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THE IMPORTANCE OF PHYSICAL EVIDENCE IN HOSPITALS: THE CASE OF THE PUBLIC HOSPITAL PÊRO DA COVILHÃ

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Abstract:

Since physical evidences are very important for service provider organizations due to the influence that they may have over the reaction of their target audiences and over their resulting behaviours, this study aims to contribute to the knowledge of the role that physical evidences play in the patients, visitors/caregivers and hospital employees' overall satisfaction level and their willingness to recommend the services of the organization.

At this purpose, through a questionnaire research carried out at the Hospital Pêro da Covilhã (Portugal), where 150 people divided into the three above mentioned groups were surveyed, it was possible to ascertain that physical evidences influence the satisfaction of the hospital target audiences as well as their willingness to recommend the institution to others.

Keywords: *physical evidences*; *servicescape*; *healthscape*; *satisfaction*; *willingness to recommend*

LA IMPORTANCIA DE LA EVIDENCIA FÍSICA EN LOS HOSPITALES: EL CASO DEL HOSPITAL PÚBLICO PÊRO DA COVILHÃ

Resumen:

Dado que las evidencias físicas son muy importantes para las organizaciones proveedoras de servicios debido a la influencia que pueden tener en la reacción de sus públicos objetivo y en las conductas resultantes, este estudio trata de contribuir al conocimiento del papel que juegan las evidencias físicas en el nivel global de satisfacción de pacientes, visitantes/cuidadores y empleados hospitalarios y su disposición a recomendar los servicios de la organización.

Con este propósito, a través de una encuesta realizada en el Hospital Pêro da Covilhã (Portugal), donde se entrevistó a 150 personas divididas conforme a los tres grupos mencionados, fue posible determinar que las evidencias físicas influyen en la satisfacción de los públicos objetivo hospitalarios, así como en su disposición a recomendar la institución a otros.

Palabras clave: *evidencias físicas*; *servicescape*; *healthscape*; *satisfacción*; *disposición a recomendar*

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1. Introduction

Hospitals are the guarantors of one of the most important service provisions, namely the healthcare one and its "derivatives". Notwithstanding being considered as a service provision to which people are "obliged" to attend to when in need, even in this field the competition is increasing more and more and the customer has at his disposal more options in order to satisfy his needs in terms of health. This way, hospitals are starting to adopt the marketing principles developed for industrial and consumer products (France and Grover 1992).

It is here that physical evidences start playing its role as, according to Jones (2004), the physical environment is more important for the healthcare provision than it may be thought and it is more significant in situations in which the users are experiencing anxiety and stress. She also emphasizes the importance of the physical environment because it may influence the way we feel physical and psychologically and in the case of healthcare provision environments, aspects such as the communication between patients and doctors and even the employees' ethics may be affected.

According to Holder (2008), the physical environment in healthcare has a noteworthy effect in the satisfaction of the patients, the perception of the service quality, the returning intention and the willingness to recommend. Thus, hospitals are dependent on its physical evidences as these aspects are often the deciding factor when choosing a hospital. Public hospitals are not an exception, yet in these, this aspect is often pushed into the background due to either financial constraints or other factors considered as more important.

In this way, if the study of this topic is relevant to hospitals in general, it is more relevant for public ones, because it is essential to show in what way this marketing mix tool may contribute to improve the satisfaction of patients, visitors and employees, as well as, the implications it has in the willingness to recommend the institution. This study is even more relevant due to the fact that this topic is still under investigation and there aren't any studies and analysis regarding physical evidences in Portuguese hospitals.

2. Literature review

2.1. Services

According to Kotler and Keller (2009), a *service* is any act or performance that one can offer to another that is essentially intangible, not resulting in the ownership of nothing, and that its production may or may not be associated with a physical good. On a more profound and complete way, a *service business* is that in which the perceived value of the offer to the buyer is determined more by the service provided than by the product offered itself (Gonçalves 1998). This includes businesses that have an almost exclusively intangible offer, such as cleaning services, justice and health services. It also includes businesses that offer both services and products, such as restaurants and shopping services. In other words, any company or institution in which a large proportion of the perceived offer is a service found in the services sector.

Services are distinguishable from goods mainly due to their *intangibility*, that is to say, the absence of physical substance. However, as suggested by several authors (Zeithaml et al. 1985; France and Grover 1992; Lovelock and Gummesson 2004; Vargo and Lusch 2004; Corrêa et al. 2007; Kotler and Keller 2009; Moeller 2010), there are other features of services allowing to distinguish them comparatively to physical goods. These features are, in addition to the aforementioned intangibility, the *inseparability*, the *heterogeneity* and the *perishability*. For Zeithaml and Bitner (2003), the differences between services and goods result in unique, or at least different management challenges for business services or to the producers that own services as their main offer.

Services have an increasing importance in developed countries economies. There is a widespread belief that one of the pillars of economic development of countries is the services sector, since families have increasing expenses in services such as health, old age protection, education, culture and leisure. Economic activities as well as those that are related to tourism, free time activities, people and property insurance, finance, catering, communications, information technology, among others, have an increasing weight in the economy; not only due to the representing turnovers but also to the employment provided (Lindon 2008). Given the importance of this fact, it makes all sense that organizations that constitute this sector provide, increasingly, better services, as it is the case of hospitals in the health sector.

2.2. Health services

In Portugal, the National Health System (NHS) is unanimously seen as the biggest case of success of the democracy and one of its secrets is its ability of adapt itself to the evolution of the demand and supply of healthcare services (ARSLVT 2009). At present, it assumes a constitutional responsibility to provide to all citizens the healthcare they need through its structures of Primary Health Care, Hospitals and Integrated Long-Term Care. From these structures, hospitals are emphasized due to their importance for this investigation. Hospitals should ensure the provision of quality healthcare, in a timely manner, in accordance with the state of the art and the real health needs of the populations, given the logic of efficiency and rationality (GTROIH 2010).

Lovelock and Wright (2001) show that, besides the four aforementioned features, two other are important for health services: on the one hand, the *customer involvement* in the production process; on the other hand, the greater *difficulty of evaluation* of the service provided by the customer. In addition to the features of the services previously mentioned, there are other aspects that differentiate health services from all others. In this sense, France and Grover (1992) argue that health services are particularly more complex than other types of services due to five reasons: i) they are probably the most intangible of all services; ii) the difference between customer's expectations and actual delivery may be higher for health services; iii) the demand for health services is less predictable; iv) the distinction between the decision maker and the customer is more confusing in health services; and v) very often the customer does not exchange directly money for health services. These features of health services allow a demonstration of its greater specificity and, hence, a different type of approach comparatively to services in general.

2.3. Services marketing

Simultaneously to the increase of services importance in modern societies, there is a need for services marketing, similar to the existing in products marketing, which, according to Cota (2006), presents as a function to try, as much as possible, to make as noticeable as possible the service provision, highlighting the benefits offered.

Due to the same differences between products and services, the services marketing professionals are brought face to face with certain challenges. These challenges, as recommended by Zeithaml and Bitner (2003), involve the understanding of the needs and expectations of customers regarding the services, as well as making the services offer tangible, deal with countless people and distribution processes, and keep the promises made to the customers.

To achieve the goals that the service provider organizations have set, it is necessary to control the aspects related to the services mix. This will make it easier to tangibilize the services provided, giving the customers an easier evaluation of the service provision to which they were subjected to.

One of the most basic concepts of marketing is the so-called marketing mix, defined by Zeithaml and Bitner (2003) as a set of elements that an organization controls and that may be used in order to satisfy the customers. These elements may be reduced to four factors resulting in the traditional marketing mix and are presented by Perreault and McCarthy (2002) as product, price, distribution and promotion.

However, services are different from goods, and due to their characteristics, there is a need of expansion of the marketing mix in order to accommodate other elements. Thus, according to Zeithaml and Bitner (2003), the marketing mix of services has the following three additional elements (or three additional P's): *People*, *Process* and *Physical evidence*. As services have, to a greater or lesser extent, the characteristic of intangibility, the customer demands and interprets signals that give them clues regarding its quality. The physical appearance and image of the reception clerk at the doctor's (a clear example on the importance of *people*), the speed and efficiency when a check-in in an airline company is made (just the same referred to *processes*) and the cleanliness of the floor and counter in a café (*physical evidence*) are all signs of the eventual quality of the services in question (Saias 2007).

2.4. Physical evidence

It is on the physical evidence that the interest of this study falls back to. For Zeithaml and Bitner (2003), the physical evidence includes all the tangible elements of a service, such as brochures, business cards, signs and equipments. In other cases, it may include the *servicescape* which, according to Bitner (1992), is the physical surrounding where the service is provided and that may trigger an internal reaction in the customers, leading to approximation or avoidance behaviours, both by the customers and employees.

Besides the impact in customers, the servicescape may also influence the behaviour of the employees that provide a service and influence the nature of the social interaction between customers and employees.

The way a service is presented to the market is an integral part of the service and the physical aspects play an important role in the way customers see the service provider (Gonçalves 1998). As it is indicated by Bitner (1990), the evaluation of an organization by the customers often depends on the evaluation of the setting where the service is provided. This assessment may even be the result of a first impression which, according to Lin (2004), customers will use to create their beliefs, attitudes and expectations about the service that will be or is being provided.

According to Gonçalves (1998), physical evidence is also extremely important for customers' orientation and to make them feel comfortable during the process of service provision and permanence in the facilities as well as making them feel confident about the service provider.

At the end, it will be through these physical aspects that customers may tangibilize the service provided, allowing them to easily issue an opinion on the same, because, as Hoffman and Bateson (2006) refer, it is difficult to the costumers to objectively assess the quality of the services due to its intangibility, being these, several times, dependent on the physical evidences in a way that it is possible to make an evaluation in this sense.

Physical evidences/servicescape are seen by some authors (Bitner 1992; Hoffman and Bateson 2006) as a facilitator mean on the level of: packing; aid to the activities flow; the process of socialization among employees, among costumers and between employees and customers; aid to customers and employees in the performance of their respective tasks throughout the process of service provision; the differentiation, signalling the market segment to be achieved by positioning the organization and distinguishing it from the competition; and the range of the specific marketing objectives, such as the attraction and customers' satisfaction as well as the employees' satisfaction, motivation and efficiency.

Apart from the afore described aspects eased by physical evidence, Bitner (1992) suggests the effects that the servicescape may cause in the behaviours and internal responses, both of customers and employees. These effects may be on the individual behaviour and social interactions level. Regarding the internal responses, the effects may be cognitive, emotional and physiological.

Concerning the internal responses, Zeithaml and Bitner (2003) show that, in overall, people react to the setting in the ways previously described and that their reactions influence their behaviours, but the reaction will not always be the same or identical for all individuals. Different personality features, as well as temporary conditions and the reasons of their permanence may cause variations in the way people react to servicescape.

It is important to mention that as stated by Bitner (1992), the servicescape does not directly lead people to behave in a bold way, being the reactions previously referred as the ones that beget emotions, beliefs and physiological sensations that, in turn, will influence the individual's behaviour. The servicescape contributes significantly to the experience had during the service provision, which will affect the feelings, satisfaction and attitudes (Bitner 1990; Grace and O'Cass 2004).

In terms of how the individuals are affected by the organizations' setting dimension, it may result, according to Bitner (1992) and Lin and Worthley (2012), in approximation, or in opposition, avoidance behaviours, being these, obviously, away from the interests of the organizations which provide services.

Being able to produce in the individuals the responses and the behaviours previously described, the servicescape highlights its importance. In this sense, Bitner (1992) unveils that the organizations will be able to achieve its external and internal aims in a better way through a careful and creative management.

Otani et al. (2010) point out that all industries are interested in customer satisfaction, because satisfied customers are loyal customers. Health is not an exception and that way patients' satisfaction is critical in healthcare outcomes.

Thus, physical evidences reveal to be equally important to health units, since, similarly to other organizations, they provide services subject to the recognition of their patients/customers and, according to Becker et al. (2008), these have a bigger perception of quality and satisfaction when the physical surrounding is attractive. Beside patients/customers, physical evidences also influence employees (Fottler et al. 2000).

Hutton and Richardson (1995) name as *healthscape* the physical facilities where health services are provided and are assessed in at least four out of five senses: sight, hearing, smell and touch. According to these authors, as well as to Fottler et al. (2000), this setting influences several aspects, such as the patients' behaviours, their satisfaction, the perceived quality, the returning intention and the willingness to recommend the healthcare provider to others.

According to Bitner (1992) and Ulrich et al. (2008), a hospital may be planned in order to offer comfort, satisfaction and security and, at the same time, to ease the performance of the employees' tasks. For Cedrés de Bello (2000), the physical setting must beget some behaviours and avoid others, because non-fulfilled needs may result in tension, inconformity, dissatisfaction and even making a task unbearable. These negative aspects may give rise to psychological changes, fatigue and accidents.

On the contrary, a well-developed healthscape may allow to: exceed customers' expectations regarding the service provision in terms of security, support, physical and psychological comfort, contribute to the creation of a healing environment and a memorable experience (Fottler et al. 2000); help in reducing infections, reduce work accidents, improve the arrangement to the shift work (Joseph 2006), reduce employees' stress and fatigue and increase their efficacy, increment patients' safety, improve results and overall quality (Ulrich 2004).

This way, it is observed that, as stated by Bitner (1992), organizations that provide healthcare services may, through a careful management of their healthscape, achieve in a more satisfactory way their objectives towards the external and internal target audiences.

It is due to the existing difficulty in the assessment of the provided services, especially obvious in the healthcare provision, that physical evidences play an essential role in the evaluation made by the patient/customers and also by the hospitals employees as well as in the creation of positive responses and resulting behaviours of approximation of the organization internal and external target audiences.

3. Research methodology

This study, developed according to a quantitative dimension, aims to answer the questions raised about the physical evidences and their influence in the Portuguese hospital units, being the Hospital Pêro da Covilhã (public hospital) used as object of study. These questions are related to the physical evidences which are more relevant and appreciated by the institution internal and external target audiences and in what way these may influence their opinion and even limit the overall satisfaction level towards the institution and the willingness to recommend it to others.

3.1. Hypotheses

There are several authors (Bitner 1990; Bitner 1992; Grace and O'Cass, 2004; Thusyanthy and Senthilnathan 2011; Lin and Worthley 2012) who mention physical evidences as relevant to the customers and employees of a service provider organization. Such importance is, equally, observed in healthcare service providers when considering their external and internal target audiences (Hutton and Richardson 1995; Cedrés de Bello 2000; Fottler et al. 2000; Joseph 2006; Becker et al. 2008; Sadler et al. 2008; Ulrich et al. 2008; Janakiraman et al. 2011). As seen in the literature, this study aims, according to its specific objectives, to investigate, using in particular the analysis of the Hospital Pêro da Covilhã, the role played by physical evidences regarding the overall satisfaction of its target audiences. This way the following hypothesis is presented:

H_1: physical evidences influence the overall satisfaction of hospitals patients, visitors/caregivers and employees.

As it is possible to observe, physical evidences may influence the satisfaction of the target audience of a service provider organization and may also influence the willingness to recommend an institution provider of healthcare services (Hutton and Richardson 1995; Fottler et al. 2000; Becker et al. (2008). According to what has been evidenced by different authors and in consonance with the specific objectives of this research, we aim to investigate to what extend physical evidences may influence the opinions of the target audiences of an institution provider of healthcare services in a way it may limit the willingness to recommend it to others. In order to get an answer for this question, a new hypothesis is presented:

H_2: physical evidences influence the willingness to recommend a hospital.

After developing the research hypothesis, the study and its objective would not be fulfilled without the analysis and consequent sample presented below.

3.2. Sample selection and characterization

The choice of the unit of analysis fell on the Cova da Beira Hospital Centre, EPE (CHCB). This institution is situated in the interior region of Portugal, more specifically, in the Cova da Beira region and appears as the main provider of health care in this region of the country.

According to the purpose of the investigation and after choosing the unit of analysis, it was found that the population would be made up of internal and external target audiences of the CHCB. As workforce, there are 1288 effective professionals, while as external targets we could advance the number of approximately 96,000 inhabitants of the area of influence of this hospital. However, and since it is the mission of this institution providing health care for the entire population of its area of influence, as well as to all citizens in general, it is impossible to determine the exact number of the population that can be increased by visitors and patients caregivers.

The study shows, as sample, a set of 150 respondents divided into three groups representing internal and external target audiences of the CHCB, all of them selected by convenience. Thus, the sample consists of 50 employees, 50 visitors/caregivers and 50 patients, each group representing 33.33% of the total sample, which allows, in this context, perfect sample heterogeneity.

Additionally, the sample is composed of 59.33% females and 40.67% males. As for his age level, the most representative of the intervals are the ages between 26 and 40 with 40.00% of respondents, and between 41 and 55 years with 37.33%, representing in total, 77.33% of the whole sample. Less representative are the intervals under the age of 26 years and older than 55 years, both with 11.33% representing together 22.67% of the sample.

3.3. Data collection instrument

For data collection, we used a questionnaire based on the literature review where all aspects of physical evidence forming the servicescape are pointed (Bitner, 1992; Hutton and Richardson, 1995; Fottler et al., 2000). They were also instrumental in drafting the questionnaire, questions developed to achieve the study objectives.

The questionnaire was designed in three parts, all integrating structured questions that, according to Malhotra (2004), specify a set of alternative responses, as well as the model's response, and may present itself in the form of multiple choice, dichotomous or scale.

The first part is formed of three questions that address the demographic characteristics of the respondent such as age, gender and the reason why he/she is in the hospital, i.e., as user, visitor/caregiver or employee. The second part of the questionnaire presents, after a brief explanation regarding how to answer, a set of 14 questions about the exterior, 21 about the interior, and 2 questions about the CHCB employees. For these 37 questions (presented in the form of statements) Likert-type scale with five points of intensity, ranging from 1 (*"completely disagree"*) to 5 (*"completely agree"*) was used. The second part of the questionnaire ends with a question about the degree of overall satisfaction with the hospital, and for which also a Likert-type scale with five points of increasing intensity from 1 (*"not at all satisfied"*) to 5 (*"very satisfied"*) was used. The third part of the questionnaire presents two questions, one dichotomous (*"yes"*/ *"no"*), in which is questioned whether the hospital meets the needs of the respondent, and a second, polychotomous (*"yes", "no"* or *"maybe"*), questioning on the possible recommendation of this Hospital.

All questionnaires were given to respondents in hand, and it was always given a brief verbal explanation of the correct way to fill the responses, being the researchers always present and available for any further explanation during the questionnaire.

3.4. Data processing

The information collected through the implementation of the questionnaire underwent statistical analysis, using the *Statistical Package for Social Sciences (SPSS) 20.0*. The analysis carried out were inferential analysis, which allows analysing and identifying relationships between the independent and dependent variables under study.

4. Presentation and discussion on results

The results were achieved through inferential statistics that allow to study the relationships between variables, having being used the logistic regression that, according to Pestana and Gageiro (2008), aims to find the best linear combination of explanatory variables that maximizes the likelihood of obtaining the observed frequencies, in order to make predictions and classify new cases. In this way, there is the possibility to assess which independent variables affect and how they affect the dependent variable. The use of this analysis has shown the influence physical evidence has on overall satisfaction and willingness to recommend a hospital unit.

This statistical analysis allowed answering the research hypotheses outlined in the previous chapter, which, in turn, made possible to achieve the research objectives proposed.

In order to facilitate the analysis of the independent variables representing the observable physical evidence in a hospital unit, a factor analysis was used in which the obtained results (using the varimax rotation method) allow to verify the retention of 10 factors representing 71,92% of the total variance. For the factor analysis validation, it was used the KMO (Kaiser-Meyer-Olkin) test, that allows to check the quality of the data and in this case, with a value of 0.819, it is considered adequate. Regarding the Barlett sphericity test, since it has a *p*-value inferior to 0.001, it leads to the rejection of the hypothesis of the correlations matrix being the identity matrix, thereby demonstrating that there is a correlation between the variables (Pestana and Gageiro 2008; Marôco 2010).

The 10 factors retained were designated as F1 - *"sensations"*, F2 - *"interior aesthetics"*, F3 - *"interior signage"*, F4 - *"exterior aesthetics"*, F5 - *"cleanliness"*, F6 - *"exterior signage"*, F7 - *"ambient music"*, F8 - *"accessibilities"*, F9 - *"staff appearance"*, and F10 - *"parking facilities"*.

4.1. Logistic regression with "degree of general satisfaction" as dependent variable

The first regression model to be estimated aims to estimate the probability of a higher degree of satisfaction of the external and internal target audiences of the Pêro da Covilhã Hospital being dependent on their perception of the physical evidence of this hospital unit, towards the validation of H_1.

Initially it was chosen the ordinal regression method for modelling this probability, given the qualitative nature of the ordinal dependent variable *"degree of general satisfaction"* with four classes: 0 (*"little satisfied"*), 1 (*"satisfied"*), 2 (*"very satisfied", and 3 ("extremely satisfied"*). The non-validation of the slopes homogeneity assumption led to the use of the multinomial regression as alternative analysis, as suggested by Marôco (2010).

The multinomial model fit, having *"general satisfaction degree"* (*GEN.SATISF.DEGREE*) as dependent variable and as independent variables or predictors the latent factors of *"physical evidence of the Hospital environment"* obtained through the factor analysis described above, was inadequate and its validity uncertain, which led to the use of the logistic regression analysis only considering the categories *"satisfied"* and *"very satisfied"* of the dependent variable. Thus, in the first estimated model, such variable has the code 0 (*"satisfied"*), and 1 (*"very satisfied"*). The independent variables correspond to the ten latent factors of the *"physical evidence of the Hospital environment"*, as referred above.

Table 1 presents the parameters estimates and their respective standard errors, the likelihood ratio test (G^2), the *-2LL* statistic, the *Nagelkerke pseudo-*R^2 and the adjustment test of Hosmer and Lemeshow of *model 1* and *readjusted model 1* (i.e., only with the significant independent variables). The last column shows the model exponential coefficients *Exp(β)* and the estimates of the odds ratio of the dependent variable per additional unit of the independent variable.

Regarding *model 1*, the test of the difference of the likelihood ratio [$G^2(10) = 23.485$ ($p = 0.009$)] indicates that the difference between the null model and the added model of the independent variables is statistically significant, concluding that at least one of the independent variables has predictive power over the dependent variable. The value from the Hosmer and Lemeshow adjustment test [$X^2_{HL}(8) = 11.135$ ($p = 0.194$)] allows not rejecting the null hypothesis that the model fits the data, that is, the values estimated by the model are close to the values observed. The *Nagelkerke pseudo-*R^2 for *model 1* shows that the independent variables included in the model allow reducing the uncertainty of the dependent variable in 20.6%. Given the observed and predicted classification of *model 1*, it is concluded that the logistic regression correctly classifies 68.1% of cases.

Table 1. Logit coefficients of the logistic regression model on degree of general satisfaction with the Pêro da Covilhã Hospital depending on its physical evidence

	Model 1					Model 1 readjusted					
	B	*S.E.*	*Wald*	*df*	*Sig.*	*B.*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(β)*
F1	**0.354**	**0.200**	**3.138**	**1**	**0.076****	**0.341**	**0.195**	**3.064**	**1**	**0.080****	**1.406**
F2	**0.581**	**0.213**	**7.450**	**1**	**0.006***	**0.536**	**0.202**	**7.009**	**1**	**0.008***	**1.709**
F3	0.196	0.195	1.014	1	0.314						
F4	0.052	0.187	0.077	1	0.781						
F5	0.322	0.203	2.507	1	0.113						
F6	0.115	0.208	0.308	1	0.579						
F7	-0.005	0.201	0.001	1	0.982						
F8	**0.450**	**0.209**	**4.651**	**1**	**0.031***	**0.473**	**0.205**	**5.333**	**1**	**0.021***	**1.605**
F9	0.204	0.201	1.033	1	0.309						
F10	-0.240	0.196	1.500	1	0.221						
Intercept	-0.625	0.192	10.533	1	0.001	-0.599	0.187	10.319	1	0.001	0.549
G^2 *(sig)*	23.485 (0.009)					16.732 (0.001)					
-2LL (sig)	165.994					172.747					
X^2_{HL} *(sig)*	11.135 (0.194)					4.620 (0.797)					
pseudo-R^2 *Nagelkerke*	0.206					0.150					
Global classification	68.1%					66.7%					
N	144					144					

* Significance level 0.05 ** Significance level 0.10

According to the Wald test, associated to the logit coefficients of the estimated *model 1*, it turns out that for the significance level of 0.05, only the independent variables F2 - *"interior aesthetics"* [$\chi^2_W(1) = 7.450$ ($p = 0.006$)] and F8 - *"accessibilities"* [$\chi^2_W(1) = 4.651$ ($p = 0.031$)] are significant. Considering a higher probability of error ($\alpha = 0.10$), it can be stated that the factor F1 - *"sensations"* [$\chi^2_W(1) = 3.138$ ($p = 0.076$)] has also a marginally significant effect over the probability to occur a higher degree of satisfaction among respondents.

The *new readjusted model 1* containing only the significant independent variables (and marginally significant) of *model 1* is statistically significant [$G^2(3) = 16.732$ ($p = 0.001$); $X^2_{HL}(8) = 4.620$ ($p = 0.797$); $R^2_N = 0.150$]. The regression coefficients (β), after readjustment of *model 1* are also present, and therefore the logistic regression model under study can be written as:

$$\textit{Model 1}: \quad \text{Logit}(\hat{\pi}) = -0.599 + 0.341\,F1 + 0.536\,F2 + 0.473\,F8 \qquad [1]$$

or, in probabilistic terms, as:

$$\textit{Model 1'}: \quad \hat{\pi} = \frac{1}{1 + e^{-(-0.599 + 0.341\,F1 + 0.536\,F2 + 0.473\,F8)}} \qquad [1']$$

Regarding the values of the column *Exp(β)*, it is found that the odds ratios of being very satisfied with the Pêro da Covilhã Hospital are 1.406, 1.709 and 1.605 for each additional value on the factors F1, F2 and F8. This means that, in percentage terms, the odds of being more satisfied with the Hospital increases 40.6% for each additional unit of the factor *"sensations"*, increases 70.9% for each additional unit of the factor *"interior aesthetics"*, and increases 60.5% for each additional unit of the factor *"accessibilities"*. For the remaining physical evidence, it is verified that they do not affect the degree of satisfaction of the respondents.

With the cut-off value of 0.5, the overall classification of the model is 66.7% and, based on the values of sensitivity of 58.6% and specificity of 68.7%, has a reasonable predictive capability.

These results allow thus the validation of the hypothesis H_1, finding itself in accordance with the established and advocated by several authors, namely that the physical evidence influence the overall

satisfaction of an organization's target audiences. There are several factors related to the physical evidence that may be perceived both by consumers and employees and both groups can respond to the environment in a cognitive, emotional and physiological way, influencing their general satisfaction (Bitner 1992).

So it is possible to verify that, as indicated by Lin and Worthley (2012), a pleasant servicescape can be manipulated with environmental attributes in order to generate feelings of satisfaction among consumers, extending this fact to employees (Cedrés de Bello 2000).

4.2. Logistic regression with "willingness to recommend" as dependent variable

Similarly, in order to validate H_2, it was proceeded to the estimation of the logistic regression model that allows modelling the probability that respondents have the willingness to recommend the Pêro da Covilhã Hospital according to its physical evidence.

The dependent variable *"recommendation of the Hospital"* has the codes 0 (*"undecided"*), and 1 (*"recommend"*), i.e. the reference class was being 0 (*"undecided"*). The independent variables also correspond to the latent factors of the *"physical evidence of the Hospital environment"* resulting from the factor analysis.

Table 2 contains the *model 2* parameters estimated and their respective standard errors, before and after the readjustment. It also contains the statistics G^2, X^2_{HL}, *Nagelkerke pseudo-*R^2 and the indicator *-2LL*, as well as the readjusted exponential coefficients.

According to the data presented in this second table, it is possible to conclude that *model 2* is statistically significant [$G^2(10) = 23.718$ ($p = 0.008$)], since according to the ratio test of the likelihood between the null model and the final model, the null hypothesis that the model is not significant is rejected and can therefore be concluded that there is at least one independent variable that significantly influences the respondents' willingness to recommend the Hospital to others. Although this model is significant, the extent of the effect is somewhat reduced ($R^2_N = 0.244$). The statistical of the test and the significance of the Hosmer and Lemeshow test does not allow rejecting the null hypothesis that the model fits the data appropriately [$X^2_{HL}(8) = 7.967$ ($p = 0.437$)].

Table 2. Logit coefficients of the logistic regression model on willingness to recommend the Pêro da Covilha Hospital according to its physical evidence

	Model 2					Model 2 readjusted					
	B	*S.E.*	*Wald*	*df*	*Sig.*	*B.*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(β)*
F1	**0.624**	**0.230**	**7.331**	**1**	**0.007***	**0.587**	**0.228**	**6.624**	**1**	**0.010***	**1.798**
F2	0.362	0.236	2.368	1	0.124						
F3	0.210	0.237	0.786	1	0.375						
F4	0.098	0.237	0.170	1	0.680						
F5	0.247	0.211	1.370	1	0.242						
F6	**0.519**	**0.239**	**4.709**	**1**	**0.030***	**0.535**	**0.231**	**5.371**	**1**	**0.020***	**1.707**
F7	**-0.448**	**0.259**	**3.004**	**1**	**0.083****	**-0.455**	**0.254**	**3.224**	**1**	**0.073****	**0.634**
F8	-0.280	0.262	1.141	1	0.285						
F9	0.002	0.212	0.000	1	0.992						
F10	**0.508**	**0.250**	**4.123**	**1**	**0.042***	**0.442**	**0.237**	**3.477**	**1**	**0.062****	**1.555**
Intercept	1.953	0.289	45.541	1	0.000	1.856	0.270	47.151	1	0.000	6.400
G^2 (sig)	23.718 (0.008)					17.961 (0.001)					
-2LL (sig)	114.239					119.997					
X^2_{HL} (sig)	7.967 (0.437)					4.495 (0.810)					
pseudo-R^2 Nagelkerke	0.244					0.188					
Global classification	83.9%					85.2%					
N	149					149					

* Significance level 0.05 ** Significance level 0.10

Based on the Wald test associated to the logit coefficients of the estimated *model 2*, it is noted that, for the significance level of 5%, the independent variables F1 - *"sensations"* [$\chi^2_W(1) = 7.331$ ($p = 0.007$)], F6 - *"exterior signage"* [$\chi^2_W(1) = 4.709$ ($p = 0.030$)], and F10 - *"parking facilities"* [$\chi^2_W(1) = 4.123$ ($p = 0.042$)] significantly affect the probability logit of respondents having the willingness to recommend the hospital. For the significance level of 10% it can still be considered the marginal effect of factor F7 - *"ambient music"* [$\chi^2_W(1) = 3.004$ ($p = 0.083$)] to predict the occurrence of recommending the Hospital to others.

Model 2 was also readjusted, including only the independent variables with a significant and marginally significant effect on the dependent variable. Thus, the *readjusted model 2* is also statistically significant [$G^2(4) = 17.961$ ($p = 0.001$)], remaining low the statistic of the *Nagelkerke pseudo-*R^2 ($R^2_N = 0.188$). As with the previous model it is also concluded that the model fits appropriately to the data [$X^2_{HL}(8) = 4.495$ ($p = 0.810$)].

The Wald test associated to the logit coefficients of the *readjusted model 2* shows that factors F1 - *"sensations"* [$\chi^2_W(1) = 6.624$ ($p = 0.010$)], and F6 - *"exterior signage"* [$\chi^2_W(1) = 5.371$ ($p = 0.020$)] continue to significantly affect the logit of the probability of respondents having the willingness to recommend the Pêro da Covilhã Hospital. Factor F7 - *"ambient music"* [$\chi^2_W(1) = 3.224$ ($p = 0.073$)] remained marginally significant, although the significance probability is relatively lower than that of *model 2*. Factor F10 - *"parking facilities"* [$\chi^2_W(1) = 3.477$ ($p = 0.062$)] also assumed a marginally significant effect.

Therefore, based on the regression coefficients (β), after *model 2* readjustment is possible to write the logistic regression model as:

$$\text{Model 2:} \qquad \text{Logit}(\hat{\pi}) = 1.856 + 0.587\,F1 + 0.535\,F6 - 0.455\,F7 + 1.555\,F10 \qquad [2]$$

or, in probabilistic terms, as:

$$\text{Model 2':} \qquad \hat{\pi} = \frac{1}{1 + e^{-(1.856 + 0.587\,F1 + 0.535\,F6 - 0.455\,F7 + 1.555\,F10)}} \qquad [2']$$

Turning now to the coefficients exponential of the *readjusted model 2* (see Table 2), it is concluded that the chances ratios of subjects' willingness to recommend the Pêro da Covilhã Hospital are 1.798, 1.707, 0.634 and 1.555 for each additional value of the physical evidence of the hospital environment, namely *"sensations"*, *"exterior signage"*, *"ambient music"*, and *"parking facilities"*, respectively. This means that the probability of willingness to recommend the Hospital increases with the improvement of sensations, with better exterior signage and better parking facilities. That is, in percentage terms, there is an increase of 79.8%, 70.7% and 55.5% of chances to recommend the Hospital for each additional unit of the referred physical evidence, respectively. The opposite happens with the factor *"ambient music"* once the chances of recommending the Hospital decreases 36.6% for each additional unit of this factor. For the remaining physical evidence in study, it is found that they do not affect the willingness of recommending the hospital unit.

According to the observed and predicted classification for the *readjusted model 2*, it is concluded that for a cut-off value of 0.5 the logistic regression correctly classifies 85.2% of cases. The model also presents a sensitivity of 85.8% and a specificity of 75%, which indicates a good predictive capability.

The results obtained through this analysis allow verifying the existing capacity of the physical evidence to influence the willingness of recommending a hospital unit by their target audiences. This influence can be verified at the level of the aspects related to sensations, exterior signage and parking. However, the influential capacity is not only in a positive way and in the case of the ambient music, there is a negative influence, once for each additional unit of this factor, the probability of recommendation decreases 36.6%. In the case of the ambient music it is verified the opposite effect of the other factors and this may be due to its specificity demonstrated by Hui et al. (1997). These authors suggest that in addition to the fact that people feel good with ambient music, it may have other effects on individuals as a greater perception of waiting time.

However, either in a positive or negative way, the results obtained allow to validate the hypothesis H_2, i.e. the physical evidence exerts influence on the willingness of recommending the Hospital units by their target audiences. This result is in accordance with the advocated by several authors as Hutton and Richardson (1995) or Fottler et al. (2000) which indicate that the healthscape can influence the intention to recommend the service to others.

5. Conclusions

This research allowed to evaluate the importance physical evidence has for patients, visitors and staff's satisfaction and their willingness to recommend a hospital unit. At this purpose, the analyzed literature is clear in the determination of the importance that physical evidence has for a greater satisfaction of an organization's target audience, as well as for a greater willingness of recommendation by these groups. This research is consistent with these conclusions and allows, for a hospital unit, to verify the influence that these aspects exert in the satisfaction of their target audiences and also in their willingness to recommend the hospital unit. Regarding the influence on satisfaction aspects related to sensations, interior aesthetics and accessibilities become relevant, while all the others showed no influence ability.

Similar to what happens to satisfaction, the literature is also clear in the association of physical evidence to a greater willingness to recommend an organization. Given the obtained results, it is found that this research shares these outcomes, being the aspects related to *sensations*, *exterior signage* and *parking facilities* the most influential on the *willingness to recommend*. All these aspects have a positive influence capacity on the willingness to recommend, however, there is one factor that has an adverse effect, i.e., negatively influences that willingness. Since this factor gathers two variables related to *ambient music*, and one of which is *"the ambient music is perceptive"*, it may be assumed that the fact of being perceptive, leads individuals to lose the willingness to recommend the hospital, perhaps because they do not like to listen to music in this environment. This statement is obviously just an opinion, thereby needing confirmation.

Furthermore and according to the obtained results, it is found that the most relevant aspects regarding physical evidence, which may be perceived on a hospital environment are those that are related to interior aesthetics, accessibilities, exterior signage, parking and, mainly, those who can be perceived with the senses, here classified as *"sensations"*. Among those who are presented here as the most relevant, sensations are considered the most important because they are influent either in satisfaction and the willingness to recommend the Hospital unit.

In this sense, it is concluded that, for a greater satisfaction and greater willingness to recommend a hospital unit, these are the factors on which the organization should focus since with their target audiences more satisfied and with a greater willingness to recommend its services, it will be easier to achieve the internal and external objectives meanwhile outlined.

6. Limitations and future research

As limitations of this study it is verified that the sample, although it is perfectly heterogeneous considering its distribution at the level of the target audiences and be considered good on its distribution by gender and age, can be considered somewhat limited in its size. Considering that more than 1,200 employees and about 96,000 people are part of the area of influence of CHCB, this sample should be more representative with a larger number of respondents.

Another aspect is related to the fact that the study has only one analysis unit. In order to a comparative base of the results, the same study should have been performed in another hospital unit, and if possible, with a distinctive visual aspect, i.e. with a type of construction unquestionably different of that of the Pêro da Covilhã Hospital, where it could be perfectly perceptible its previous or subsequent construction. By presenting an older or, on the contrary, more modern type of construction, certainly the physical evidence would be different, which would allow a comparative basis and assess more effectively the role of physical evidence in the perceptions and responses of respondents and, more specifically, its role for the patients, visitors and staff satisfaction and willingness to recommend.

This study was implemented in the main and medical offices atriums of the Pêro da Covilhã Hospital, allowing respondents to answer the questionnaire based on what they can perceive in these common areas. For a future research, this study could be implemented in the wards (internments) and medical offices area allowing to investigate another aspect advocated by some authors that the physical evidence influences the health care ability in the improvement of patients by creating a *"healing environment"*.

Authors such as Fottler et al. (2000), Martins (2004), Joseph (2006) and Ulrich et al. (2008) indicate that physical evidence play an important role in the development of healing environments which allow greater effectiveness in the healing process of patients. The improvement of patients may well be due, not only to health care provided by the staff, but also to aspects related to physical evidence such as single rooms,

natural lighting, good quality artificial lighting, overlooking nature, reception area for families and noise reduction procedures, among others, which can lead to the reduction of infections, reduction of medical errors, reduction of falls, reduction of pain, improvement of sleep, reduction of stress, reduction of depression, improvement of privacy and confidentiality, improvement of communication between patients and families, improvement of social support, and most importantly, increased customer satisfaction.

Apart from the health care provided by health professionals, these aspects of the physical evidence also play, according to these authors, a fundamental role in the healing process of the patients and, in this sense, it is believed that this could be considered a new line of research by relating the physical evidence at hospital units with the healing process of the patients of these organizations.

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