signage system of the environment, and quality of design have an direct or indirect positive effects on patient's movement, travel time, and wayfinding, and whether, as a result of these positive effects patients' travel experience and satisfaction improve.

1.0.

1.0. BUILT ENVIRONMENT AND PATIENTS SATISFACTION

In the outpatient context, the environment in which the service is experienced can significantly improve patients' satisfaction and the perceived quality of care (Becker & Douglass 2008; Becker, Sweeney, & Parsons 2008; Fottler et al. 2000; Harris, McBride, Ross, & Curtis 2002). Sitzia and Wood (1997) propose that accessibility, waiting times, waiting environment, attitude of staff, and patient information are critical components of patients' satisfaction. Backer's (2008) study shows that patients' perception of overall quality of care and experience depend on the physical attractiveness of the waiting room environment. Besides this, different features of healthcare settings such as clarity of signs and directions, orderly facilities and equipment, pleasantness of atmosphere are important determinants of patient satisfaction (Ware et al. 1983). To understand how spatial design of the outpatient departments could support patient satisfaction, it is important to understand the journeys that patients make through the department. In an inefficient layout, the long distances and complicated routes from the hospital entrance to the department can give the patient a poor travel experience. Literature shows that the plan and layout of the hospital might impact the ease of wayfinding and the speed of travel to various locations (Carpman, Grant, & Simmons 1993). Therefore, it is important to facilitate the movement of patients and visitors through design within the outpatient departments to ensure less walking time to locate their destination.

The signage systems that aid patients in finding their way have greater influence on patients' travel experience and satisfaction. In an unfamiliar environment, when patients engage in the wayfinding process, their satisfaction level depends on what they expect to find in that environment. In this case, poor signage systems can make them frustrated and can increase anxiety, confusion and dissatisfaction with hospital experience (Carpman et al. 1993). In addition, interior design features like floor finish, color, artwork and the layout of furniture affect patients' physical comfort and, therefore, can influence their experience (Arneill & Devlin 2002; Becker & Douglass 2008; Harris et al. 2002).

2.0. SPATIAL LAYOUT AND PATIENT'S TRAVEL EXPERIENCE

Designing a spatial layout is an important factor for patients' wayfinding and travel experience. Research shows that people depend more on spatial layout and the other architectural features than on signage in wayfinding situations (Carpman et al. 1993; Weisman 1981). A simple and regular spatial system can make the building easy to understand in wayfinding situations and can improve the experience of movement through the environment (O'Neill 1991; Weisman 1981). In wayfinding situations patients also feel more comfortable when they make more frequent visits to the hospital (Gärling, Lindberg, and Mäntylä 1983; O'Neill 1992).

The travel experience of the hospital building is affected by the way in which spaces are connected, the changes of direction imposed by the circulation system, the creation of room sequences, the distribution of branching points, the availability of alternative routes, and the relations of visibility between and across spaces (Peponis and Zimring 1996). Therefore, the number of changes in direction needed to access the reception area from main entrance; the distance between the treatment rooms and the main entrance; and the number of treatment rooms that visitors and patients will pass when travelling between these areas, all need to be considered during hospital design (Khan 2011). All this suggests that physical accessibility of the spatial layout is an important factor for improving patients' travel experience and satisfaction. In addition, visual accessibility appears to be crucial in influencing the way in which people experience the spaces (Turner, Doxa, O'Sullivan, & Penn 2001) and in facilitating one's spatial orientation and wayfinding (Gärling, Böök, & Lindberg 1986). Higher visual accesses in the spatial layout give patients a greater sense of spatial orientation in wayfinding situations (Montello 2007).

3.0. RESEARCH METHOD

The study examined the relationship between spatial structure and patients' travel experience and satisfaction in several outpatient departments. Multi-method data collection was used in this study, including systematic behavioral observation, patient survey, and the floor layout analysis.

3.1 Systematic Observation & Patient Survey

All patients who entered the reception area of the outpatient department were invited to participate in the study. Informed consent of the patients was taken by the principal investigator before a systematic observation was done of patients' behavior in wayfinding situations. Observation was conducted with synchronized watch and data collection sheets. Each patient was tracked from the entry (reception area) to the destination (clinical unit). The travel time needed to complete each trip was recorded on data collection sheets. When the patient reached his or her destination and was waiting for medical service, he or she was asked to fill out a survey concerning his or her travel experience and satisfaction. In addition, individual

patient route and travel behavior such as the number of decision making stops, the number of times the patient needed to look around to find the way, and the number of times the patient needed to ask for directions on the movement route were also recorded on the observation sheet. Observations occurred over a 2-week period. In the study, 60 patients were observed in 80 hours of data collection.

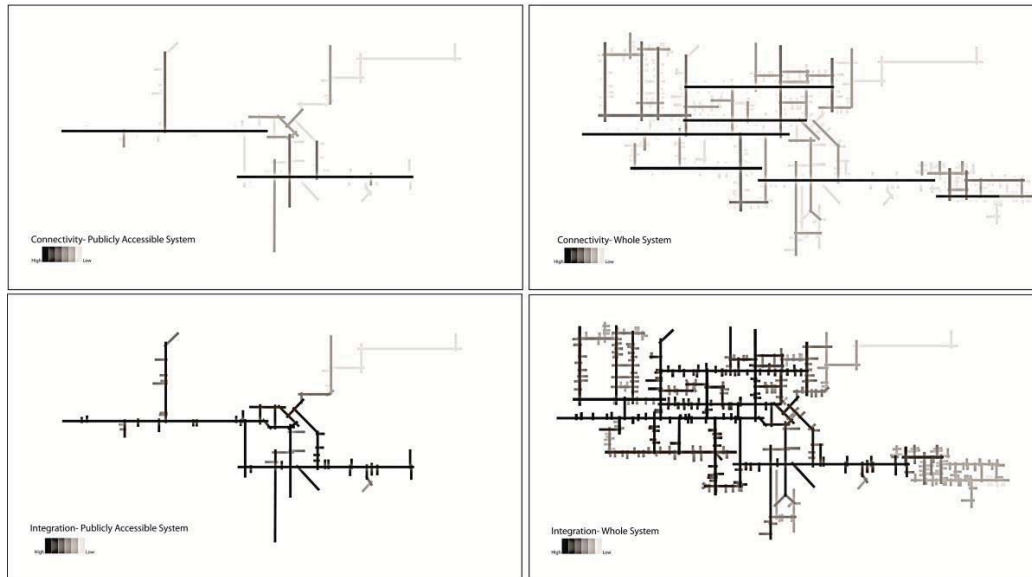


Figure 1: Axial map analysis of the whole system and the publicly accessible system

3.2. Floor Plan Analysis

The primary source of physical design data was the floor plan drawings of the outpatient department. The study focused on four departments (i.e. Pain management, Laboratory, Radiology and Surgery) that are all on the entry level of the building. The accessibility and inter-connection of the layout were analyzed using the construct of space syntax theories and method. Research has shown that space syntax variables can predict deliberate use of space in wayfinding situations (Peponis, Zimring, & Choi 1990; Zimring et.al.1998; Haq 1999;). For analysis, an axial map was produced for the *whole spatial system* of the study floor and the *publicly accessible route* of the floor (Figure 2). The "*whole spatial system*" refers to all circulation spaces on the study floor that were used by patients, staff nurses and doctors and the "*publicly accessible route*" refers to all spaces that patients could use.

The *axial map*, which represents a set of minimum number of longest sight line that covers every circulation space in the layout, was created for the study floor. "*Depth map 9*", a space syntax software program, was used to assess the relational pattern of the axial lines in the axial map (Figure 1). In this study, only *connectivity* and *integration* measures of space syntax were used. *Connectivity* is measured by counting the number of lines or spaces that are directly connected to another line or space. It provides the degree of choice on the line. A higher connectivity value represents more choice of movement on that line. *Integration* measures the relative position of any space or axial line with respect to all the space and lines in building layout. A higher integration value represents the space that is easily accessible.

4.0. ANALYSIS

The research evaluates the overall satisfaction with the hospital experience, and explores differences in patients' satisfaction across four departments. All data are analyzed in SPSS 20. In this analysis, patient satisfaction is measure in relation to patient demographic characteristic, spatial attributes, and spatial configuration

4.1 Patient Characteristics and Satisfaction

Patient demographic characteristics are an important determinant in studying patient satisfaction (Cleary & McNeil 1988). In this study, the aged patients (+60age) show higher satisfaction whereas the middle age groups (36-65) are less satisfied with signage system, overall layout, and design quality (figure 1). The

findings are consistent with prior research that shows aged people are always more satisfied than younger and middle age (Rahmqvist, 2001; Schoenfelder, Klewer, & Kugler, 2011). Literature shows that gender difference has an impact on patient satisfaction (Rahmqvist, 2001; Schoenfelder, Klewer, & Kugler, 2011; Sitzia & Wood, 1997). The findings show that in wayfinding situations, female patients are less satisfied than male patients in relation to spatial layout, signage system, and overall design quality (Figure1). Various research (Lawton, Charleston, & Zieles, 1996; Lawton & Kallai, 2002) reported that females are more stressed and anxious in wayfinding situations than males. In wayfinding situations, more stress can be a reason for less satisfaction among female patients.

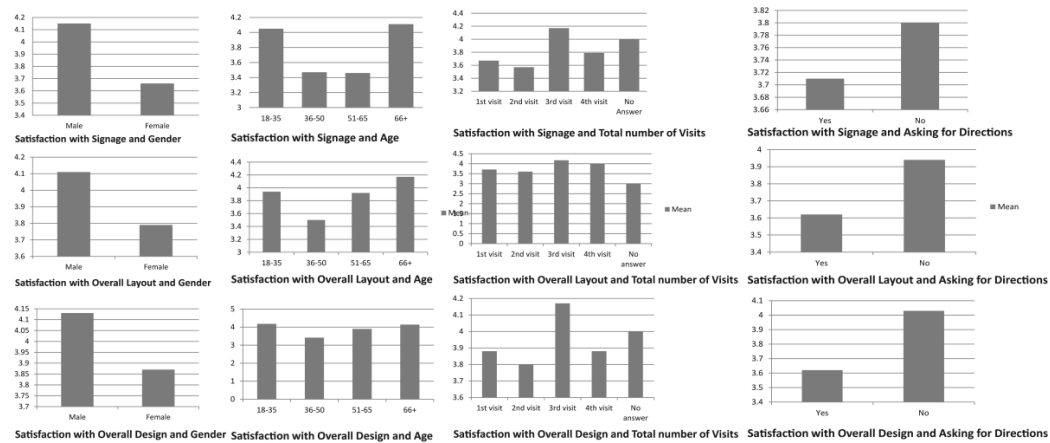


Figure 2: Patients' personal characteristics and satisfaction

In wayfinding situations, the study showed that patient who asked for volunteer help are less satisfied with the signage system, overall layout, and quality of design. It is possible that patients who were not confident in finding their way ask for volunteer and show dissatisfaction in order to locate their destination. The study also showed that patient satisfaction depends on the number of visits and the frequency of visits (Figure2). Patients who visited this hospital for the third time (about 10%-13% of all observed patients) are more satisfied with the signage, overall layout, and design than patients on their first, second, and fourth visits. This finding supports that familiarity with the environment reduces the stress level of patients in wayfinding situation and at the same time increases their satisfaction level. This study showed that patients who visited this hospital fourth time were less satisfied than the third time visit patients. It is possible that due to long time gap between third visit and fourth visit patients who visited this hospital fourth time were less satisfied in this study.

Table 1: Spatial attributes of Patient route

		Pain Management & Endoscopy	Laboratory			Radiology and Surgery		
		Route 1	Route 1	Route 2	Route 3	Route 1	Route 2	Route 3
No of directional change		1	4	4	5	5	5	6
Distance from entry		116.42 (ft.)	246.00(ft.)	240.75(ft.)	279.67(ft.)	359.5(ft.)	354.25(ft.)	383.33(ft.)
Signage on	wall	4	4	7	7	8	10	13
	floor	1	1	4	4	1	2	4
	roof	7	7	8	8	14	12	14
Landmark		You are here map	You are here map	You are here map	You are here map	You are here map	You are here map	You are here map
		Atrium	Atrium	Atrium	Atrium	Atrium	Atrium	Atrium
				Shop and setting	Shop and setting		Shop and setting	Shop and setting
					Elevator lobby1			Elevator lobby1
								Elevator lobby 2

This research only observed the main entrance that leads the visitor to the main atrium place. Within the three departments (Pain and Endoscopy, Laboratory, and Radiology & Surgery), only seven patient routes were studied. Table 1 shows the total length of the route, the number of directional changes, the number of directional signage, and the type and the number of landmark. The 'You are here' map, food court atrium, gift shop, and lift lobby are the landmarks in the setting. The map was placed in the central position of the atrium facing the entry. Therefore, it was visually and physically accessible to the patients. Information desk is physically and visually accessible from the entry. The findings show that the increases in the number directional change in the route also increase the number of signage and the length of travel route (Table 1).

4.2 Spatial Attributes and Patient Satisfaction

The correlation analysis between spatial attributes and patients' satisfaction with overall signage system, overall layout, and quality of design showed no significant relationship in this study. These denote that the number of signage was not related to patients' travel experience and satisfaction in wayfinding situations. However, the number of signage is highly correlated with patients' travel behavior (Table 2). The increase in the number of signage also increase patients travel time, travel distance, number of stops, number of looking around, number of asking for direction.

Table 2: Correlation between Spatial attributes, Patients' travel behavior and Satisfaction

	Satisfied with overall signage system	Satisfied with amount of time taken to reach services	Satisfied with overall layout	Satisfied with overall quality of design	Travel time	Travel distance	Number of stops	Number of Looking Around	Number of Asking for directions
Number of wall signage	-0.048	-0.072	-0.003	0.095	0.634**	0.855**	0.433**	0.678**	0.468**
Number of floor signage	0.185	-0.038	0.23	0.11	0.414**	0.511**	0.403**	0.486**	0.337**
Number of Ceiling Signage	-0.194	-0.139	-0.173	-0.033	0.521**	0.651**	0.254	0.500**	0.344**
Number of Landmark	0.097	-0.07	0.197	0.078	0.502**	0.657**	0.457**	0.620**	0.481**

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

*. Correlation is significant at the 0.05 level (2-tailed)

Table 3: Syntactic measure of Patient's travel route

	Correlation (R ²)		Mean Syntactic Measure	Pain Management & Endoscopy	Laboratory				Radiology and Surgery		
				Route1	Route 2	Route 3	Route 4	Route5	Route6	Route7	
Whole System	Rn - CV	0.108	Integration	1.81	2.03	1.88	1.84	1.95	1.87	1.89	
			Connectivity	24.00	24.00	19.14	23.11	25.00	19.14	22.36	
Publicly accessible system	Rn - CV	0.211	Integration	1.42	1.36	1.31	1.27	1.29	1.26	1.23	
			Connectivity	9.50	7.20	6.57	5.67	7.33	6.75	5.90	

4.3 Spatial Configuration and Patient Satisfaction

The axial map analysis of space syntax was done for both the publicly accessible system the whole spatial system. The analysis of the observed patient travel routes in the whole spatial system show the highest global integration value (Rn=2.03) for the Route 2 which take patient from the reception area to the laboratory (Table 3). The axial map analysis of the publicly accessible system shows that the connectivity value and global integration were highest for the Route 1 which takes patient from reception to pain and endoscopy department. The axial map analysis of the floor plan reveal poor correlation between global integration and connectivity (Rn-Cn) for the whole system (R2=0.108, p<0.5) and the publicly accessible system (R2=0.211, p<0.5). Hillier, Hanson, & Peponis (1987) define this correlation as the degree of intelligibility of a layout that helps to predict the spatial structure of a whole system. The findings denote that the spatial structure of the outpatient department is not intelligible to structure knowledge in wayfinding situation.

Table 4: Male patients' travel behavior, syntactic route attribute and satisfaction

Male Patient	Whole System				Publicly Accessible System			
	Department route		Patient route		Department route		Patient route	
	Integration	Connectivity	Integration	Connectivity	Integration	Connectivity	Integration	Connectivity
Travel Time	-0.053	-0.009	0.097	0.148	-0.309	-0.455	-0.249	-0.478
Travel distance	0.004	-0.404	0.473	-0.201	-0.846**	-0.614*	-0.437	-0.712**
Num_ stop	-0.444	-0.421	-0.109	-0.361	-0.704**	-0.452	-0.552	-0.656*
Num_ Looking around	-0.184	-0.469	0.227	-0.289	-0.611*	-0.476	-0.527	-0.546
Num_ Ask for direction	-0.228	-0.4	0.054	-0.489	-0.54	-0.117	-0.394	-0.36
Satisfied with overall signage system	-0.149	0.049	-0.174	0.261	0.186	0.24	0.075	0.454
Satisfied with amount of time taken to reach service	0.409	0.085	0.325	0.16	0.181	-0.049	0.27	0.118
Satisfied with overall layout	-0.05	-0.174	0.012	-0.092	-0.03	-0.081	-0.01	-0.013
Satisfied with overall quality of design	0.266	0.306	-0.094	-0.033	0.742*	0.806*	0.729*	0.801*

The correlation analysis show that satisfaction for all patients does not show any relation to patient travel behavior and syntactic attributes of the layout. However, male and female patients' satisfaction and travel behavior individually show a different correlation with syntactic properties of the layout. The study shows that for male patients, higher integration and connectivity value of the publicly accessible route will decrease travel distance, number of stops, and at the same time increase male patient's satisfaction about overall design (Table 4). The findings indicate that if male patients choose the publicly accessible route which is highly accessible and have higher degree of choice, they may be more satisfied in finding their destination. On the other hand, when female patient's choose route with higher integration and connectivity value, the route decrease the female patient's travel time, travel distance, number of travel behavior, and at the same time they are not satisfied with the overall layout and design (Table 5). Moreover, female patients are not also satisfied when their travel route has higher mean integration value.

Table 5: Female patients' travel behavior, syntactic route attribute and satisfaction

Female Patient	Whole System				Publicly Accessible System			
	Department route		Patient route		Department route		Patient route	
	Integrati on	Connect ivity	Integrati on	Connect ivity	Integrati on	Connect ivity	Integrati on	Connect ivity
Travel Time	0.087	-0.261	0.411**	-0.115	-0.761**	-0.471**	-0.749**	-0.526**
Travel distance	0.282	-0.385**	0.654**	-0.126	-0.910**	-0.699**	-0.870**	-0.709**
Num_ stop	-0.075	-0.213	0.089	-0.248	-0.407**	-0.324*	-0.450**	-0.412**
Num_ Looking around	-0.006	-0.255	0.277	-0.151	-0.712**	-0.528**	-0.762**	-0.599**
Num_ Ask for direction	-0.097	-0.137	0.038	-0.179	-0.360*	-0.256	-0.435**	-0.377*
Satisfied with overall signage system	-0.144	-0.111	-0.108	-0.11	0.014	-0.097	-0.009	-0.094
Satisfied with amount of time taken to reach service	-0.431**	-0.179	-0.334*	-0.181	0.203	0.192	0.213	0.224
Satisfied with overall layout	-0.377*	-0.105	-0.295	-0.132	0.042	0.054	-0.016	0.027
Satisfied with overall quality of design	-0.143	-0.274	0.054	-0.204	-0.275	-0.295	-0.278	-0.316

CONCLUSION

The aim of this study was to understand patients' travel experience and their satisfaction in relation to wayfinding in outpatient departments. The study focused on the satisfaction and travel experience of the patients' from reception to three outpatient departments - Pain and Endoscopy, Laboratory and Radiology and Surgery. The study showed that spatial layout, signage system, and the design quality of the environment were important factor for improving the patient's travel experience and satisfaction in wayfinding situation. The study also showed that personal characteristics of individual patient played an important role in determining satisfaction level. The numbers of signage system on the route have an effect

on patient travel behavior. In wayfinding situations patients' personal characteristics like age, gender, and familiarity of the environment have an effect on patients' satisfaction levels. Integration and connectivity of publicly accessible route have the ability to predict male and female satisfaction separately. At the same time female patients are always less satisfied with the spatial layout, signage system, and overall quality of outpatient department in wayfinding situation than are male patients. Therefore, the findings of this research help us understand about how layout affects the satisfaction level of patients in hospital building. The limited number of sample size, observation departments and simple hospital layout is the limitation of this study. In addition to large sample size and more observation departments, the study needs to focus on complex hospital layout. Further studies measuring patients' stress level would be needed for understanding the causes of dissatisfaction among female patients in relation to spatial layout.

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