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# WHAT DRIVES EMERGENCY DEPARTMENT PATIENT SATISFACTION? AN EMPIRICAL TEST USING STRUCTURAL EQUATION MODELING

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## Abstract

Patient satisfaction determinants in emergency departments (EDs) have for decades been heavily investigated. Despite great focus, a lack of consensus about which parameters are deemed most important remains. This study proposes an integrated framework for ED patient satisfaction, testing four key hypotheses concerning effects between the latent constructs *wait time*, *information delivery*, *safety*, and *infrastructure*. The framework allow ED decision makers insight into the magnitude of the latent constructs' importance with appertaining statistical significance based on an ample empirical sample. Such information is valuable to illuminate where to launch high impact initiatives to increase current ED patient satisfaction levels.

**Keywords:** Patient satisfaction, emergency department, structural equation modeling

## Introduction

Healthcare practitioners and administrators are coming to terms with the reality of patient satisfaction in an increasingly competitive field. Hence, there have been many contributions to literature in emergency medicine in terms of patient satisfaction drivers in the past decades. For the healthcare decision-maker, what valuable information can be extracted from all these studies? Can any of the literature's recommended themes be addressed through minor changes? If so, is it possible to implement such changes easily and without great expenses? The answers to these questions are not apparent for different reasons. First, the correlation between patient satisfaction and care rendered can be incoherent. A patient may be highly satisfied even though poor care was delivered. Thus, patients may not be faithful judges of clinical quality. Second, patients have difficulty in distinguishing between the different departments. They think in terms of their entire

hospital experience (Davies et al., 2008). The patient suffering from a thrombus in the coronary arteries (in medical terms; acute coronary syndrome) will possibly experience the ED, the imaging department, and the acute medical unit as a continuous flow of healthcare actions without clear distinctions of departmental activities. Lastly, which measures that proves most meaningful to register in ED patient satisfaction has proven to be a difficult task. For instance, a diner may count number of customers and profits as markers for satisfaction levels. No such easily defined measures exist in patient satisfaction (Welch, 2010).

Despite the difficulties in identifying the most significant drivers for ED patient satisfaction, it remains an intrinsically worthy goal due to several important benefits. Content patients have been reported to be more compliant in receiving treatment, which suggests that satisfaction is a key component in enhancing general well-being (Boudreaux, O'Hea, 2004). Additionally, a satisfied patient contributes to a more pleasant working environment, thus affects the employees in a positive manner. Adopting an economic viewpoint, financial viability is improved if patients would prefer to return in another case of emergency. Hence, there is every which reason to pursue high degrees of ED patient satisfaction. Unfortunately, literature investigating patient satisfaction in the ED suffers from methodological issues, resulting in dubious diverging conclusions. Qualitative approaches and simple statistical regression analyses have been preferred to highlight single factors of relevance to improve patient satisfaction rates. The interdependencies and magnitude of significance are thus highly wanted research areas in order to take one step deeper into the matter of understanding the underlying nature of ED patient satisfaction.

This study answers the call for such an improved statistical analysis and following interpretation of a priori hypotheses generated from theory. The objective is to empirically test emphasised propositions stemming from theory to provide an answer to what are the strongest predictors for ED patient satisfaction and their interconnections. As follows, the key hypotheses that were possible to investigate are presented.

### ***Brief presentation of hypotheses***

Bursch et al. studied actual- versus perceived wait time and found this to be *the* essential parameter contributing to ED patient satisfaction rates (Bursch, Beezy, Shaw, 1993). Their findings suggest matching patients' expectations, so that a patient's presumptions of timely treatment are aligned with current employee workloads. Perceived wait times was also given the highest influence by Kennedy et al who used 'patient who leave the ED without being seen' as control variable (Kennedy et al. 2008).

*Hypothesis 1:* Patients' satisfaction with wait times is positively connected to perceived safety.

Closely linked to a patient's satisfaction with wait times is a continuous flow of information about when he or she can anticipate value adding activities (Göransson, von Rosen, 2010). If a patient experiences unexplained or unclear wait, the time will feel longer and may have a negative effect on general satisfaction and security. Information delivery is hypothesised to impact satisfaction on both safety and wait times. Hence, two hypotheses are proposed:

*Hypothesis 2:* Deliverance of precise information on wait times is positively connected to patients' perceived safety.

*Hypothesis 3:* Patients' satisfaction with perceived wait times is positively connected to the delivery of precise information on wait times.

A new construct investigated in this study is denominated *infrastructure*. This construct encompasses two aspects being 1) how easy it is for the patient to navigate to the correct treatment facility and 2) the ease of finding an available parking slot. Even though this construct may appear somewhat peculiar at first glance, both aspects have recently been proposed to be an important determinant for patient satisfaction rates (Kington, Short, 2010). In lack of a term covering both aspects, *infrastructure* has been deemed the most appropriate for reference. In Denmark, the former urgent care unit and emergency department were two independently working units, each denominated differently. Through a recent restructuring of public hospital treatment facilities, it was decided on a political level to merge these two units into one common unit (Holm-Petersen, 2010). To date, familiarity with the new emergency department as a concept still has room for improvement. The merging of the two former units and concurrent closures of smaller hospitals increases the amount of patients to be handled. Hence, if infrastructure becomes the first ‘obstacle’ the patient encounters, despair causing a feeling of insecurity can evolve. The final hypothesis thus combines *safety* and *infrastructure*.

*Hypothesis 4:* Satisfactory infrastructure is positively connected to patients’ perceived safety.

## **Methodology**

The empirical data sample is provided by the Unit of Patient-Perceived Quality (UPPQ); a decentralised unit, which performs patient surveys on a national, regional, and local basis. Their reports are primarily used for benchmarking but also for quality improvement purposes. Until recently, Danish EDs have been omitted in terms of regional patient satisfaction surveys (Rimdal, Soerensen 2012).

The first complete patient satisfaction survey in The Capitol Region of Denmark’s EDs was carried out as a telephone survey between the 20<sup>th</sup> of February and 4<sup>th</sup> of March, 2012. Patients having visited one of the total 11 EDs in the region were eligible for participation. Prior to the telephone survey, the UPPQ conducted a literature study that included both national reports and international emergency medicine literature to highlight relevant patient satisfaction themes. Identified themes were subject to debate in a user panel consisting of two representatives from each of the EDs, typically a doctor and a nurse. Eight themes from literature were agreed by the user panel to be reflecting the most common topics of ED patient satisfaction. These themes were 1) guidance of directions, signposting, and parking facilities 2) reception, 3) waiting times (actual versus perceived), 4) relation and communication between healthcare professional and patient, 5) examination, treatment, and care in accordance to safety and personal involvement, 6) information delivery, 7) physical surroundings, and 8) overall satisfaction with stay. Subsequently, the UPPQ conducted semi-formal interviews with patients on-site to enhance external validity. All-together, 33 questions that reflected the eight themes were agreed upon. Most of these questions utilised a three- or five point Likert scale with few open ended questions.

The gross empirical sample consists of 1940 ED patient responses. Distribution of responses was at maximum 200 from each ED, with a smaller number of responses collected from smaller sized EDs. Responses were filtered prior to further analysis due to possible bias. If responses were done by either a guardian or a relative, the response was excluded since such a response may reflect personal opinions rather than the patients’.

## **Measures**

A growing body of literature has demonstrated several themes correlated with high ED patient satisfaction rates including tolerable wait times (perceived- versus actual wait times), technical competencies (human- as available technology), bedside manners, pain management, and information delivery (Welch, 2010). Not all of these essential measures can be extracted from the available empirical material. From Schull et al, the construct *safety* draws upon different aspects of how secure the patient feels in returning home, what symptoms to be aware of after discharge, and who to contact in case of exacerbation (Schull et al., 2011). An additional outcome measure has been added to this construct, namely overall satisfaction, as this has been found reasonable by the authors since 1) safety is the most crucial measure and 2) a high factor loading to this construct. Following Welch, a key measure is a patient's expectation to be treated within acceptable time limits (Welch 2010). *Wait times* are adapted in terms of both actual- and perceived wait times and the wait from arrival to first encounter with a healthcare professional. In terms of coherent *information* about status of wait times advocated by Trout, Magnusson, & Hedges in 2000, only two questionnaire items proved useful in the data analysis. These were 1) whether the patient was informed of the reason for the wait and 2) the development of expected wait time. Kington and Short point out that hospital *infrastructure* correlates with ED patient satisfaction rates (Kington, Short, 2010). This new construct covers 1) provision of precise and intuitive guidance to the ED and 2) an adequate amount of parking slots near the ED.

Table 1 summarizes the applied questionnaire items together with Cronbach's alpha as an estimate for the construct's internal consistency. As advocated by Hair et al, a cut-off value of 0.6 is applied (Hair et al., 2006).

*Table 1: Descriptive statistics*

<i>Construct</i>	<i>Cronbach's alpha</i>	<i>Items</i>
<i>Safety</i> (5-point Likert scales)	0.825	Do you feel very secure, secure, insecure or very insecure that you have received the correct examination and treatment in the ED? How do you evaluate the information about which symptoms you should be aware of after you returned home? How do you evaluate the information about who to contact in case you experienced any symptoms after you returned home? Did you feel very secure, secure, insecure or very insecure in returning home from the ED? What is your total impression of your visit in the ED?
<i>Waiting times</i> Rescaled (1-6) Reverse scaled (3-point Likert scale) (5-point Likert scale)	0.811	Waiting times distributed in triage levels How will you describe the duration of wait time from your reception till your initial examination? How do you evaluate the length of the total wait time during your entire visit at the ED?
<i>Infrastructure (newly developed)</i> (5-point Likert scales)	0.687	How do you evaluate the posting of signs to the ED? How do you evaluate the parking possibilities when you arrived at the ED?
<i>Information delivery</i> (5-point Likert scales)	0.677	Where you informed of why there was wait time from your reception to your initial examination? Where you continuously informed of the development in wait time from your reception to your initial examination - for instance by the personnel or shown on an information board/screen?

## ***Approach***

Analysis of the latent constructs' relations can be done simultaneously through structural equation modeling (SEM). This particular technique results in a more precise estimation of the constructs while eliminating biases in relation to single-indicator models. SEM has been applied using MPlus version 6.12 (Muthen, Muthen, 2007) to test the hypothesised relationships between the four latent constructs 1) *safety*, 2) *wait times*, 3) *infrastructure*, and 4) *information delivery*. The reason for choosing SEM is due to its appropriateness in testing a theoretical model, since it is capable of simultaneous estimation of multiple relationships between observed- and latent variables while taking measurement error into account. A generally accepted procedure in application of SEM, that involves two interlinked steps, has been applied (Anderson, Gerbing 1988). First, a *measurement model* must be established to analyse the validity of the model's latent constructs on the data sample. Afterwards, the actual SEM step serves as a means to quantify path coefficients while testing the relationships between the constructs by changing the measurement model into a *structural model*.

## **Results**

The results are presented in two-subchapters, each relating to the confirmatory factors analysis and the structural equation modeling accordingly.

### ***Confirmatory factor analysis results***

Heavy debate about which global goodness-of-fit measures to report along with accompanied threshold limits has been on-going for the past decade (Schreiber, 2008). Such a debate has occurred due to the dubious nature of several studies' results that draws on the missing consensus on different statistical measures in SEM (Shook et al., 2004). This study has adopted the generally accepted principal guidelines stated by Rex B. Kline (Kline, 2011).

As follows, recommended fit indices were calculated to assess how well the a priori model fitted the sample data. The measurement model's chi-square test of fit was found to be significant ( $\chi^2 = 152.126$ ,  $df = 48$ ,  $p < 0.001$ ). A significant chi-square test is not desirable, since this metric is often mentioned as a 'badness-of-fit' (Barrett, 2007). A highly significant chi-square can however be explained by a large data sample (Jöreskog, Sörbom, 1993). In this study, the applied data sample was  $n = 685$  due to a prior pairwise deletion, meaning all questionnaire items needed answers by the respondents. Reliance solely on the chi-square metric is unwarranted so other comparative fit indices were included. These comparative fit indices measure incremental model improvements by comparing the hypothesised model to the baseline. One measure, that analyses approximation error in a population, meanwhile being sensitive to the number of estimated parameters in the model, is the root mean square error of approximation (RMSEA) (Jöreskog, Sörbom, 1993). RMSEA will favour the most parsimonious model with a minimum of estimated parameters and a cut-off value below 0.08 is considered a good fit. Another included measure is the Bentler Comparative Fit index (CFI), which compares the target model to a null model in which all variables are assumed to be uncorrelated. CFI accepted threshold values must exceed 0.90 to indicate a good fit and is further regarded to be less sensitive to sample size (Hu, Bentler, 1999). Standardised root mean square residual (SRMR) can be included if questionnaire items are measured from different scales. This study included both three- and five point Likert scales, making the SRMR measure relevant. In brief, SRMR is an estimate of the difference between the sampled- and predicted correlation matrix. A SRMR value of 0 is equal to a perfect fit but values below 0.08 are acceptable (Hu, Bentler, 1999).

The measurement model's goodness-of-fit indices were found to be satisfactory, which permits a following SEM analysis. RMSEA equalled 0.056 with a 90 % confidence interval of 0.046 (low) to

0.066 (high). CFI was 0.963 and SRMR was 0.049.

### **SEM results**

Assessment of the hypothesised links between the latent constructs is done in the structural model part. The baseline model (model 1) that fitted the data sufficiently was tested (RMSEA = 0.058, CFI = 0.960, SRMR = 0.058,  $\chi^2 = 161.840$ ,  $df = 49$ ,  $p < 0.001$ ). Next, model 1 was compared to another nested structural model (model 2) rooted in literature. Two models are nested if one is a subset of the other (Kline 2011). The partly mediated model 2 is formed by removing the direct path between *information delivery* to *safety*. Such a change suggests that satisfaction with *infrastructure* and *safety* are mediated by both *information delivery* and *wait times*.

Unfortunately, removing the path resulted in a slight decrease in model fit, due to an increase in RMSEA ( $\Delta RMSEA = +0.01$ ), a decrease in CFI ( $\Delta CFI = -0.02$ ), increased SRMR ( $\Delta SRMR = +0.02$ ), and an insignificant increase in chi-square ( $\Delta \chi^2 = +5.96$ ,  $p < 0.02$ ).

Evaluating the fit-indices, model 2 obtains reduced values which indicate minor misspecifications compared to the baseline model, even though the chi-square is non-significant. The nested models are presented in Table 2.

### **Test of the hypotheses**

Estimates of all stated hypotheses was obtained exploiting the best fitted structural model; the baseline model. Non-standardized path coefficients are shown in Table 3.

Starting with the relationship between *safety* and *wait time* (Hypothesis 1), a positive and significant path coefficient was found ( $\gamma = +0.338$ ,  $p < 0.01$ ). The second hypothesis, which anticipated *safety* to be positively linked with *information delivery* was supported significantly ( $\gamma = +0.192$ ,  $p < 0.01$ ). Despite obtaining the right direction, the much emphasised relationship between *wait times* and *information delivery* (Hypothesis 3) was not found to be statistically significant ( $\gamma = +0.127$ ,  $p < 0.1$ ). Lastly, *safety* linked to *infrastructure* (Hypothesis 4) did achieve support ( $\gamma = +0.156$ ,  $p < 0.01$ ).

### **Discussion**

In this study, the underlying mechanisms of what drives ED patient satisfaction has been illuminated and empirically tested. This new knowledge can prove beneficial for multiple ED stakeholders as where to put effort in order to enhance patient satisfaction levels. Some key relations with direct impact on ED patient satisfaction have been considered. There are many ways to improve a patient's perceived experience in the ED, where initiatives could be either radical changes or smaller incremental alterations.

Proven in this study, minimising waiting times will increase satisfaction levels the most; a result consistent with much other literature findings. Bursch et al. emphasise that reducing the total length of stay in the ED is not likely to increase patient satisfaction (Bursch, Beezy, Shaw, 1993). The key issue is to limit the time interval from the time where the patient arrives to the time for initial assessment, while the patient is given the feeling that he or she is continuously being cared for. Especially being cared for in a timely manner is highlighted by multiple authors as being the prevailing determinant in patient satisfaction (Boudreaux, O'Hea, 2004). A recent study by Dinh et al (2012) points out the coherence between actual and perceived waiting times. Indeed, acceptable waiting times is a subjective matter, since one patient may find a certain wait too long, whilst another patient, suffering from similar symptoms and within the same triage level, would find the wait acceptable (Dinh et al., 2012). Hypothesis 3 confirmed, although not statistically significant, the importance of providing patients with adequate information about current waits as a

Table 2: Fit indices for structural models

No	Model	CFI	$\Delta CFI$	RMSEA	$\Delta RMSEA$	$\chi^2$	df	$\Delta \chi^2$	$\Delta df$	P
0	Measurement model	0.963		0.056		152,126	48			
1	Base line model	0.960		0.058		161,840	49			
	Model 1-0 difference		-0.003		0.002			9,71	1	p < 0.01
2	Delete Safety ON Info	0.958		0.059		167,800	50			
	Model 2-1 difference		-0.002		0.001			5,96	1	p < 0.05
	Model 2-0 difference		-0.005		0.003			15,67	2	p < 0.01

Table 3: SEM results of tested hypotheses, non-standardized path coefficients only

Note: N = 685, p < 0.01 \*\*, p < 0.05 \*

Hypothesis	Description of path	Hypothesised direction	Model 1 (baseline)
			Path coefficients
H1	Safety - Wait	+	0.338**
H2	Safety - Info	+	0.192*
H3	Wait - Info	+	0.127
H4	Safety - Infra	+	0.156**

driver for increased ED patient satisfaction. In continuation of wait times, dispersion of continuous information acting as mediator was confirmed to be the second most important measure to include in connection to perceived safety. Past studies have shown that improved information does lead to enhanced satisfaction levels and can be obtained by fairly easy changes, for instance handing out a business card upon first encounter with the patient. However, not all interventions have positive outcomes making information delivery techniques a prospective research area for the future.

The obtained SEM results were presented to the UPPQ at Frederiksberg Hospital in February 2013. 15 out of 20 tenured employees in the unit participated in a one hour workshop, reflecting on the SEM outcomes and pinpointing potential future research areas. The SEM results were confirmed to be aligned with their experience based on former studies in other hospital departments, thus adding to external validity.

In other studies where magnitude and interconnections of various latent constructs are to be investigated, SEM could be a means to do so. However, the researcher must be careful to comply with the increasingly stringent demands to global- and incremental fit indices' threshold values and especially prior survey design.

### **Conclusion**

This study has presented an empirical analysis of four hypotheses grounded in theory concerning what patients prefer the most when visiting an ED. By the use of a large patient satisfaction sample from 11 Danish EDs, none of the four hypotheses could be dismissed through the use of SEM. Even though the path coefficients obtained are of minor magnitude, most emphasised is the connection between perceived safety and the three remaining constructs 1) waiting times, 2) information delivery and 3) infrastructure. If these constructs are addressed in practice, ED patient satisfaction feedback is likely to improve. ED decisions makers are endowed with insight to launch initiatives with potentially higher impact, serving to refine an important cog in a highly complex health system.

Future research should include extending the presented SEM with more of the recommended theoretical latent constructs that could shed light on other valued patient satisfaction drivers. Also, an interventional longitudinal study design is deemed appropriate to see if specific initiatives targeted to this study's presented results have the wanted effect on ED performance levels.

### **Limitations**

Some limitations should be mentioned when interpreting the obtained results. First, preclusion of alternative causal explanation cannot be ruled out from the obtained dataset. Enhancement of reliability can be sought by adopting either a longitudinal research design or by acquisition of more survey responses from other national/international EDs. Second, the included latent constructs have all been identified in international peer-reviewed literature. However, this does not rule out the existence of other justifiable and equally important constructs, for instance staff communication skills (Rhee, Bird, 1996) and staff technical competencies (Welch et al., 2011). One of the most accentuated predictors of ED satisfaction is the communication between healthcare staff and patient

(Boudreaux et al. 2004; Boudreaux, O'Hea 2004). Unfortunately, such a construct was not possible to extract from the empirical material.

Typically, the researcher conducts the prior survey themselves a subsequent SEM analysis in mind. This study has done otherwise, since the survey had already been conducted by an external party who established the survey for a following less advanced statistical processing. Therefore, future surveys should be formed for each construct to be measured through three or more questionnaire items (observed variables) (Kline, 2011). A further benefit would be to include all three recommended control variables as indicators of overall contentment; 1) overall satisfaction with stay, 2) likelihood to recommend, and 3) willingness to return.

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