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Perceived service quality and health-related quality of life in an Obstetrics
Emergency Department

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Masters in Management of Services and Technology,

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Abstract

The healthcare sector plays a crucial role in society and must be able to respond to its patients' needs. In this context, healthcare services need to constantly improve service delivery, not forgetting to consider its patients' insights regarding service quality. The study of how patients perceive service quality, and their health-related quality of life (HRQoL), as well as the relationship between these two aspects, specifically in obstetrics emergency department (ED) represents an existing gap in the literature and will be developed in the present investigation. Additionally, the impact of the COVID-19 pandemic on perceived service quality (PSQ) also lacks existing literature and constitutes one of the purposes of this study, being that the main objective is to study how can the obstetrics ED in *Hospital de Faro* be enhanced, through patients' HRQoL and PSQ improvement.

To achieve the proposed goal, qualitative data was collected from patients and healthcare professionals, and quantitative data was gathered using an adapted version of the SERVPERF instrument applied to measure PSQ, and EQ-5D-5L questionnaire to measure HRQoL

Results lead to the conclusion that previous pregnancies and triage color impacts patients' HRQoL Improvement, and marital status and triage color affect self-rated HRQoL Improvement (VAS Improvement). Another finding is the existence of a significant relationship between variables PSQ and HRQoL and VAS Improvement. About the COVID-19 pandemic's impact on PSQ in the service under study, results indicate that there is no difference between the way patients perceive service quality before and after the pandemic.

Key Words: Health Related Quality of Life; Perceived Service Quality; Emergency Department; Obstetrics

JEL classification: I110; Y40

Resumo

O sector da saúde desempenha um papel crucial na sociedade, e deve ser capaz de responder às necessidades dos pacientes. Assim, os serviços de saúde devem estar em constante melhoria, sem esquecer as opiniões dos seus pacientes. O estudo da forma como os pacientes percecionam a qualidade do serviço, a sua qualidade de vida relacionada com a saúde (HRQoL), e a relação entre estes dois aspetos, especificamente no serviço de urgência (ED) obstétrica, representa uma lacuna na literatura. Adicionalmente, o impacto da pandemia de COVID-19 na perceção da qualidade de serviço (PSQ) também carece de literatura existente e constitui um dos objetivos deste estudo, sendo que o principal é estudar como pode o ED obstétrica no Hospital de Faro melhorar, através da melhoria da HRQoL e PSQ dos pacientes.

Para alcançar o objetivo proposto, foram recolhidos dados qualitativos de pacientes e profissionais, e dados quantitativos de pacientes, recorrendo ao instrumento SERVPERF (versão adaptada), aplicado para medir a PSQ, e ao questionário EQ-5D-5L para medir a HRQoL.

Os resultados levaram à conclusão de que as gravidezes anteriores e a cor da triagem têm impacto na melhoria da HRQoL das pacientes, e o estado civil e cor da triagem afetam a melhoria da HRQoL autoavaliada (melhoria VAS). Outro resultado é a existência de uma relação entre a PSQ e melhoria de HRQoL e VAS. Quanto ao impacto da COVID-19 na PSQ, os resultados indicam não existir diferença na forma como os pacientes percecionam a qualidade do serviço antes e depois da pandemia.

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Abbreviations List

B2B – Business-to-business

B2C – Business-to-consumer

ED – Emergency department

HRQoL – Health-related quality of life

KMO - Kaiser-Meyer-Olkin

NHS – National Health System

PCA – Principal Component Analysis

PSQ – Perceived Service Quality

QoL – Quality of life

VAS – Visual analogue scale

WHO – World Health Organization

WHOQOL - World Health Organization Quality of Life

1. Introduction

This introductory chapter intends to provide context for the present investigation. The topic of the study will be presented, as well as an analysis of the problem from which the objectives of this research emerged. Therefore, the present chapter is divided into the contextualization of the topic, general and specific objectives, research questions, a summarized description of the methodology used, concluding with a brief explanation of each chapter of this thesis.

1.1. Context

With the growth of the tertiary sector observed on the last decades, services have been playing an increasingly important role in our economy. This phenomenon led to the development of the services provided due to the growing number of competitors and increasing expectations and demands of the consumers, who are increasingly aware of the level of quality of the services provided. Thus, the healthcare services in Portugal seek to follow this tendency, with the need to increase investment, to have better planning, and better management of limited resources on the health sector becoming increasingly clear.

The National Health Service (NHS) exists to ensure the population's right to health protection, and it comprises all the official institutions and services providing health care under the Ministry of Health (Serviço Nacional de Saúde, 2021). In Portugal, the NHS defines as a priority the profound development of primary and long-term healthcare, while making a relevant improvement in the operation of hospitals, thus contributing to the relaunch and sustainability of the NHS. Nowadays, there is a growing focus on the quality of the health services and how it impacts the life of the population. The NHS has the patient as the object and target and recognizes that the health institutions must be oriented towards production of value in health, that is, to obtain better health results for patients, with higher quality in the treatment processes (technical-clinical and experience of the patient). The objectives of the NHS are to improve process quality, safety and patient experience, increase access and decrease response time, improve efficiency by reducing waste in all its forms, develop professionals to improve their performance, and contribute to the improvement of governance and the sustainability of the NHS. To achieve those objectives, a set of changes must be implemented, and, under the scope of this thesis, we can highlight the adjustment of the hospital and ED network, avoiding duplication and overlap while simultaneously improving quality and efficiency, through capacity building and qualification of services (Serviço Nacional de Saúde, 2016). These objectives are, therefore, in line with the global tendency to focus on the patient and working to provide the best service possible, namely by improving patient experience and obtaining better health results for patients and therefore better perceived service quality and HRQoL results.

Healthcare services, as any other service, have the purpose of answering patients' demands and needs, providing a quality service. However, thanks to the service complexity, the variety of health conditions and patients' diversity leads to a difficulty on evaluating them. When looking specifically to the ED, this complexity prevails, and we can say that it even increases due quite complex and specific characteristics of the service. In Portugal, the most relevant existing problems in the emergency services are the difficulty in answering to the demand with the available resources which, in addition to the inadequate visits to the ED lead to the overcrowding of the service and to longer waiting times (Grupo de Trabalho Serviço de Urgência, 2019). To give response to these challenges, the NHS has been developing a set of reforms in several divisions of the health system, such as the creation of Family Health Units aiming to improve primary care accessibility efficiency, quality, and continuity of care and increase the satisfaction of professionals and citizens. The reduction of inappropriate utilization of emergency services (around 31% (Berchet, 2015; Pereira et. al, 2001)) was an important objective of the primary health care reform since overcrowding in hospitals' ED is one of the most reported weaknesses of the Portuguese NHS. If patients have better access to primary health care, their health needs will be better met, leading to less need to use the ED, referring to it only in situations that really require it (Almeida & Vales, 2020). Even though the ED overcrowding is a problem in many other health systems, Portugal is the country with the highest rate of ED attendances (of the sample of 21 countries presented by Berchet (2015)) with approximately 70 visits per 100 inhabitants. Many factors contribute to ED overcrowding such as insufficient staff, delays in test results, hospital bed shortage, excessive demand, seasonal illness, and unnecessary visits, of which some are caused by access and quality issues in other parts of the health system (Morley et al., 2018).

Focusing now on the service under study on this dissertation, the *Hospital de Faro* obstetrics ED, integrated in *Centro Hospitalar Universitário do Algarve*, it works to provide full access to a quality healthcare to pregnant women of any social status, race, and religious belief. This service counts with one operating room, two admission/observation rooms, one waiting room, two recovery rooms and one cardiotocography room. The service works to continuously improve both the service quality perceived by the patients and their quality of life. These two aspects will be studied further in this study, as well as how they are associated with each other.

Hospital de Faro recognizes that it is essential to understand in which dimensions of service quality can and must direct investment in order to improve the patients' perception of quality of the service delivered. Additionally, the hospital aims to evaluate how patients' quality of life can be enhanced, and thus apply the needed adjustments to the service in question. In addition to the study of these two issues separately, it is of the most importance for the hospital to understand if less satisfied patients with the service quality leads to less HRQoL, and to identify the aspects of the service that can be enhanced to bring health gains and improve the way patients perceive the service. Although no studies were found on the literature on this possible relation between perceived service quality and HRQoL, some theses

were found concerning this topic (Freire, 2018; Leal, 2018), leading to the believe that this association is relevant to the obstetrics ED under study.

Another important aspect to be studied is the influence of the COVID-19 pandemic on the way the service is perceived by the patients. The coronavirus pandemic brought changes to the service provided by the obstetrics service, and it is essential to understand if the potential areas for improvement are related to specific and temporary problems caused by the pandemic or if they are related to structural problems already present on the obstetrics ED before.

Thus, it becomes important to develop this subject. Although some studies can be found analyzing PSQ and HRQoL separately, literature is scarce on evaluating the relation between these two concepts, and, to the best of our knowledge, there are no studies addressing them in the context of obstetric EDs. As mentioned before, another gap identified in the literature and that this study seeks to fill is the impact that the COVID-19 pandemic might have on the patients' perception of the service quality.

1.2. General Objective

The present research, and based on the previously presented challenges, aims to study how can the obstetrics ED services in *Hospital de Faro* be improved through the improvement of the HRQoL and service quality as perceived by pregnant women.

1.3. Specific Objectives

Based on the general objective established, some specific objectives are defined for the obstetrics ED in *Hospital de Faro*:

- O1.** Characterize the current situation of the obstetrics department by measuring the service quality perceived by women who visited the obstetrics ED;
- O2.** Characterize the current situation of the obstetrics department by measuring the HRQoL of women who visited the obstetrics ED;
- O3.** Assess the strength of the association between the perceived service quality and the HRQoL of women who visited the obstetrics ED;
- O4.** Assess the impact of the COVID-19 pandemics in the perceived service quality in the obstetrics ED;
- O5.** Develop recommendations to be implemented in the service to improve both perceives service quality and HRQoL in the obstetrics ED.

1.4. Research Questions

After establishing the objectives, the research questions to be studied in *Hospital de Faro* that arose from them were the following:

- Q1.** What is the customers' perception about the service quality provided by the obstetrics ED?
- Q2.** What is the customers' perception about their HRQoL after the service provided by the obstetrics ED?
- Q3.** Is there an association between the perceived service quality and HRQoL on the obstetrics ED?
- Q4.** Are there any differences in the way service quality is perceived before and after the COVID-19 pandemic?
- Q5.** How can the service delivery be improved in the obstetrics ED to increase both HRQoL and perceived service quality?

1.5. Research Methodology

A Case Study research design was chosen based on the literature because it provides rich data and enables a deep understanding of a phenomenon (Yin, 2018). This methodology has been widely studied and applied through the literature, contributing to the knowledge of a real-life event as a whole. The investigated phenomenon is the reality of the obstetrics ED in *Hospital de Faro*. In this study, both qualitative and quantitative data are collected and analyzed.

To achieve the closing of this case study, the literature will be explored as well as previous studies on the same topics and respective methodology, in order to choose the appropriate instruments to cover the evaluation of perceived service quality and HRQoL.

Finally, data collected with the selected instruments will provide information to investigate the existence of an association between perceived service quality and HRQoL, aiming to input new knowledge in the unit under study and thus improving its performance and patient satisfaction and quality of life. Collected data will be analyzed resorting to the IBM-SPSS 28.0 software.

1.6. Global Structure

1. Introduction – The first chapter establishes the guidelines for this study and helps understand the context of the problem under study. The objectives are defined, as well as the research questions and the research methodology.

2. Literature Review – An analysis of available literature is done to learn about the existing debate regarding the topic. It covers the topics of PSQ and HRQoL in the context of health, emergency and obstetrics care, and the tools that have been used to measure it.

3. Methodology – Contains information about the research methodology approach used, the chosen instruments and methodology to collect the data, the independent variables defined, the population and sample under study, and the data analysis tools adopted.

4. Results – The fourth chapter includes the results obtained from the collected data. Sample characterization and results' analysis for the three data collection moments are presented, including a reliability analysis for the quantitative data collection instruments. Hypotheses testing and correlation coefficients were performed.

5. Conclusion – The last chapter consists of answering to the formulated research questions, thus allowing to arrive at the main conclusion of the study. Finally, this investigation's limitations are exposed, as well as some recommendations for future research.

2. Literature Review

In this chapter relevant theoretical background on the thematic will be addressed. The purpose is to examine existing literature in order to support this research and better understand the framework on perceived service quality and HRQoL on the healthcare sector and, more specifically, on EDs and obstetrics units, and how to measure it. The concepts of service and PSQ will be visited, as well as a review on tools used to measure it. Then, an analysis on the healthcare context will be carried out, and the instruments to measure HRQoL will be analyzed. Finally, the hypotheses to investigate will be constructed, as well as a conceptual framework.

2.1. Service

It is important to ascertain the concept of ‘service’, which is not an easy task since it can mean different things in different contexts and because of that, the word ‘service’ can be used to describe around 80 per cent of economic activity in developed countries (Johnston et al., 2012). The lack of a single, agreed, and comprehensive definition of ‘service’ leads to some confusion when studying the subject.

According to Grönroos (2001), service is a process where production and consumption occur at the same time and causes a certain outcome. Johnston et al. (2012), in its turn, defined a service as “*an activity – a process or a set of steps - which involves the treatment of a customer (or user) or something belonging to them, where the customer is also involved, and performs some role in the service process.*”

According to Vargo & Lusch (2004; 2016) the concept of ‘service’ emerges from the comparison of Goods-Dominant Logic and Service-Dominant Logic. In this perspective, a service is the use of knowledge and skills from one actor in the shape of goods or services. Thus, it implies that there is always a coordination between the provider and the receiver, essential to the service delivery. To this coordination was given the name of co-production. It can be defined as the voluntary or involuntary involvement of public service users in any of the design, management, delivery and/or evaluation of public services (Osborne et al., 2016). The conceptualization of co-production as a fundamental feature of service delivery (Osborne & Strokosch, 2013) changes the way the delivery process is perceived and the user’s role in measuring outcomes.

2.2. Perceived Service Quality

When we talk about service quality, it is important to consider that although it is an ambiguous and indistinct construct, its importance to firms and consumers is unequivocal (Parasuraman et al., 1985). The growing use of technology and the higher educational level of customers lead to more exigency in terms of expected level of service provided. Thus, accomplishing a satisfactory level of service quality has become a priority for service providers, not only to face the continuous growth of consumer expectations but also the growth of competing companies (Kandampully & Butler, 2001).

To better define and measure service quality, we must first understand the four main service characteristics (Parasuraman et al., 1985; Fitzsimmons and Fitzsimmons, 2014):

- **Intangible** – services are about performance rather than objects, thus, they cannot be seen or touched in the same way as goods. They also cannot be counted, measured, inventoried, or tested before the act of sale, becoming even more difficult to guarantee the quality provided and consequently evaluated by the customer. Intangibility has been crucial for the distinction between goods and services.
- **Heterogeneous** – heterogeneity of services concerns the difficulty in standardizing services. The service performance varies from producer to producer, so its output will result on a unique interaction between two elements: the provider and the customer (Fitzsimmons and Fitzsimmons, 2014).
- **Inseparable** – inseparability concerns the difficulty of having separate moments for service production and service experience. This represents a concern because it can be difficult to predict the service quality since each moment of delivery is done directly to the customer and, consequently, the quality is only perceived at that moment, when the service is received. Since customer interaction is inherent to the process, this also makes it harder for the company to have full control of the quality of the service.
- **Perishable** – this characteristic emphasizes the fact that, unlike goods, services cannot be stored. The service itself perishes in the very instant of its performance, even though its effects can persist along time.

Now better understanding what characterizes a service, we can acknowledge what grants quality to a service.

The literature presents multiple definitions for the concept of service quality as it might be difficult to express it as a single and objective idea. According to Johnston et al. (2012) the quality of a service can be defined from two perspectives, as operational service quality and customer perceived quality. The first is the quality of the operational part – how well the service was delivered comparing to what was planned. On the other hand, the quality perceived by the user is based on their personal judgment of how satisfied they are with the service provided, comparing their experience/perceived benefit with their previous needs and expectations (Johnston et al., 2012). Expectations are reflected in the desires of the consumers which they believe a service provider should offer. Once the user's expectations are formed, they will help make a comparison between what they anticipated and what they in fact received (Zeithaml et al., 1993).

According to Sánchez et al. (2006), perceived quality is a cognitive construct that values the outcome, where expectations are compared with the result achieved. These two points of view need to be managed by the service provider in order to meet the user's expectations or even exceed them.

In the healthcare sector, there is a growing search to provide better services to patients, and hospitals must keep pace with technological advances as the consumers become better informed, and more demanding and involved in their healthcare (Padma et al., 2009).

2.2.1. Measuring Perceived Service Quality

Several studies have been conducted with the purpose of creating service quality models and presenting them as instruments to measure PSQ. One of the most frequently used scales is the multi-dimensional service quality scale **SERVQUAL** proposed by Parasuraman et al. (1985; 1988) that compares expectations with perceptions in a total of 44 items. The model evaluates service quality in ten dimensions, later reduced to five – tangibles, reliability, responsiveness, assurance, and empathy. Even though SERVQUAL is a widely validated instrument in evaluating service quality (Jain & Gupta, 2004), it has also received some criticism on various conceptual and operational grounds. On the conceptual side, critics claim that there is no solid evidence showing that customers evaluate the quality of a service by the gap between expectations and perceptions of the service performance; expectations are a dynamic construct, that constantly changes over time; the number of appropriate dimensions doesn't bare the same importance in different types of services and therefore should not be constant as the SERVQUAL model suggests; and the model may mistakenly confuse the concepts of satisfaction and attitude (Gronroos, 1988; Cronin & Taylor, 1992). Regarding the operational side, literature indicates that expectations and their interpretation might be different across customers; the extensive dimension of the questionnaire can lead to the participant's withdrawal or to random answers to the final questions of the survey; critics also mention that the SERVQUAL scale was developed specifically to be used on B2C services, so its employment on B2B context is criticized (Gronroos, 1988; Buttle, 1996).

In 1992, Cronin & Taylor developed another service quality measurement tool (**SERVPERF**), presenting solutions for some of the SERVQUAL limitations. SERVPERF is a tool that evaluates service quality based on the performance component, discharging the expectation component. Cronin & Taylor (1992) provided theoretical and empirical arguments that corroborate the superiority of SERVPERF when evaluating PSQ. This instrument proves to be more efficient as the number of items to be measured are reduced by 50% (22 items), and it also has proved to be superior for being able to explain greater variance in service quality (Jain & Gupta, 2004). In the healthcare sector, SERVPERF is considered more suitable because when the questionnaire is applied, the patient already started the service experience, meaning that they might not be able to recall the exact expectation they had before.

2.2.2. Measuring Perceived Service Quality in Healthcare

Focusing now on studies that measured PSQ on the healthcare sector, it was observed that it is possible to apply the tools developed to assess PSQ for services in general. SERVQUAL and SERVPERF are the most generally used instruments to measure PSQ.

Al-Neyadi et al. (2018) applied SERVQUAL to assess and compare service quality perceived by the patients of public and private hospitals and concluded that there are no significant differences between them. Turan & Bozaykut-Bük (2016) used this instrument, in an adapted version, to examine the effects of healthcare service quality on patient satisfaction, repatronage intention and positive word-of-mouth at a public hospital specialized in women and children's diseases. Giovanis et al. (2017) also used an adapted version of SERVQUAL to measure PSQ and concluded that it is an important driver of patients' satisfaction and behavioral intentions. SERVQUAL has also been used to measure PSQ in an ED by Shuv-Ami and Shalom (2020).

Regarding the use of SERVPERF, we can highlight Akdere et al. (2020)'s study where this tool is used at in-patient care departments in a public hospital and concluded that all dimensions of SERVPERF are significant predictors for high overall service quality. Martins et al. (2015) used this tool to measure perceived quality of the service provided to women who delivered babies at a public hospital. Still on subject of obstetrics, Larson et al. (2014) applied a different instrument composed by a set of six questions regarding aspects of the quality of care, and combined information on women's characteristics and birth experiences with features of the facility at which she delivered, in order to explore how women's expectations and experiences during the visit in question influence their ratings of the quality of delivery care.

To summarize this information collected on the literature, Table 2.1 was built.

Table 2. 1 - Previous Studies in Evaluating Perceived Service Quality

Reference	Tool	Healthcare Sector
Larson et al. (2014)	Set of six questions regarding aspects of the quality of care	Obstetrics
Martins et al. (2015)	SERVPERF	Obstetrics
Shuv-Ami and Shalom (2016)	SERVQUAL	Emergency department
Turan and Bozaykut-Bük (2016)	SERVQUAL (adapted)	Inpatients from gynecology and pediatrics
Giovanis et al. (2017)	SERVQUAL (adapted)	Primary care services
Al-Neyadi et al. (2018)	SERVQUAL	Inpatients from various units
Akdere et al. (2020)	SERVPERF	Inpatients from various units

2.3. Health Related Quality of Life (HRQoL)

The most generally accepted definition of health is the one established by WHO (1946), corresponding to “a state of complete physical, mental and social well-being and not merely the absence of a disease or infirmity”, being considered a fundamental right of every human being and its provision is a governments’ responsibility, through adequate health and social measures.

Another relevant concept that is important to emphasize is quality of life (QoL). Despite the importance of QoL in health and medicine, there is a constant conceptual and methodological debate about the meaning of QoL and about how it should be measured. There is no single agreed definition of the concept nor there is a single adopted measurement technique, however, there is broad agreement that studies of QoL should include indicators of physical functioning, such as physical symptoms and pain; psychological function including concentration and mood; social and sexual functioning and occupational status (O’Boyle et al., 1993). Besides that, WHOQOL (1995) presents one accurate definition of QoL: “An individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns”.

When QoL is considered in the context of health and disease, it is commonly referred to as health-related quality of life (HRQoL) to differentiate it from other aspects of quality of life (Foundation Health Measure, 2020). HRQoL refers to the health aspects of quality of life, thus reflecting the impact of disease and treatment on disability and daily functioning, and the impact of perceived health on an individual’s ability to live a fulfilling life (Haraldstad et al., 2019). Since health is a multidimensional concept, HRQoL is also multidimensional and combines fields related to physical, mental and emotional, and social functioning. HRQoL goes beyond direct health measures and focuses on the QoL outcomes of health status (Foundation Health Measure, 2020).

2.3.1. Measuring HRQoL

Given the complexity of the QoL concept, that can be interpreted and defined in a number of ways within various fields, there is many different instruments used to assess QoL (Haraldstad et al., 2019). Regardless of the variety of measurement instruments available, the collection of data relating to individuals’ health status and QoL is usually done through the application of questionnaires based on previously studied methods (Ferreira, 2003). The tools used to measure such a complex concept are quite different and cover several aspects of the considered well-being of an individual. Some are general and cover aspects like general health state, regardless of a specific problem or illness, and focus on important components for health, like physical symptoms, social roles, or mental states. Others are more specific and allow the analysis of a problem or illness focusing mainly over symptoms and can be used to establish comparisons between individuals with the same characteristics.

One measurement instrument that is widely used in different countries by researchers is the **EQ-5D**, a generic measure of health status developed by EuroQol Group (1990). EQ-5D focus on self-reported health and HRQoL problems, providing a simple descriptive profile and a single index value used in the clinical and economic evaluation of health care and on population health surveys. EQ-5D is considered a standardized, non-disease-specific instrument for measuring HRQoL that aims to complement other HRQoL measures, by defining health through five dimensions (five multiple choice questions): mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. The respondent selects from three ordinal statements representing three levels (EQ-5D-3L): no problem; some or moderate problems; extreme problems, which best describes their health state in the moment. EQ-5D-3L was developed with the purpose of supplementing other instruments, with its initial simple and short measure of three answer levels, however, it has been increasingly used as a ‘stand-alone tool’ (Buchholz et al., 2018). Even though EQ-5D-3L has shown to be a valid and reliable measurement tool of patient health, some criticism has emerged that, in some contexts, the three-level version may lack sensibility or fail to capture important aspects of health in certain disease areas. It led to the creation of the new five-level expanded version (EQ-5D-5L), aiming to get more accurate responses with the more sensitive scale to measure health-status, thus EuroQol Group was able to address the previously mentioned critics (Devlin & Krabbe, 2013). According to Janssen et al. (2008)’s studies, when comparing the two versions of the questionnaire, the great majority of respondents agreed that the 5L expressed their opinion better. This study also observed that the 5L version produced higher informativity than the 3L in all dimensions, as expected, but at the same time, the extended version is able to not deteriorate the evenness score observed.

The second part of the questionnaire is common to both EQ-5D versions, and it consists of a 100-point overall health state visual scale (VAS), where 100 and 0 represents best imaginable health state and worst imaginable health state, respectively (Rabin & De Charro, 2001).

There are multiple studies where the EQ-5D scale is used to measure HRQoL outcomes, for example, Raymakers et al. (2018) applied the 3L version to assess HRQoL on general population and came to the conclusion that EQ-5D can be used in economic evaluations that inform decisions for new health interventions, and help finding out where improvements could be made in patient care. Koivunen et al. (2016) used the same version to study HRQoL on alcohol intoxicated people admitted to the ED, with a 3, 6 and 12- month follow-up after the brief intervention on the hospital. The application of the 5L version of this instrument on general population to evaluate its health state by Huber et al. (2017) helps reinforce that it is a widely used instrument to measure HRQoL.

Some studies were found where a comparison between the two versions is made. Ferreira et al. (2016) learned that the EQ-5D-5L version performed better, showing higher completion rate and lower ceiling effect than the EQ-5D-3L version, and concluded that EQ-5D-5L is an adequate measure of the

HRQoL in young and relatively healthy adults. Rezaei et al. (2021) also did this analysis and the study showed that the measurement properties of the 5L version performed similar or better in terms of ceiling effects, convergent validity, know-groups validity, Relative Efficiency and informativity when compared to the 3L version, in the context of the general population of Iran. The authors suggest the use of the 5L version in economic evaluation, clinical and public health studies in Iran.

Another frequently used generic tool is the Short Form-36 (**SF-36**) health survey, and its successor shortened version **SF-12**, used to assess the physical and mental components of a person's HRQoL (Provencher et al., 2016). These questionnaires are a self-reported outcome measure assessing the impact of health on an individual's everyday life. The surveys are based on 8 health domains: general health, mental health, vitality, social functioning, role limitation due to physical health problems, role limitation due to emotional problems, bodily pain limiting usual activities, and physical functioning. These domains can then be summarized in a Physical Component Summary scale (PCS) and Mental Component Summary scale (MCS), ranging from 0 (worst) to 100 (best) score (Ware, 1993). A score higher than 50 can be interpreted as positive self-rated health and a score below 50 indicates a negative perception (González et al., 2014). The SF-12 and SF-36 consists of 12 and 36 questions, respectively. Provencher et al. (2016) used SF-12 questionnaire on frail older adults with minor fractures at 3 and 6 months after ED discharge to ascertain HRQoL. Gopinath et al. (2020) also used it with the same purpose, in addition to the EQ-5D tool mentioned above, concluding that SF-12 proved to be more appropriate than the EQ-5D to capture certain aspects of general health status, however, it does not provide an overall index score for individuals' health, nor are the scores preference weighted. The joint use of the instruments reduced the EQ-5D-3L ceiling effect. Alaya et al. (2021) applied the SF-12 questionnaire to assess and compare physical and mental HRQoL on women receiving perinatal care with and without COVID-19.

In 2004, National Institutes of Health (NIH) developed a set of person-centered measures to evaluate and monitor physical, mental, and social health in adults and children. This instrument is called **PROMIS** (Patient-Reported Outcomes Measurement Information System) and aims to create a new paradigm for how clinical research information is collected, used, and reported. PROMIS is a measurement tool that rigorously tests patient reported outcome (PRO) and “uses recent advances in information technology, psychometrics, and qualitative, cognitive, and health survey research to measure PROs such as pain, fatigue, physical functioning, emotional distress, and social role participation that have a major impact on quality-of-life across a variety of chronic diseases” (NIH, 2019). According to HealthMeasures (2021), the PROMIS instrument has the advantages of having greater precision (less error) and less items than most conventional measures managing, on one hand to enhance power in a less costly way than increasing sample size, and on the other, to reduce the burden on the participant. This tool was employed in the study performed by Dresden et al. (2020), where the authors analyze ED visits and the HRQoL decline on possible returns by older adults. Regarding its

application in the obstetrics field, Slavin et al. (2019) used PROMIS to evaluate HRQoL and it proved to be a good tool to measure physical and mental health during pregnancy and postpartum period.

The instruments used to measure HRQoL and in what context are compiled on Table 2.2.

Table 2. 2 – Previous Studies in Evaluating HRQoL

Reference	Tool	Population
Ferreira et al. (2016)	EQ-5D-3L EQ-5D-5L	Young Adults
Koivunen et al. (2016)	EQ-5D-3L	Alcohol intoxicated patients in the ED
Huber et al. (2017)	EQ-5D-5L	General population
Raymakers et al. (2018)	EQ-5D-3L	Patients with type 1 diabetes
Slavin et al. (2019)	PROMIS	Pregnant and postpartum women
Gopinath et al. (2020)	EQ-5D-3L SF-12	Non-catastrophic road traffic crash injured patients
Alaya et al. (2021)	SF-12	Women receiving perinatal care
Rezaei et al. (2021)	EQ-5D-3L EQ-5D-5L	General population
Provencher et al. (2016)	SF-12	Frail older adults with minor fractures in the ED
Dresden et al. (2020)	PROMIS	Older adults in the ED

2.4. Investigating Hypotheses

The purpose of the present thesis is to identify sources of improvement for the obstetrics ED in *Hospital de Faro*, by increasing PSQ and HRQoL, while attempting to understand if improvements in the first lead to improvements in the other, and vice-versa. To do so, a set of hypotheses to investigate and a conceptual framework were created.

In previous studies, age, education, and living arrangement were characteristics identified as factors that influence the overall perceived service quality (Zarei et al., 2012) or HRQoL (Huber et al., 2017; Bolina et al., 2021). Levinton et al. (2011) concluded that region of residence was also a factor affecting the way service quality is perceived.

Thus, to evaluate if the mentioned characteristics actually influence PSQ and HRQoL in the service under study, H1 and H2 were formulated:

H1: Patient Characteristics influence HRQoL (HRQoL Improvement + Self-Rated Health Improvement (VAS Improvement)).

H1 a) Patient Characteristics influence HRQoL Improvement.

H1 b) Patient Characteristics influence Self-Rated Health Improvement (VAS Improvement).

H2: Patient Characteristics influence PSQ (PSQ + Overall PSQ).

H2 a) Patient Characteristics influence Overall PSQ

H2 b) Patient Characteristics influence PSQ.

To better understand the formulated hypotheses, the conceptual model obtained from them is represented in Figure 2.1.

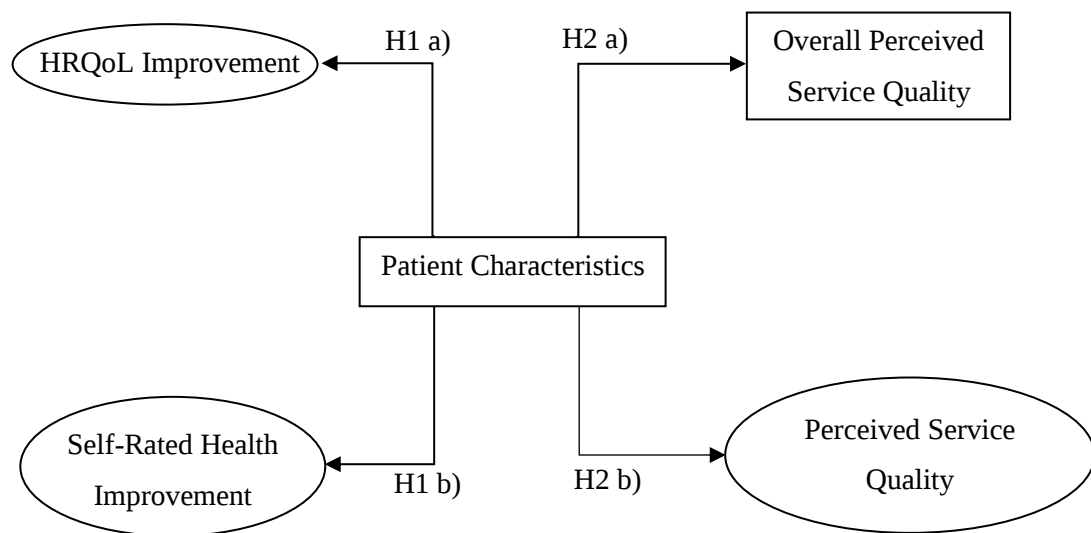


Fig. 2. 1 - Conceptual Framework comprising H1 and H2

The last hypothesis to be tested represents one of the major intentions of this study and consists of evaluating the association between PSQ and HRQoL. No studies were found on the literature regarding this possible relation beyond the already mentioned theses concerning this topic (Freire, 2018; Leal, 2018). Thus, this study aims to intend as a contribution to the literature, by investigating if, in this case, the improvement/deterioration on the patient's health state and QoL affects their perception of the service quality, and vice versa.

For that, H3 was formulated:

H3: HRQoL and Perceived Service Quality are correlated.

H3 a) PSQ and Overall PSQ are correlated.

H3 b) PSQ and HRQoL Improvement are correlated.

H3 c) PSQ and Self-Rated Health Improvement (VAS Improvement) are correlated.

H3 d) HRQoL Improvement and Overall PSQ are correlated.

H3 e) Overall PSQ and Self-Rated Health Improvement (VAS Improvement) are correlated.

H3 f) HRQoL Improvement and Self-Rated Health Improvement (VAS Improvement) are correlated.

This hypothesis is illustrated in Figure 2.2 for a better understanding.

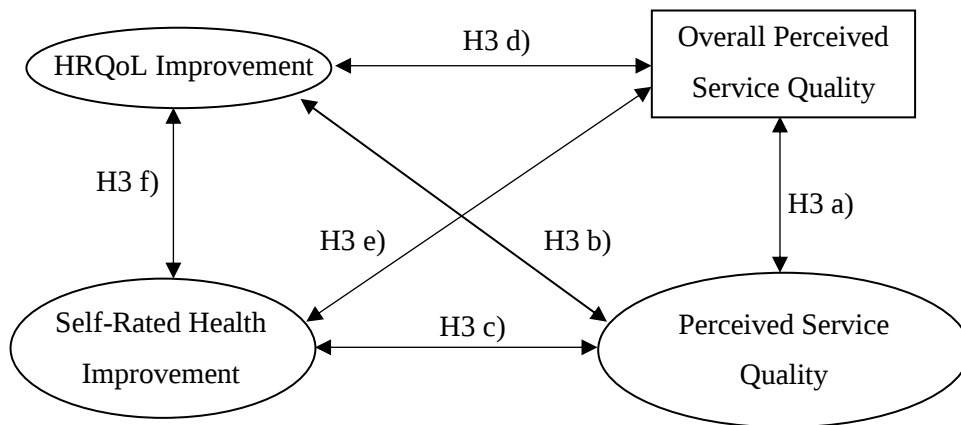


Fig. 2. 2 - Conceptual Framework comprising H3

2.5. Conclusion

In this chapter, the two main themes of this thesis were studied, PSQ and HRQoL, and the tools that have been used in the literature to measure them.

Concerning the measurement of PSQ, the two instruments that stand out are SERVQUAL and SERVPERF, both being widely applied and validated by the authors. SERVQUAL has been used in many studies, but it also has received some criticism regarding both conceptual and operational grounds. These limitations, previously mentioned on this chapter, and highlighting the one that claims that a performance-only approach of service quality is enough (Cronin & Taylor, 1992; Jain & Gupta, 2004), led to the choosing of the SERVPERF tool. This instrument answers to some of the SERVQUAL limitations, while providing a lighter questionnaire to the respondent. In the healthcare sector,

SERVPERF is considered more suitable because when the questionnaire is applied, patients already started the service experience, meaning that they might not be able to recall the exact expectation they had before. Cronin & Taylor (1992) provided theoretical and empirical arguments that confirms the superiority of SERVPERF when evaluating service quality.

Regarding now the instrument that will be used to measure HRQoL, the ones presented in this chapter have been used to measure pregnancy-related outcomes, however, we can observe that the most commonly used and most adjusted is the EQ-5D. When compared to the SF-12 questionnaire, EQ-5D has the advantage of providing an overall index score for individuals' health (Gopinath et al., 2020). Comparing it to PROMIS, EQ-5D has the benefit of being shorter, reducing the probability of dropping out (Hartman & Craig, 2018), and providing the additional ability to calculate health economic utility scores (Shim & Hamilton, 2019).

Now deciding between the 3L and 5L version, Ferreira et al. (2016) showed the superiority of the 5 level on the Portuguese population in general and also on the young population. Similar conclusions were taken in different contexts than the Portuguese (Scalone et al., 2013; Rezaei et al., 2021).

Finally, after going through the literature, some gaps emerged. This study presents developments in the obstetrics sector, a field not yet very explored regarding PSQ and HRQoL. Additionally, the study of the association between these two constructs has not yet been extensively studied in the literature, in emergency or obstetrics services, or even on the healthcare sector in general, to the best of our knowledge, except for the theses found (Freire, 2018; Leal, 2018), leaving a gap that this thesis seeks to fill. Another theoretical contribution is the study of the extent to which PSQ has been influenced by the current practices implemented due to the COVID-19 pandemics. In a more practical point of view, this thesis aims to identify the aspects of the unit under study where the service quality perception is lower, aiming to propose improvements.

3. Methodology

In this chapter, will be presented and explained the research methodology that will be developed in this thesis. The data gathering tools will be presented and described, as well as the data analysis methods.

3.1. Case study approach

The characteristics of this investigation, in addition to the fact that, to the best of our knowledge, there is no previous similar studies, testing the same hypotheses and conceptual model, and taking in consideration Yin (2018)'s perspective, led to the realization that the most suitable research approach is the case study. The type of approach to be applied depends on the following three factors:

- The form of research question to be answered
- The extent of control over behavioral events
- The degree of focus on contemporary as opposed to entirely historical events

Thus, this study fits the case study approach because the presented research questions are mostly “how” and/or “why” questions, typical in case studies, and it focuses on contemporary reality, where the relevant behavior cannot be manipulated and therefore the investigator has no control over the events. Additionally, the case study approach is particularly suitable to cases where the existing theory and past empirical observation seems inadequate (Eisenhardt, 1989). This approach adds two sources of evidence to the investigation, direct observation of the events, and interviews of the people involved in it, going beyond the historical data existent on the literature (Yin, 2018).

Another characteristic of the case study approach is that it applies uniquely to the case under study, with a small margin to scientific generalizations (Yin, 2018), which might represent a concern that comes with this research method. Even so, we can argue that any progress made facilitates learning and allows comparisons between empirical results, in addition to the practical contribute to the healthcare unit in question and its users.

The data collection and analysis will follow a mixed-method approach, divided into an exploratory phase (qualitative data), a subsequent descriptive phase (quantitative data) followed by an explanatory phase (new qualitative data collection).

3.2. Data Collection

3.2.1. Instruments for data collection

After the analysis carried out in the literature review chapter, the tools used to collect data and to measure PSQ and HRQoL were chosen. Firstly, a qualitative data collection takes place, recurring to semi-structured interviews. Then, in the quantitative data collection, SERVPERF with the necessary adaptations is used to measure PSQ, and EQ-5D-5L to measure HRQoL. Finally, on the second qualitative data collection, semi-structured interviews are applied, this time with the patients visiting the ED under study.

First qualitative data collection phase - Semi-Structured Interviews

Regarding the first qualitative data collection (exploratory phase), semi-structured interviews to the healthcare professionals at the obstetrics ED were performed, aiming to help developing better suiting research tools to the service under study. The interviews intend to study patients' characteristics that might have influence both on the patients' HRQoL and on the way they perceive the service quality, and that have not yet been explored on the existent literature but are relevant under the scope of this investigation. Those new characteristics under study are the patient's marital status, the trimester of pregnancy, the history of previous pregnancies, and the triage color assigned. In addition to these, the interviewed professionals were asked to add any others that they considered relevant based on their professional experience. Another aspect covered by these interviews were the validation of the SERVPERF dimensions by the healthcare professionals, where their insight about the relevance of each dimension were registered, and again they had the opportunity to add any aspect that they considered significant to the way patients perceive service quality. The interview guide can be found on Annex A.

Quantitative data collection phase - SERVPERF

The quantitative data collection regarding PSQ was done using the SERVPERF instrument. The original questionnaire includes 22 items that evaluate the service quality from the customers' perspective, and they are grouped in 5 quality dimensions - Tangibles, Reliability, Responsiveness, Assurance, and Empathy – as described below:

- **Tangibles** (P1 to P4) – Refers to tangible and physical attributes of the service, like the aspect of the surroundings, equipment used and professionals' appearance.
- **Reliability** – (P5 to P9) – Includes items about the unit's capacity to perform the service in the promised conditions, if it conveys trust and if it keeps updated data and records.

- **Responsiveness** (P10 to P13) – Gives information about the professionals’ willingness to help customers and provide prompt service.
- **Assurance** (P14 to P17) – Concerns the knowledge and courtesy of the professionals and their ability to convey trust and confidence.
- **Empathy** (P18 to P22) – Refers to the ease of relationships, good communication, individualized attention, and understanding of the customers’ needs.

Question 22 on the Empathy dimension consists of an item regarding the patient’s privacy, replacing the original question regarding the operating hours of the service since the ED in question works 24h/day and therefore that question does not apply to the service under study. The new item included was obtained from the interviews with the healthcare professionals, on the qualitative part of this study (more details can be found on the previous section (*Semi-Structured Interviews*) and on the results analysis chapter (*First qualitative data collection phase - Results*)).

To measure these 22 items, the scale used is the one proposed by Parasuraman et al. (1988) and Cronin and Taylor (1992). It is a 7-point Likert-like scale that goes from 1 – *Totally Disagree* to 7 – *Totally Agree*. According to the authors, this scale is adequate to this questionnaire, and eases its answering and subsequent analysis by the researcher.

Also, one last item (P23) is included referring to Overall Perceived Service Quality of the obstetrics ED in the customers’ perspective. The same scale is used, from 1 – *Very Low* to 7 – *Excellent*.

The complete questionnaire employed in this study, including the adaptations done to adjust it to the healthcare and emergency care unit, can thus be found on the Annex B.

Quantitative data collection phase - EQ-5D-5L

Now, to evaluate HRQoL, it was resorted to the EQ-5D-5L questionnaire (EuroQol Group, 1990) (Annex B - Group II). This questionnaire includes 5 dimensions that measure health status, aggregated in Mobility, Self-Care, Usual Activities, Pain/Discomfort, and Anxiety/Depression. For each of these dimensions, there are 5 answer levels that reflect the level of severity of patient’s health condition. Level 1 refers to the lowest level of severity, when the patient has no problem performing the activity or does not identify themselves with that condition. The most severe level of health condition (level 5) corresponds to when the patient has serious problems performing the task or feel strongly identified with that condition. Finally, in the second part of the questionnaire, to measure self-rated health improvement, a visual scale that goes from 0 (worst imaginable health state) to 100 (best imaginable health state) is presented to the patient and they must mark the level that reflects their health status in that moment (VAS).

Second qualitative data collection phase – Semi-Structured Interviews

On the second qualitative data collection (explanatory phase), the semi-structured interviews were performed on ED with the patients visiting the service. This time the goal was to study the possible influence of the COVID-19 pandemics on PSQ. The existing literature does not study the impact of the coronavirus crisis on the service quality perceived by patients. As the pandemic affected healthcare services globally, it is important to understand if the service quality perceived is due to measures resultant from the COVID-19 containment measures. Thus, these interviews aim to understand the reasons behind the results obtained in the quantitative data collection and how it can be related with the COVID-19 pandemic. In addition to the questions about what the reasons behind the worst evaluated topics can be, the patients will be asked if they consider that the COVID-19 pandemic control measures can be the cause of those problems verified in the obstetrics ED service. The interview guide can be found on Annex C.

3.2.2. Pre-test and data collection procedure

A pre-test was conducted before applying the questionnaires, with the objective of detecting flaws and improve them to the final version. This pre-test was run with 8 women in order to guarantee the adequacy of the questionnaires to the population and service under study. The feedback received was positive and led to the change of some wording in order to make the questionnaire more easily understood by the general respondents.

In the next phase, the first qualitative data was collected, starting with the interviews with the service' professionals, followed by the quantitative data collection, using SERVPERF to measure PSQ after the patient has received treatment. It was applied in-person at the obstetrics ED after the patient has received treatment.

The EQ-5D-5L questionnaire was applied in two different moments. The first time was before the medical intervention, with the objective of capturing the patient's health state before receiving any care. Then, and if the treatment was completed after the visit to the obstetrics ED, the questionnaire was applied again immediately after the patient left the service. In cases where the treatment needed to be done/completed at home in the following days, patients were asked to leave an email contact in order to receive the questionnaire and answer it when the treatment was completed.

In the first moment, and in addition to the EQ-5D-5L questionnaire, some questions about the patient were also made, regarding personal information and characteristics.

Finally, the second moment of qualitative data collection took place at the end of the quantitative data collection, and the interviewees were the patients who visited the obstetrics ED under study.

Qualitative data for the exploratory phase was collected on March 24th, 2022, followed by the quantitative data collection, from March 27th to May 28th, 2022. Finally, the qualitative data collection for the explanatory phase occurred on May 30th and 31st, 2022.

3.3. Independent Variables

As referred on the hypotheses' formulation, it is believed that personal characteristics influence the patient's perception of the service. The variables used to characterize a patient are age, education, region of residence, and living arrangement. *Instituto Nacional de Estatística* categorizes the variables as follows: **age** - 18 to 24 years old, 25 to 34 years old, 35 to 44 years old, 45 to 64 years old and 65 years old or more; **education** - cannot read or write, 1st Cycle of Basic Education (4th year of Schooling), 2nd Cycle of Basic Education (6th year of Schooling), 3rd Cycle of Basic Education (9th year of Schooling), Secondary Education (12th year of Schooling), Bachelor's degree, Master's degree or higher; and **living arrangement** - will only be considered two types: Alone or With someone. Regarding the **region of residence** and considering the location of the hospital in question, the options will include the surrounding counties of the hospital in Algarve and some in Alentejo (Faro, Olhão, Loulé, S. Brás de Alportel, Tavira, Alcoutim, Silves, Almodôvar, Mértola, Ourique, Castro Verde and Odemira).

3.4. Population and Sample

The sample used for the first qualitative data collection was chosen by convenience and is composed by the healthcare professionals who were working on the Hospital de Faro' obstetrics ED at the moment of the data collection. The interviews were done with the collaboration of the professionals who were available and willing to help.

The quantitative study was developed in the obstetrics ED of *Hospital de Faro*, with a sample of the service' patients as it is not possible to examine the total population. In *Hospital de Faro*, the emergency care is divided between general emergency and obstetrics emergency, working as separate services. In this case, the sample was randomly chosen between the whole population receiving care on the obstetrics ED and includes answers from 103 participants.

The questionnaire participants are women over the age of 18 years old, who show consent and physical/mental capacity to collaborate in the investigation. It is important to mention that the participation is voluntary and requires the patient to sign the informed consent document.

On the second qualitative data collection, the sample considered comprises a set of patients of the obstetrics ED and who had experienced the service before and after the COVID-19 pandemic.

3.5. Data Analysis Tools

3.5.1. Principal Component Analysis

To evaluate PSQ, it is necessary to convert the SERVPERF results in a single variable that includes the different dimensions that compose the instrument. To do so, two options were considered. The first is the one presented previously, consisting of giving equal weight to each item of each dimension presented by Parasuraman et al. (1985), computing the arithmetic mean of the 22 items. The second, and in order to have an instrument that can better suit for the specific healthcare context under study, involves determining that variable from a weighted average created from new dimensions. This option will now be further developed.

The Principal Component Analysis (PCA) is an “exploratory multivariate analysis technique that transforms a set of correlated variables into a smaller group of independent variables, linear combinations of the original variables, called principal components” (Marôco, 2021). This technique was first introduced by Karl Pearson in 1901 and aims to reduce data complexity. Besides that, another advantage of this approach is allowing to summarize information from multiple correlated variables in one or more independent linear combinations, which represent the majority of information present on the original data.

3.5.2. Hypotheses’ Testing

One way to infer about one or more population parameters is by using hypotheses testing. This method aims to refute (or not) a certain hypothesis about one or more population parameters, through one or more estimates obtained in the samples (Marôco, 2021). According to Laureano (2013), the performance of a hypothesis test follows a work methodology that aims to minimize decision errors. This approach will allow to test the investigation hypothesis H1 and H2.

These tests are commonly divided into two groups: parametric and non-parametric. According to Laureano (2013), parametric tests are most frequently used, and these involve hypothesis related to a population parameter or a comparison between parameters of two or more population. These tests are applied when the sample distribution is known (normal distribution is the most common). To perform a parametric test, the fulfillment of two assumptions is required:

- **Normality** – The dependent variable follows a normal distribution. To test this assumption, the Kolmogorov-Smirnov test will be applied (Marôco, 2021).
- **Homoscedasticity** – The variables have homogeneous variance. To test the homoscedasticity, the Levene test is recommended by Marôco (2021).

When these requirements are met, parametric testes can be used, and it is possible to use the t-student test, which allows the comparison between two populations' means, or the ANOVA one-way test for the comparison between more than two populations (Marôco, 2021).

Regarding the non-parametric tests, these do not require the variable to follow a normal distribution and these tests are used when the assumptions mentioned above are not met. In this case, the Wilcoxon-Mann-Whitney test is used in alternative to the t-student test when comparing variable distribution functions (Marôco, 2021). To compare more than two populations and as an alternative to the ANOVA one-way, the Kruskal-Wallis's test is recommended.

The rejection of the null hypothesis (H_0), both in parametric and non-parametric tests, leads to the conclusion that there is, at least, one population mean that is different from the others, not indicating which pair or pairs of means are different. Thus, the groups that have that difference need to be identified, and post-hoc tests of multiple mean comparison need to be run. After parametric tests, and according to Marôco (2021), Scheffe's test will be applied when exists homogeneity of variances, and Games-Howell when this requirement is not met.

3.5.3. Correlation Coefficient

Regarding the test of H_3 , the correlation coefficient method will be used. This approach is used to measure the strength of a relationship between two variables. The most commonly used method is the Pearson's correlation coefficient, applied to measure how strong is a linear relationship between two quantitative variables. In cases where the relationship is not linear, the Spearman's correlation coefficient is the most used non-parametric alternative using a monotonic function (Laureano, 2013). A 95% confidence interval will be used, and a coefficient can be considered sufficiently reliable when $p < 0.05$. The coefficient can take values between $-1 \leq r \leq 1$, where values closer to 1 mean a positive correlation between the variables, and values closer to -1 mean the variables are negatively correlated.

3.6. Conclusion

Concluding this chapter, Table 3.1 was built to summarize the main ideas, including the methods used to answer to the research questions and therefore complete the specific objectives:

Table 3. 1 – Summary of Specific Objectives, Research Questions and Analysis Techniques

Specific Objectives	Research Questions	Analysis
O1. Characterize the current situation of the obstetrics department by measuring the service quality perceived by women who visited the obstetrics ED.	Q1. What is the customers' perception about the service quality provided by the obstetrics ED?	Descriptive Analysis and Hypotheses' Testing (H2)
O2. Characterize the current situation of the obstetrics department by measuring the HRQoL of women who visited the obstetrics ED.	Q2. What is the customers' perception about their HRQoL after the service provided by the obstetrics ED?	Descriptive Analysis and Hypotheses' Testing (H1)
O3. Assess the strength of the association between the perceived service quality and the HRQoL of women who visited the obstetrics ED.	Q3. Is there an association between PSQ and HRQoL on the obstetrics ED?	Correlation Coefficient (H3)
O4. Assess the impact of the COVID-19 pandemics in the perceived service quality in the obstetrics ED.	Q4. Are there any differences in the way service quality is perceived before and after the COVID-19 pandemic?	Qualitative Approach (second qualitative study)
O5. Develop recommendations to be implemented in the service to improve both perceives service quality and HRQoL in the obstetrics ED.	Q5. How can the service delivery be improved in the obstetrics ED to increase both HRQoL and PSQ?	Qualitative Approach

4. Analysis of Results

The present chapter includes the analysis of the results obtained on the data collection phase performed on the obstetrics ED in *Hospital de Faro*. Results from the different data collection phases will be presented, including information about the sample characterization, construct reliability and internal consistency analysis, along with the results that will allow answering the investigation questions.

4.1. First qualitative data collection phase

4.1.1. Sample Characterization

Regarding the first qualitative data collection, it was done with the collaboration of the obstetrics ED professionals who were available and willing to help. The sample was chosen by convenience, and the list of professionals who participated on the interviews is the following:

Table 4. 1 – Profile of the interviewees in the first moment of qualitative data collection

Interviewee	Seniority in the service/sector
Obstetrician doctor (Service Director)	33 years
Obstetrician doctor	17 years
Obstetrician doctor	9 years
Nurse	28 years
Nurse	3 years

4.1.2. Results

From the interviews carried out with the health professionals working at the obstetrics ED under study was possible to collect valuable information about the reality of the service from the perspective of those working there daily. The professionals were asked to give an opinion about what characteristics can have a bigger impact on patients' HRQoL and on the way they perceive service quality. In addition to validating the characteristics present on previous literature (age, educational level and living arrangement), they also validated the new suggested characteristics (marital status, trimester of pregnancy, previous pregnancies and the triage color assigned).

Besides this, the healthcare providers believed that the existence of chronic diseases or other pathologies associated with the pregnancy and the presence of out-of-hospital follow-up were two important factors that seemed to affect patients' HRQoL and PSQ and therefore these characteristics were added to the independent variables to be studied.

Another goal of this data collection phase was to understand if the five SERVPERF dimensions were appropriate to the reality of the service and all the respondents validated the topics covered by the instrument's items. Finally, when given the opportunity of adding other aspects that might influence PSQ, the professionals considered that the existence of privacy was a weak point of the service and therefore had a great impact on the way patients perceive quality. Due to the lack of space and to the fact that *Hospital de Faro* is a university hospital that allows students to watch the procedures, patients' privacy might be compromised at some point. Based on this information, an additional item was added to the original questionnaire and included on the empathy dimension (P22).

4.2. Quantitative data collection

4.2.1. Sample Characterization

To characterize the sample of the quantitative data collection, the variables age, education, living arrangement and region of residence were considered as previously mentioned. Additionally, and according to the results obtained on the first qualitative data collection provided by the healthcare professionals of the service, the variables marital status, trimester of pregnancy, history of previous pregnancies, triage color assigned, out-of-hospital follow-up, and existence of chronic or pregnancy-related diseases were also considered relevant and therefore included on the patient's characteristics analysis. In Annex D – Table D.1 can be found the relative and absolute frequencies for these variables.

Regarding **age**, it was initially divided into 5 age gaps then reduced to only 3 due to the lack of answers on the older age intervals, an expected results since the respondents are women in childbearing age. The majority of respondents are on the 25-34 years old gap (52,4%), being the others 17,5% on the 18-24 years-old gap, and the remaining 30,1% were between 35-44 years-old.

The **region of residence** variable was divided in 15 options, then reduced to 5, and the data collected registered two dominant municipalities, Faro (25,2%) and Loulé/São Brás de Alportel (33,0%), followed by Olhão (16,5%). The remaining respondents were from Tavira/Vila Real de Santo António (11,7%), and Albufeira/Silves (13,6%).

For the **educational level**, initially aggregated in 7 groups, and later evaluated in 5 due to the lack of responses on the lower levels of education. Most answers were for higher levels of education, with 42,7% studying up to 12th grade, 25,2% had a bachelor's degree, and 13,6% had a master's degree or higher grade. 18,4% of the respondents studied until 9th grade or less.

Concerning the **marital status**, the respondents were mainly single or divorced (64,1%), and the remaining 35,9% were married.

Regarding the **living arrangement** variable, the two options under study were if the patient lived alone or with someone, with the results revealing that the great majority, 94,2%, lived with someone.

The sample's data related to the **trimester of pregnancy** registered 35,9% of the patients were on the first trimester of pregnancy, 20,4% on the second and 43,7% of the last trimester.

To the question regarding if the patient was receiving any kind of **out-of-hospital follow-up**, most respondents said they were not, and only 23,3% answered positively.

The great majority of respondents did not have any **chronic or pregnancy-related diseases** (89,3%).

Regarding the history of **previous pregnancies**, 35% patients had never been pregnant before, 36,9% had been pregnant once, 15,5% twice and 12,6% three or more times.

Finally, the questionnaire participants were mostly **triaged** with the colors green (34%) and yellow (45,6%), followed by the color blue with 8,7%, and orange with 11,7%. No patient who responded the questionnaire were triaged with the color red.

4.2.2. SERVPERF analysis

4.2.2.1. SERVPERF reliability

To assess the reliability and internal consistency among the items and on each dimension of the SERVPERF instrument, the most widely used coefficient is the Cronbach's alpha, according to Bonett & Wright (2015). This coefficient was applied to measure reliability of every dimension and to the global model. Cronbach's alpha varies from 0 to 1 and according to Nunnally (1978) the instrument is considered reliable when its value is at least 0,7. The higher the value is, the greater is the internal consistency of the instrument. Table 4.2 shows the values obtained for the Cronbach's alpha on each dimension of the SERVPERF instrument and also for the global instrument.

Table 4. 2 – Cronbach's alpha for the SERVPERF instrument and its dimensions

Dimension	Cronbach's alpha
Tangibility	0,741
Reliability	0,803
Responsiveness	0,794
Assurance	0,824
Empathy	0,901
Global Instrument	0,945

Analyzing this data, we can verify that all Cronbach's alpha values are higher than 0,7, showing a good indication of reliability, and proving to have internal consistency to evaluate the reality under study.

In order to further test the reliability of the instrument, the Cronbach's alpha of each dimension and of the global instrument in case of removing one item was also computed. The values obtained can be found on Annex E (Tables E.1 and E.2) and they allow us to conclude that if any of the items were removed, it would not result in a significative increase of the construct's alpha compared to the original, allowing to determine that all items will be maintained.

Finally, the removal of each dimension was analyzed. Table 4.3 shows the obtained results. One more time the results show that the instrument is reliable, and the removal of any dimension would not improve the Cronbach's alpha.

Table 4. 3 - Cronbach's alpha for the SERVPERF instrument if each dimension is deleted

Dimension	Cronbach's alpha if dimension deleted
Tangibility	0,931
Reliability	0,875
Responsiveness	0,894
Assurance	0,871
Empathy	0,868

4.2.2.2. Principal Component Analysis

The PCA analysis was run using SPSS software and the output, by the KMO and Bartlett tests' results, showed adequate partial correlation strength (KMO = 0,885) and lead to the rejection of the null hypothesis on the Bartlett's test (Sig. = <0,001) which says that variables are unrelated and not ideal for factor analysis. The output also showed that the 22 items of the questionnaire were better distributed into 4 dimensions instead of the 5 originally established. Those 4 dimensions explain 72,07% of the sample variation.

To make a decision on which path to follow, a reliability analysis of this instrument was made, and lead to the conclusion that the new dimensions were more reliable, with higher values for the Cronbach's alpha (Table 4.4).

Table 4. 4 – Cronbach’s alpha for the new dimensions obtained from PCA

Dimension	Cronbach’s alpha
Dimension 1	0,946
Dimension 2	0,902
Dimension 3	0,779
Dimension 4	0,827
Global Instrument	0,945

Additionally, the alpha for each dimension when each item was removed did not show significant reliability improvement and therefore all items should be maintained (Annex F).

Thus, the division with the new dimensions was adopted and the weighted average was calculated for the new variable measuring PSQ. This variable will be used to test H2 and H3.

4.2.2.3. SERVPERF Descriptive Analysis

To analyze PSQ on the obstetrics ED under study measured by SERVPERF, the set of 22 items was analyzed. On a scale from 1 to 7, patients attributed their evaluation on each item, according to their experience on the *Hospital de Faro* obstetrics ED. The mean, standard deviation, minimum and maximum for each item and dimension, as well as the relative frequencies of the SERVPERF’s scale can be found on Annex E (Table E.3).

The SERVPERF results show that the item that obtained the best result were P3: *“The employees are well dressed and appear neat”*, with a mean of responses of 6,21, and the highest registered minimum of 3. The results found in this question concerning the professional’s appearance contrast with the outcome of the dimension in which it is inserted (Tangibility). This dimension is the one with the lowest score, with a mean of 5,24 which reflects the existing problem in *Hospital de Faro* regarding the antiquity of the facilities and infrastructures, as well as the equipment used by the healthcare professionals to treat patients. Item P7: *“This unit is trustworthy”*, with a mean of 6,13, also obtained one of the highest scores suggesting that patients trust the ED despite of the flaws identified by them on other items.

On the other hand, the lower scores given by the patients were on P2: *“The physical facilities are visually appealing”* followed by P10: *“This unit informs you exactly when the service will be provided”*, P5: *“When this unit promises to do something by a certain time, it does so”*, P1: *“This unit has up-to-date equipment”*, P11: *“The healthcare professionals of unit provide prompt service”* and P8: *“The employees provide the service at the time they promise to do so”*, with answers’ mean under 5. These

items belong to the Tangibles, Reliability and Responsiveness dimensions and indicate that the topics of greatest concern regarding PSQ are related to the physical installations and medical equipment, waiting time, and availability of information.

Evaluating now the consensus among patients, the two items that gathered the most agreement between the respondents (SD of 0,997) coincide with the questions with the highest score (P3: “*The employees are well dressed and appear neat*” and P7: “*This unit is trustworthy*”), reinforcing the good results obtained on these questions. On the other side, the item with the highest SD was P10: “*This unit informs you exactly when the service will be provided*” (SD of 1,743) and the dimension where it is inserted (Responsiveness) also registered the most dispersion of answers (SD of 1,574) suggesting great variability on service delivery time, employees promptness, and availability of information regarding waiting times.

In general, and looking at the dimensions’ means, patients have a positive perception of the obstetrics ED, with all dimensions with a mean above 5, with Assurance having the best result (mean of 5,87). To the question regarding the overall PSQ (P23), the results are also good, with a mean of 5,47 out of 7.

4.2.3. EQ-5D-5L Analysis

4.2.3.1. EQ-5D-5L Reliability

Regarding the EQ-5D-5L instrument, the same instrument was used to assess the reliability and internal consistency among the items. Cronbach’s alpha was applied to measure the instrument’s reliability on the initial moment (before medical care) and on final moment (after medical care).

Cronbach’s alpha obtained were 0,671 and 0,515 which represents low values according to Nunnally (1978). Despite this, the values are acceptable and, on all dimensions, with exception of the Anxiety/Depression, the alpha value decreases with the removal of the dimension. With the removal of the Anxiety/Depression dimension we can verify an improvement of the internal consistency, not representing, however, a significant improvement that justifies the removal of the entire dimension and, thus, all items were maintained. One factor that can justify the low obtained values is the reduced number of questions on the EQ-5D-5L questionnaire. Table 4.5 presents the reliability data for this instrument.

Table 4. 5 - Cronbach's alpha for the EQ-5D-5L instrument and dimensions if each dimension is deleted

	Initial Moment	Final Moment
Dimension	Cronbach's alpha if item deleted	Cronbach's alpha if item deleted
Mobility	0,554	0,399
Self-care	0,659	0,512
Usual Activities	0,521	0,313
Pain/Discomfort	0,502	0,384
Anxiety/Depression	0,764	0,642
Cronbach's Alpha	0,671	0,515

4.2.3.2. EQ-5D-5L Descriptive Analysis

To measure HRQoL, the chosen instrument is composed of two parts, which will now be analyzed. The answers' absolute and relative frequencies can be found on Annex G. Table 4.6 presents the results of the EQ-5D-5L on both moments, before and after medical care.

Table 4. 6 – HRQoL by dimension and moment

	1st moment				2nd moment			
Dimension	Mean	SD	Min	Max	Mean	SD	Min	Max
Mobility	1,31	0,686	1	4	1,15	0,381	1	3
Self-Care	1,11	0,418	1	4	1,08	0,269	1	2
Usual Activities	1,60	0,889	1	5	1,41	0,633	1	4
Pain/Discomfort	2,19	0,991	1	5	1,60	0,583	1	3
Anxiety/Depression	1,49	0,752	1	5	1,42	0,748	1	5
VAS	71,50	18,69	0	100	81,21	11,60	50	100

The questionnaire outcome shows low mean values for both moments, with values close to 1, representing good HRQoL on all dimensions, and we can highlight that the highest obtained mean value was for the dimension Pain/Discomfort (2,19) and it is still a low value.

Comparing the two moments, we can underline an improvement (a decrease) in the mean values for all dimensions from the first to the second moment.

The second part of the questionnaire, the VAS, registered mean values of 71,50 on the first moment (SD of 18,68), with an improvement to 81,21 and a decrease on the dispersion of answers (SD of 11,60).

Another aspect to highlight is the fact that on the second moment the minimum health state level marked by the patients was mid-scale (50).

To evaluate patients' health state improvement after the visit to the obstetrics ED, the first part of the EQ-5D-5L instrument requires the conversion of the patient's answers to an index number that goes from -0,603 (worst health state obtained by the answer 55555) to 1 (best health state obtained by the answer 11111). This conversion was made based on the value set to Portugal presented by Ferreira et al. (2019). The index values allow to compute the difference between the two moments of the questionnaire and therefore the patient's health state improvement. The term "HRQoL Improvement" and "VAS Improvement" will from now on refer to the improvement measured on the first and second part of the EQ-5D-5L questionnaire, respectively. Table 4.7 contains the descriptive analysis of the data obtained (answers of the first part of the questionnaire already converted to index).

Table 4. 7 – Descriptive analysis of HRQoL and VAS results

	Mean	SD	Minimum	Maximum
Index First Moment	0,87	0,161	0,16	1,00
Index Second Moment	0,93	0,074	0,60	1,00
HRQoL Improvement	0,06	0,105	0,00	0,56
VAS First Moment	71,50	18,693	0,00	100,00
VAS Second Moment	81,21	11,599	50,00	100,00
VAS Improvement	9,71	9,544	-5,00	50,00

Analyzing the mean values obtained on the first part of the questionnaire, we can observe that values are close to the maximum (1) indicating good HRQoL for patients both before and after receiving medical treatment. Even so, an improvement of 0,06 was registered after the visit to the ED. On the first moment we can see that exists a higher dispersion in patient's answers (SD of 0,161), revealing greater variation in their health state on arrival than when leaving the hospital (SD of 0,074). Looking at the minimum values, they reveal a considerable difference between the lower HRQoL in the first moment evaluation moment (0,16) and the second moment, where the worst value registered was 0,60, suggesting that medical intervention had a great impact on patients with lowest HRQoL.

In the VAS section of the questionnaire, this time on a scale from 0 to 100, the results allow similar conclusions. The results reveal good self-evaluated HRQoL from patients, with means of 71,50 and 81,21 on first and second moments, respectively, and therefore a mean VAS improvement of 9,71.

4.2.4. Hypotheses Testing

The hypotheses established before will now be tested. To test H1 and H2, the two assumptions required for parametric tests mentioned above were analyzed. Regarding normality, the assumption was considered met for groups with $n > 30$. Mathematical demonstrations and simulation studies has proven that parametric tests are robust to the violation of the normality assumption when the distribution is not extremely skewed or flat, and when the sample dimension is not extremely small (Marôco, 2021). For groups with $n < 30$, normality was tested resorting to the Kolmogorov-Smirnov test. When the normality assumption was confirmed, those groups were tested for the homoscedasticity assumption using Levene's test. Thus, for variables whose groups meet both assumptions, parametric tests were applied, and if not, non-parametric tests were used. Additionally, post-hoc tests were run for variables that showed significant difference between groups' means.

Age

The existence of a significant difference between means on patient's answers in different age categories was tested. Normality and homoscedasticity were confirmed for PSQ and therefore ANOVA parametric test was performed. The significance obtained on each test is presented on Table 4.8.

Table 4. 8 – Hypothesis test for independent variable “Age” (Sig.)

	Normality (n < 30) Kolmogorov-Smirnov	Levene	ANOVA	Kruskal-Wallis
	18-24 years old			
PSQ	0,200	0,368	0,302	-
Overall PSQ	0,006	-	-	0,479
HRQoL Improvement	<0,001	-	-	0,577
VAS Improvement	0,006	-	-	0,741

Tests' results show that there is no significant difference between the perceptions of patients in different age gaps. Thus, we can say that age does not influence PSQ, Overall PSQ, HRQoL Improvement or VAS Improvement ($p > 0,05$).

Residence

For the patient's residence analysis, normality and homoscedasticity were confirmed for PSQ and parametric test ANOVA was performed. Table 4.9 presents the p -values obtained.

Table 4. 9 – Hypothesis test for independent variable “Residence” (Sig.)

	Normality (n < 30) Kolmogorov-Smirnov				Levene	ANOVA	Kruskal-Wallis
	Faro	Olhão	Tavira and VRSA	Albufeira and Silves			
PSQ	0,200	0,189	0,200	0,200	0,492	0,078	-
Overall PSQ	0,002	0,003	<0,001	0,024	-	-	0,259
HRQoL Improvement	<0,001	0,002	0,004	0,003	-	-	0,217
VAS Improvement	0,004	<0,001	0,015	0,040	-	-	0,125

Results show that there is no evidence of a difference in patient’s perceptions depending on the region of residence, with all p -values > 0,05.

Education

Regarding the study of how educational level impacts the way patients perceive service quality and their own quality of live, PSQ fulfilled the normality and the homoscedasticity assumptions. The ANOVA test was performed for PSQ and Kruskal-Wallis for the others (Table 4.10).

Table 4. 10 – Hypothesis test for independent variable “Education” (Sig.)

	Normality (n < 30) Kolmogorov-Smirnov			Levene	ANOVA	Kruskal-Wallis
	9 th year of schooling or less	Bachelor’s degree	Master’s degree or higher			
PSQ	0,200	0,145	0,200	0,350	0,568	-
Overall PSQ	0,041	<0,001	0,005	-	-	0,131
HRQoL Improvement	<0,001	<0,001	<0,001	-	-	0,066
VAS Improvement	0,028	<0,001	0,017	-	-	0,823

The SPSS output, and as we can see in table 4.10, revealed that there is no significant difference ($p > 0,05$) in patient’s answers on any evaluated topic depending on the level of education they have.

Marital Status

For the study of marital status, normality was assumed for every group, since all of them have $n > 30$. Homoscedasticity was confirmed for Overall PSQ, HRQoL Improvement and VAS Improvement, but not for PSQ. Thus, and because there are only two groups, the parametric and non-parametric tests used were t-student and Mann Whitney, respectively.

Table 4. 11 – Hypothesis test for independent variable “Marital Status” (Sig.)

	Levene	t-student	Mann-Whitney
PSQ	0,048	-	0,845
Overall PSQ	0,067	0,967	-
HRQoL Improvement	0,278	0,845	-
VAS Improvement	0,065	0,006	-

Table 4.11 shows that there is no significant difference in PSQ, Overall PSQ and HRQoL Improvement between the two groups “Married” and “Single or Divorced” ($p > 0,05$). For VAS Improvement, the significance obtained on the t-student test was $p = 0,006$, which represents a significant difference between means of groups “Married” and “Single or Divorced”.

Living Arrangement

Since living arrangement only has two groups, with one of them (patients who live alone) with $n < 30$, the Kolmogorov-Smirnov and Levene’s test were performed one more time. All PSQ, Overall PSQ, HRQoL Improvement and VAS Improvement met the normality and homoscedasticity assumptions, so the t-student parametric test was run (Table 4.12).

Table 4. 12 – Hypothesis test for independent variable “Living Arrangement” (Sig.)

	Normality (n < 30)	Levene	t-student
	Kolmogorov-Smirnov		
	Alone		
PSQ	0,200	0,388	0,294
Overall PSQ	0,200	0,287	0,437
HRQoL Improvement	0,062	0,312	0,379
VAS Improvement	0,200	0,816	0,308

Results show that there is no significant difference ($p > 0,05$) between the answers of patients who lived alone or with someone.

Trimester of Pregnancy

Regarding trimester of pregnancy, the group “2nd Trimester” was tested for normality, which was confirmed for the PSQ, as well as the homoscedasticity test. ANOVA was run for PSQ and Kruskal-Wallis for Overall PSQ, HRQoL Improvement and VAS Improvement (Table 4.13).

Table 4. 13 – Hypothesis test for independent variable “Trimester of Pregnancy” (Sig.)

	Normality (n < 30) Kolmogorov-Smirnov	Levene	ANOVA	Kruskal-Wallis
	2 nd Trimester			
PSQ	0,200	0,885	0,827	-
Overall PSQ	<0,001	-	-	0,368
HRQoL Improvement	<0,001	-	-	0,432
VAS Improvement	0,002	-	-	0,094

Results show that there is no influence of the trimester of pregnancy in PSQ, Overall PSQ, HRQoL Improvement or VAS Improvement, with all p-values $> 0,05$.

Out-of-hospital Follow-up

To the question whether the patient was receiving any kind of follow-up outside the hospital, 24 patients answered “Yes”, so normality was tested for that group. As that assumption was not fulfilled, non-parametric test Mann-Whitney was performed for every aspect.

Table 4. 14 – Hypothesis test for independent variable “Out-of-hospital Follow-up” (Sig.)

	Normality (n < 30) Kolmogorov-Smirnov	Mann-Whitney
	Yes	
PSQ	0,041	0,791
Overall PSQ	<0,001	0,516
HRQoL Improvement	<0,001	0,590
VAS Improvement	<0,001	0,229

As we can see on Table 4.14, there is no significant difference ($p > 0,05$) on the answers of patients who were receiving out-of-hospital follow-up and those who were not.

Chronic or pregnancy-related diseases

Concerning the analysis of the existence of chronic or pregnancy-related diseases, 11 patients answered positively and for that group normality was verified. VAS Improvement fulfilled both normality and homoscedasticity assumptions, and therefore parametric test t-student was run. For PSQ, Overall PSQ and HRQoL Improvement were performed non-parametric tests.

Table 4. 15 – Hypothesis test for independent variable “Chronic or pregnancy-related diseases” (Sig.)

	Normality (n < 30) Kolmogorov-Smirnov	Levene	t-student	Mann-Whitney
	Yes			
PSQ	0,048	-	-	0,745
Overall PSQ	0,044	-	-	0,249
HRQoL Improvement	0,001	-	-	0,237
VAS Improvement	0,078	0,832	0,915	-

The results presented on Table 4.15 show there is no significant difference in patient’s perceptions depending on the presence or not of chronic or pregnancy-related diseases ($p > 0,05$).

Previous Pregnancies

Regarding previous pregnancies, PSQ’s normality and homoscedasticity were confirmed, so the parametric test ANOVA was performed. For Overall PSQ, HRQoL Improvement and VAS Improvement, non-parametric Kruskal-Wallis’ test was done.

Table 4. 16 – Hypothesis test for independent variable “Previous Pregnancies” (Sig.)

	Normality (n < 30)		Levene	ANOVA	Kruskal -Wallis
	Kolmogorov-Smirnov				
	Two	Three or more			
PSQ	0,114	0,200	0,846	0,533	-
Overall PSQ	0,025	0,080	-	-	0,584
HRQoL Improvement	<0,001	<0,001	-	-	0,029
VAS Improvement	<0,001	<0,001	-	-	0,055

On Table 4.16 we can see the outcome of the tests performed. Results show that there is no significant difference in PSQ, Overall PSQ and VAS Improvement between different pregnancy histories. By contrast, data shows that there is a difference in HRQoL Improvement depending on how many previous pregnancies patients had ($p = 0,029$). Since there are 4 groups, “None”, “One”, “Two” and “Three or more”, post-hoc tests were done to identify between which groups exists that difference between means. Table 4.17 shows the results obtained.

Table 4. 17 – Pairwise Comparisons for “Previous Pregnancies” – HRQoL Improvement

Sample 1 – Sample 2	Sig.
Two – None	0,159
Two – One	0,045
Two – Three or more	0,004
None – One	0,456
None – Three or more	0,041
One – Three or more	0,130

Pairwise comparisons from the SPSS software output show there is significant difference between the pairs of means “Two – One” ($p = 0,045$), “Two – Three or more” ($p = 0,004$), and “None – Three or more” ($p = 0,041$), meaning that it is between those groups of patients’ previous pregnancies that the answers to the HRQoL Improvement part of the questionnaire differed from each other.

Triage Color

Finally, triage color was studied. For PSQ and Overall PSQ both normality and homoscedasticity assumptions were met, so the ANOVA test was performed. Non-parametric Kruskal-Wallis' test was run for HRQoL Improvement and VAS Improvement.

Table 4. 18 – Hypothesis test for independent variable “Triage Color” (Sig.)

	Normality (n < 30)		Levene	ANOVA	Kruskal -Wallis
	Kolmogorov-Smirnov				
	Blue	Orange			
PSQ	0,200	0,200	0,088	0,248	-
Overall PSQ	0,200	0,101	0,101	0,190	-
HRQoL Improvement	-	0,004	-	-	0,002
VAS Improvement	0,002	0,025	-	-	0,037

Analyzing the significance levels obtained on the mentioned tests (Table 4.18), it is possible to say that there is no significant difference on PSQ and Overall PSQ depending on the color that the patient was triaged. In contrast, for HRQoL Improvement and VAS Improvement, Kruskal-Wallis' test shows there is a difference in groups' means of patients triaged with different colors ($p = 0,002$ and $p = 0,037$, respectively). Post-hoc tests were done to understand where that difference lies (Table 4.19).

Table 4. 19 – Pairwise Comparisons for “Triage color” – HRQoL Improvement and VAS Improvement

	HRQoL Improvement	VAS Improvement
Sample 1 – Sample 2	Sig.	Sig.
Blue – Green	0,007	0,199
Blue - Yellow	<0,001	0,016
Blue – Orange	0,001	0,025
Green – Yellow	0,137	0,077
Green – Orange	0,226	0,130
Yellow – Orange	0,821	0,727

The pairwise comparison resulted in the conclusion that the significant difference in HRQoL Improvement is in groups “Blue-Green”, “Blue – Yellow”, and “Blue – Orange”, and in VAS Improvement is in groups “Blue – Yellow” and “Blue – Orange”.

4.2.5. Correlations

To investigate hypothesis H3, and therefore evaluate the existence of an association between PSQ, Overall PSQ, HRQoL Improvement and VAS Improvement, Pearson's correlation coefficient was the instrument used. This tool allows to find if exists a significant relation, and its strength, if it exists, and if it is significant. As mentioned before, Pearson's coefficient varies from -1 to 1, with values closer to 1 meaning a strong positive relation and closer to -1 meaning a strong negative relation. The confidence interval used is 95%, meaning that the coefficient can be considered reliable when significance when $p < 0.05$.

Association between PSQ and Overall PSQ

Evaluating the existence of a relation between the two variables measuring perceived service quality - PSQ and Overall PSQ - Pearson's coefficient suggests that these two variables have a significant and quite strong positive relation, with a correlation coefficient of 0,754 and a p-value of <0,001 (Table 4.20). Thus, H3 a) will not be rejected.

Table 4. 20 – Pearson's correlation coefficient for PSQ and Overall PSQ

		PSQ	Overall PSQ
PSQ	Pearson's correlation	1	0,754
	Sig. (2-tailed)	.	<0,001
Overall PSQ	Pearson's correlation	0,754	1
	Sig. (2-tailed)	<0,001	.

Association between PSQ and HRQoL Improvement

Regarding the relation between PSQ and HRQoL Improvement, Pearson's correlation was computed, leading to the conclusion that exists a negative relation between them, that, although slight, is significant. As we can see on Table 4.21, the p-value is 0,012 and the correlation coefficient is -0,246, leading to the non-rejection of H3 b).

Table 4. 21 – Pearson's correlation coefficient for PSQ and HRQoL Improvement

		PSQ	HRQoL Improvement
PSQ	Pearson's correlation	1	-0,246
	Sig. (2-tailed)	.	0,012
HRQoL Improvement	Pearson's correlation	-0,246	1
	Sig. (2-tailed)	0,012	.

Association between PSQ and VAS Improvement

To evaluate the relationship between PSQ and VAS Improvement, Pearson's correlation coefficient was calculated one more time, with the results obtained represented on Table 4.22. The SPSS output suggests that exists a small negative correlation of -0,208. Significance level of 0,035 indicates that this relation is significant and H3 c) should not be rejected.

Table 4. 22 – Pearson's correlation coefficient for PSQ and VAS Improvement

		PSQ	VAS Improvement
PSQ	Pearson's correlation	1	-0,208
	Sig. (2-tailed)	.	0,035
VAS Improvement	Pearson's correlation	-0,208	1
	Sig. (2-tailed)	0,035	.

Association between Overall PSQ and HRQoL Improvement

The relationship between Overall PSQ and HRQoL Improvement was also studied. The value obtained on Pearson's correlation coefficient suggests that exists a small relation between them, however, that association is not significant ($p = 0,078 > 0,05$). Thus, the decision is to reject H3 d).

Table 4. 23 – Pearson's correlation coefficient for Overall PSQ and HRQoL Improvement

		Overall PSQ	HRQoL Improvement
Overall PSQ	Pearson's correlation	1	-0,174
	Sig. (2-tailed)	.	0,078
HRQoL Improvement	Pearson's correlation	-0,174	1
	Sig. (2-tailed)	0,078	.

Association between Overall PSQ and VAS Improvement

Similarly to the previous analysis, the study of the association between Overall PSQ and VAS Improvement, also lead to the conclusion that Overall PSQ and VAS Improvement are negatively correlated, being this relation very weak (-0,178) and not statistically significant ($p > 0,05$), as shown in table 4.24. These results lead to the conclusion that H3 e) should be rejected.

Table 4. 24 – Pearson’s correlation coefficient for Overall PSQ and VAS Improvement

		Overall PSQ	VAS Improvement
Overall PSQ	Pearson’s correlation	1	-0,178
	Sig. (2-tailed)	.	0,071
VAS Improvement	Pearson’s correlation	-0,178	1
	Sig. (2-tailed)	0,071	.

Association between HRQoL Improvement and VAS Improvement

Finally, the relationship between the variables extracted from the EQ-5D instrument, HRQoL Improvement and VAS Improvement, was evaluated. For the Pearson’s correlation coefficient, the result obtained was 0,444, representing a moderate positive relationship between the two variables. Regarding the significance ($p = < 0,001$), it suggests that that relation is in fact significant. Thus, H f) should not be rejected (Table 4.25).

Table 4. 25 – Pearson’s correlation coefficient for HRQoL Improvement and VAS Improvement

		HRQoL Improvement	VAS Improvement
HRQoL Improvement	Pearson’s correlation	1	0,444
	Sig. (2-tailed)	.	<0,001
VAS Improvement	Pearson’s correlation	0,444	1
	Sig. (2-tailed)	<0,001	.

4.3. Second qualitative data collection phase

4.3.2. Sample Characterization

The participants on the second moment of qualitative data collection were 5 women chosen between the visitors of the obstetrics ED. The interviewed women were on the difference age gaps, being between the ages of 21 and 37 years old and all of them had visited the service before the COVID-19 pandemic, of which 3 had already delivered a baby on that service before.

4.3.3. Results

The second qualitative data collection was important to gather information about the impact of the COVID-19 pandemic in how patients perceive service quality in the obstetrics ED, as well as what they considered was causing sources of dissatisfaction and grievances.

With the worst results of the quantitative study concerning physical installations and equipment, waiting time, and availability of information, patients were asked if they agreed that these topics were

the least positive on the obstetrics ED. To that question, 3 patients agreed that equipment and physical installations were a weak point of the service, 3 considered that the waiting time is a problem in the ED, and also 3 women agreed that the availability of information was poor.

The next step was to ask what they believed were the motive behind those low evaluated topics. Patients who said that installations and equipment are a fragility of *Hospital de Faro*, considered that the motives for this was the hospital's antiquity, resulting in old buildings and equipment. One patient mentioned that she considered the hospital needed to renew the facilities, and the lack of investment was responsible for that not to happen. Another patient referred that most healthcare gear used by the professionals in the exams was modern, contrasting with the physical surroundings, like hospital beds and stretchers, and the building itself. Regarding waiting time, patients believed that human resources shortage was responsible for the long waiting times, combined with high patient inflow. Finally, when asked the motive behind the lack of information they were given, patients considered it to be a consequence of healthcare professionals shortage, causing the workforce to not have the time to dedicate to explain procedures and predict waiting times. Besides this, and regarding the availability of waiting time information, patients seem to understand that it is hard to predict how long each patient will take to be examined. It is important to highlight that patients were given the opportunity to mention other aspects they thought might be behind the low-scoring aspects, but none inserted new reasons, and more specifically, none of them mentioned the COVID-19 pandemic.

Thus, in the second part of the interviews the COVID-19 pandemic topic was introduced, and patients were asked if the pandemic could be a reason for the long waiting times and lack of information availability, as well as the problems with equipment. All interviewees agreed that they feel safe being examined in that service during the pandemic, with the professionals following the imposed rules about keeping the materials clean and using the personal protective equipment. While 3 patients did not see a difference in the service quality before and after the healthcare crisis, 2 patients considered that after the pandemic more is demanded of professionals, and it could contribute to aggravate the already problematic aspects of service quality.

4.4. Discussion

The obtained results on the data collection phase, will now be discussed. Looking to the professionals' insight, it had an important role in the construction of the questionnaire to be later submitted to the patients of the service. Not only it allowed to confirm the adequacy of the questions to be asked, but also contributed with aspects, considered by the healthcare professionals, to have an impact in the way patients perceive service quality and influence their QoL. Thus, it allowed to adapt the questionnaire to fit the service and its users, and thus get more reliable answers, better reflecting the reality of the obstetrics ED. Professionals validated the suggested ideas that patients characteristics "marital status",

“previous pregnancies” and “triage color” could have an impact on patient’s HRQoL and the hypotheses testing later allowed to confirm that those characteristics in fact affected both “HRQoL Improvement” and “VAS Improvement”.

On patients’ answers concerning their perception of service quality in *Hospital de Faro*’ obstetrics ED and their HRQoL improvement after the visit, we can see that answers differ according to some of the patients’ characteristics.

Contrary to what might be expected, and to what Zarei et al. (2012) concluded, the service quality perceived by patients who lives in Faro or near were the lowest. Something that may possibly justify this is the fact that residents might expect more from an institution located in their homeland than one further away and that they do not know very well. Contrasting to this, the best improvement in QoL after the ED visit was registered on patients from Faro and nearby cities. Another result that goes against Zarei et al.’s finding is that the scores given on the PSQ and Overall PSQ decreased as patient’s educational level increased, being the lowest on patients with a master’s degree.

Something else worthy to look at is the fact that patients who are single or separated, and patients who live alone rather than with someone, gave lower scores to the PSQ questions. It is possible that this happens because those patients are used to additional comfort and support from people close to them, and therefore miss that individual attention. On HRQoL Improvement, patients who were married or lived with someone registered better results.

The question addressing the presence of chronic or pregnancy-related diseases emerged from the healthcare professionals’ insight, and the results were as expected since patients who suffered from this health problems tended to give lower scores on service quality, even though their QoL improvement was better than in patients who did not suffer from these diseases. Also, patients triaged with the colors blue and orange gave a worst score to service quality, the first possibly due to the long waiting time associated with a least severe emergency, and the second because a more serious health problem and the pain that might be associated, lead to the need of fast health support, that might not always be possible in the ED. Patients’ anxiety in these cases also tend to be higher, leading to less tolerance regarding service delivery. Predictably, as the triage color gets more urgent, the patients’ quality of life improvement after the visit is higher.

The mean values for PSQ, Overall PSQ, HRQoL Improvement and VAS Improvement according to the patients’ characteristics groups can be found on Annex D. The mean values for PSQ are converted in a scale created by the SPSS software, and not in the original scale from 1 to 7.

More specifically, in the SERVPERF results, it is possible to observe that the highest scoring aspects are related to the professionals’ aspect and politeness, and to how patients feel safe and trust the healthcare unit, which is in line with the high scores given to the Empathy and Assurance dimensions.

Zamil et al. (2012) and Le and Fitzgerald (2014) present similar results in their studies, with the Assurance dimension also presenting the highest PSQ scores. In contrast, the worst scored items respect to waiting time, availability of information, and physical facilities. These results are not surprising given the nature of the service, an emergency department, where long waiting times and overcrowding are a known reality in Portugal, as previously mentioned (Grupo de Trabalho Serviço de Urgência, 2019). The hospital's antiquity also leads to predict the results obtained on P1 and P2, reflecting the old facilities and outdated equipment used, which is a problem whose resolution depends only on investment by the hospital's administration. Thus, the main problems identified in the obstetrics ED seem to not be related to the healthcare provided but rather with the long wait patients have to go through before being seen by a professional, and the discomfort that it causes, specifically when they do not have access to information about how long the wait will take. In the long term, we can predict that problems like these might be responsible for patients resorting to other healthcare options, mainly for reasons that are not related with the care provided in the service.

The hypotheses testing lead to the finding that patients' HRQoL Improvement is influenced by the existence of previous pregnancies and by the color the patient was triaged and VAS Improvement is affected by patients' marital status and triage color. Additionally, correlation analysis allowed to confirm the expected existing positive correlation between PSQ and Overall PSQ, and HRQoL Improvement and VAS Improvement. On the other hand, a not so expected result was the negative correlation between PSQ and HRQoL Improvement, and PSQ and VAS Improvement which means that as PSQ increases (or decreases), HRQoL Improvement and VAS Improvement decreases (or increases). One motive for this might be that patients who register a greater HRQoL and VAS Improvement arrive at the ED in a more severe health state and may end up giving a worst evaluation to service quality.

Finally, it is relevant to consider the pandemic context in which this study occurred. For that, the results from the second qualitative study were important to identify if the results obtained in the questionnaires might be conditioned by that reality. The results obtained revealed that patients did not consider service quality suffered from the global health emergency, which reveals that the obstetrics ED have a good power to adapt in cases of adversity and being able to maintain the level of service quality.

4.5. Conclusion

In this chapter, PSQ and HRQoL were evaluated in *Hospital de Faro*' obstetrics ED in the patients' perspective. For that, healthcare professionals and patients were interviewed, and a validated questionnaire was applied. From the professionals and patients' insights, plus the 103 answers to the questionnaire, some main conclusions were found.

When it comes to the sample of the first qualitative data collection, it is composed by professionals well familiar with the service, many of them working there for several years. Both doctors and nurses

interviewed showed to be comfortable in the workplace, and all have shown to have valuable information to share about everyday reality in the obstetrics ED. Regarding the sample of the qualitative study, it was composed by young women, mostly between 25 and 34 years old. These women were predominantly natural from Faro and cities nearby, like Loulé and Olhão, and the sample showed to be a well-educated sample, with only 18,4% of the participants having studied less than the 9th grade. Concerning the living arrangement and marital status, respondents are mostly single/divorced, although living with someone. Additionally, most women were on the last trimester of pregnancy from their first or second child, was not receiving out-of-hospital follow-up, and did not suffer from any chronic or pregnancy-related disease. The majority of patients answering the questionnaire were triaged with the colors green and yellow. The interviews with the patients counted with answers from women visiting the obstetrics service, and patients of different ages and with a history of visits to the service before the pandemic were chosen.

Professionals gave their ideas on how the questionnaire could be improved, allowing to conclude that the SERVPERF questions were adequate to the service under study and suggested the introduction of an item to study patients' privacy when visiting the ED. Additionally, the healthcare professionals helped understand which patients' characteristics could impact the variables under study.

The answers obtained in the quantitative data collection were analyzed in this chapter, and the Cronbach's alpha instrument allowed to verify the reliability of the tools used. Even though the SERVPERF dimensions proposed by Parasuraman et al. (1985) revealed good internal consistency, dividing the questionnaire's items according to the PCA dimensions proved to be an even more reliable instrument to measure PSQ. The main conclusions taken from hypotheses testing include the finding that patients' HRQoL Improvement is influenced by the existence of previous pregnancies and by the color the patient was triaged. From the correlation analysis, it was concluded that there is positive correlation between PSQ and Overall PSQ, and HRQoL Improvement and VAS Improvement. Contrarily, there is negative correlation between PSQ and HRQoL Improvement, and PSQ and VAS Improvement. To sum up the conclusions from hypotheses testing, Table 4.26 was built.

Table 4. 26 – Hypotheses testing results summary

Hypotheses	Conclusion
H1 a)	Partial Rejection Non-rejection for characteristics “Previous Pregnancies” and “Triage Color” Rejection for the remaining independent variables
H1 b)	Partial Rejection Non-rejection for characteristics “Marital Status” and “Triage Color” Rejection for the remaining independent variables
H2 a)	Rejection
H2 b)	Rejection
H3 a)	Non-rejection
H3 b)	Non-rejection
H3 c)	Non-rejection
H3 d)	Rejection
H3 e)	Rejection
H3 f)	Non-rejection

From the second qualitative data collection, the main conclusion to retain is that service quality did not suffer with the COVID-19 pandemic in the perspective of patients who have visited the Hospital de Faro obstetrics ED before.

5. Conclusion

In this chapter, the formulated research questions to fulfill the specific objectives are answered, thus allowing to arrive to some main conclusions. Limitations to the present investigation are also presented, as well as some recommendations for further investigation.

5.2. Answer to Research Questions

Q1. *What is the customers' perception about the service quality provided by the obstetrics ED?*

The results obtained on Overall PSQ (P23) show a mean score of 5,47 out of 7, reflecting that patients have a good impression of the global service quality. In general, the descriptive analysis suggests that patients' perception about the obstetrics ED in *Hospital de Faro* is positive, with the worst ranked question having an average score of 4,48 (P2).

The best PSQ related results regard to the staff's appearance and politeness (P3 and P16), to the unit being trustworthy (P7), and to the patients feeling safe when interacting with the professionals (P15). Besides patients' confidence in the service and its professionals, they consider that their ability to provide a prompt service at the promised time needs to be improved (P5, P8 and P11), as well as their capacity to give patients accurate information about when the service will be provided (P10). Physical facilities are also an aspect with space for improvement in the patients' perspective, being the aspect that achieved the worst rating (P2).

Q2. *What is the customers' perception about their HRQoL after the service provided by the obstetrics ED?*

Regarding patients' HRQoL, it is possible to observe that it has improved in every dimension of the EQ-5D-5L questionnaire after the visit to the ED. The Pain/Discomfort dimension is the one with the worst results, but also the one with the best improvement after the visit, where 73,8% of respondents presented some kind of pain or discomfort before entering the ED, with this value decreasing to 55,3% after the visit.

Self-Care and Usual Activities dimensions registered smaller improvements from the first to the second moment of the questionnaire, and although few patients had problems with self-care, many of them experienced difficulties performing their usual activities. The small improvement on these dimensions might be explained by the fact that the problems patients feel in their day-to-day are due to the pregnancy itself and the limitations it brings them.

The Mobility dimension shown moderate improvement after the ED visit, with patients' ability to walk around without problems increasing after being seen by the professionals, probably due to feeling less pain and to having their health problem taken care by a doctor.

The Anxiety/Depression dimension registers 37,9% of patients having feelings of anxiety or depression before the ED visit, and a decrease to 31,1% after it. This decrease might be explained by the relief patients feel after visiting the service, where their condition is evaluated and explained to them.

On the visual analogue scale, patients initially self-evaluated their general health state with 71,50 out of 100, improving to 81,21 on the second moment of evaluation. Thus, after the service provided by the obstetrics ED, patients showed that they felt quite good evaluating their HRQoL with a very positive score.

Q3. *Is there an association between the perceived service quality and HRQoL on the obstetrics ED?*

The previous chapter “Results” presents the findings on this matter, where the correlation coefficient for the variables measuring PSQ and HRQoL was calculated. The previously presented analysis provides valid support to the existence of a significant relationship between PSQ and HRQoL (both HRQoL Improvement and VAS Improvement), but not between Overall PSQ and HRQoL (both HRQoL Improvement and VAS Improvement).

Q4. *Are there any differences in the way service quality is perceived before and after the COVID-19 pandemic?*

The second qualitative data collection gathered patients’ perspective on the impact of the COVID-19 pandemics in the obstetrics ED service quality. Patients who have visited the service before and after the pandemic, including women who had given birth in the service before, considered that it had no impact in the quality of the service delivered, although they considered that the viral emergency might have caused some overwork on the professionals. Besides that, interviewees shared that they felt safe with the sanitary measures adopted and the professionals’ behavior regarding patients’ protection. Thus, based on the patients’ insight, the answer to research question 4 is that there is no relevant differences in the way patients perceive service quality before and after the COVID-19 pandemic.

Q5. *How can the service delivery be improved in the obstetrics ED to increase both HRQoL and perceived service quality?*

Considering the results obtained, it is possible to understand that the aspects with the most need for improvement on the ED under study are related to waiting times, availability of information for patients, and the physical facilities and equipment.

The problem of the long waiting times is well known in ED, and it is not an easy challenge to overcome. The limited resources that the service has at its disposal associated with the large affluence of patients, often lead to an overcrowd and increases waiting times. To surpass this problem, the hospital might have to invest in reinforcing its work force in order to better answer to the patient’s influx. Additionally, and to avoid the inappropriate visits to the ED, the hospital should have an important role in patients’ health literacy. Better educated patients can better interpret symptoms and its severity, and

therefore avoid improper ED visits. In Portugal, besides the hospital ED, there are local health centers (*centros de saúde*), to which people can resort in less severe cases, with a policy of open house for primary care for patients who experienced the symptoms in the last few days (Unidade de Saúde Familiar – Famílias, 2020), thus being able to avoid going to the ED. In cases where people do not know where to go, the telephone line SNS 24 can be a valuable resource to help patients understand the best procedure for their symptoms (SNS 24, 2022).

Concerning the lack of information available for patients, namely about waiting times, it is expected that in a service in which the flow of incoming patients varies indefinitely and therefore cannot be predicted, the waiting time can vary a lot. Thus, for the professionals it can be difficult to give accurate information about the time one might will have to wait to be seen by the health care professionals, being that a more severe case can appear at any time and need to be attended to more urgently. As professionals cannot control the waiting time variability, one measure that can help in the information available for patients might be a more regular update on the situation for patients in the waiting room, avoiding leaving them without any news regarding the waiting time status.

Finally, the current conditions of physical facilities and equipment are also a weak point of the obstetrics ED service. *Hospital de Faro* is an old building, as well as some of the medical equipment used by the healthcare professionals, and patients' perceptions of service quality suffer as a result. To overcome this problem, the hospital should consider investing in improvements to the building and in more modern equipment, capable of providing patients with more comfort and quality of care.

5.3. Limitations and future research

Despite the conclusions drawn, some limitations can be pointed out.

One of them is the limited scope of the investigation. The data collected is from one hospital (*Hospital de Faro*), and from one specific service – the obstetrics ED, so they are only valid in the scope of that sample and the obtained results cannot be extended to other hospitals in other regions.

Another limitation of this study is the reduced sample on the quantitative data collection, which might lead to a less real representation of reality. Thus, even though the sample is best possible, depending on factors like the patients' capacity and willingness to participate, the conclusions cannot be generalized to other obstetrics ED.

Finally, it is important to mention that the special situation experienced worldwide due to the COVID-19 pandemic may have had an impact on this study's outcome. The coronavirus emergency affected everyone's lives, not only physically and also mentally, with hard to measure consequences for society, including for all the professionals and patients of the service under study.

Regarding the recommendations for future research, and taking into account the mentioned limitations, the first is to increase the sample size, as well as extend the study to other hospitals in order to get a more accurate representation of reality. This would require a longer data collection period, as more resources and authorization from other hospitals' administration.

Another suggestion for the future is the evaluation of the healthcare professionals' perspective on service quality. The professionals' opinion can be an important input since they work in the service every day and know it better than anyone else. Thus, it would be possible to compare both perspectives and evaluate discrepancies and therefore improve the service delivery.

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Annex

Annex A – Semi-structured interview with the healthcare professionals

Semi-structured interview with the health professionals from the obstetrics ED in *Hospital de Faro*

My name is Sofia Gomes, and I am currently developing a master's thesis on HRQoL and PSQ by patients in this obstetrics emergency service, as part of the master's in Management of Services and Technology at ISCTE. The purpose of this interview is to get to know the service better from the professionals' perspective and thus adapt the questionnaire to be later applied to patients.

Aiming to evaluate the perceived service quality and quality of life of the service users, we will also collect data from them. The purpose is to understand how the characteristics of each woman may, or may not, impact the way they perceive the service and how their quality of life may also be affected. At this point, and based on the existing literature, the characteristics that will be studied are age, level of education, and living arrangement.

In addition to these, and in an intention to study new characteristics of the clients that may be relevant, the characteristics marital status, trimester of pregnancy, the existence of previous pregnancies (and problems that occurred during them) and the color with which patient was triaged are under consideration.

1- I would now like to know what your opinion is about these last-mentioned characteristics, whether you consider them relevant or not to how the service is perceived by the patients, and how they can impact their quality of life.

2- Can you think of any other characteristics that, based on your professional experience in this service, seem evident to you to have an impact on patients' health gains and how they perceive the quality of the service?

Regarding the study of the perceived service quality by patients, 5 dimensions will be studied - Tangibles, Reliability, Responsiveness, Assurance and Empathy.

3- Regarding perceived quality by patients on this service, do you consider that these dimensions are adequate?

4- Are there other aspects that you consider influencing the way clients perceive the quality of this service?

- Define interviewee profile (position held and antiquity in the service/sector)

Annex B - Questionnaire

Questionnaire

Dear patient,

This study aims to assess your perception regarding your health state at the time you are answering it, as well as your perception of service quality in this service. The data collected will be used later in an academic study for a master's thesis in Management of Services and Technology at ISCTE-IUL. All your answers are anonymous and confidential.

Thank you for your cooperation,

Sofia Gomes.

Group I – Patient Characterization

Please, mark your answer with an (x) in the option corresponding to your answer.

Age:

- | | | |
|---|---|---|
| ☐ 18 to 24 years-old | ☐ 35 to 44 years-old | ☐ 55 years-old or more |
| ☐ 25 to 34 years-old | ☐ 45 to 54 years-old | |

Residence:

- | | | | |
|--|---|------------------------------------|---------------------------------------|
| ☐ Faro | ☐ Tavira | ☐ Albufeira | ☐ Ourique |
| ☐ Olhão | ☐ Alcoutim | ☐ Silves | ☐ Castro Verde |
| ☐ Loulé | ☐ Castro Marim | ☐ Almodôvar | ☐ Odemira |
| ☐ S. Brás de Alportel | ☐ V.R.S. António | ☐ Mértola | ☐ Other: _____ |

Education:

- | | |
|---|---|
| ☐ Don't know how to read or write | ☐ Secondary Education (12 th year of Schooling) |
| ☐ 1 st Cycle of Basic Education (4 th year of Schooling) | ☐ Bachelor's degree |
| ☐ 2 nd Cycle of Basic Education (6 th year of Schooling) | ☐ Master's degree or higher |
| ☐ 3 rd Cycle of Basic Education (9 th year of Schooling) | |

Marital Status:

- | | |
|-----------------------------------|------------------------------------|
| ☐ Single | ☐ Widowed |
| ☐ Married | ☐ Separated |
| ☐ Divorced | |

Living Arrangement:

- | | |
|--------------------------------|---------------------------------------|
| ☐ Alone | ☐ With Someone |
|--------------------------------|---------------------------------------|

Trimester of Pregnancy:

☐ 1st Trimester ☐ 2nd Trimester ☐ 3rd Trimester

Out-of-hospital follow-up:

☐ Yes ☐ No

Chronic or pregnancy-related diseases:

☐ Yes ☐ No

Previous Pregnancies:

☐ None ☐ One ☐ Two ☐ Three or more

Triage Color:

☐ Blue ☐ Green ☐ Yellow ☐ Orange ☐ Red

Group II – Health Related Quality of Life

By placing an (x) in one box in each group below, please indicate which statements best describe your own health state today.

MOBILITY

- | | |
|---|--------------------------|
| I have no problems in walking around. | ☐ |
| I have slight problems in walking around. | ☐ |
| I have moderate problems in walking around. | ☐ |
| I have severe problems in walking around. | ☐ |
| I am unable to walk around. | ☐ |

SELF-CARE

- | | |
|---|--------------------------|
| I have no problems in washing or dressing myself. | ☐ |
| I have slight problems in washing or dressing myself. | ☐ |
| I have moderate problems in washing or dressing myself. | ☐ |
| I have severe problems in washing or dressing myself. | ☐ |
| I am unable to wash or dress myself. | ☐ |

USUAL ACTIVITIES (ex: work, study, housework, family or leisure activities)

- | | |
|--|--------------------------|
| I have no problems performing my usual activities. | ☐ |
| I have slight problems performing my usual activities. | ☐ |
| I have moderate problems performing my usual activities. | ☐ |
| I have severe problems performing my usual activities. | ☐ |
| I am unable to perform my usual activities. | ☐ |

PAIN/DISCOMFORT

- | | |
|-------------------------------------|--------------------------|
| I have no pain or discomfort. | ☐ |
| I have slight pain or discomfort. | ☐ |
| I have moderate pain or discomfort. | ☐ |
| I have severe pain or discomfort. | ☐ |
| I have extreme pain or discomfort. | ☐ |

ANXIETY/DEPRESSION

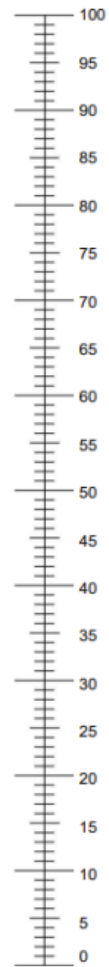
- | | |
|---------------------------------------|--------------------------|
| I am not anxious or depressed. | ☐ |
| I am slightly anxious or depressed. | ☐ |
| I am moderately anxious or depressed. | ☐ |
| I am severely anxious or depressed. | ☐ |
| I am extremely anxious or depressed. | ☐ |

Please indicate your health state today on the scale below, in your opinion.
Place an (x) in the point of the scale that represents your health state TODAY. After that, please write the number you marked on the scale in the box below.

- The scale is numbered from 0 to 100.
- 100 means the best health state you can imagine. 0 represents the worst health state you can imagine.

YOUR HEALTH STATE TODAY =

The best health state
you can imagine



The worst health state
you can imagine

Group III – Perceived Service Quality

Mark with an (x) the number that best describes your agreement level with each of the following statements, considering the scale that goes from 1 – “Totally Disagree” to 7 – “Totally Agree”.

Items		Scale						
		Totally Disagree					Totally Agree	
P1	This unit has up-to-date equipment	1	2	3	4	5	6	7
P2	The physical facilities are visually appealing	1	2	3	4	5	6	7
P3	The employees are well dressed and appear neat	1	2	3	4	5	6	7
P4	The appearance of the physical facilities is suitable for the type of services provided	1	2	3	4	5	6	7
P5	When this unit promises to do something by a certain time, it does so	1	2	3	4	5	6	7
P6	When you have a problem, the employees are sympathetic and reassuring	1	2	3	4	5	6	7
P7	This unit is trustworthy	1	2	3	4	5	6	7
P8	The employees provide the service at the time they promise to do so	1	2	3	4	5	6	7
P9	This unit keeps your records updated and without flaws	1	2	3	4	5	6	7
P10	This unit informs you exactly when the service will be provided	1	2	3	4	5	6	7
P11	The healthcare professionals of unit provide prompt service	1	2	3	4	5	6	7
P12	The healthcare professionals of this unit are always willing to help you	1	2	3	4	5	6	7
P13	The healthcare professionals of this unit are always available to answer promptly to your questions	1	2	3	4	5	6	7
P14	The behavior of the healthcare professionals in this unit inspires trust	1	2	3	4	5	6	7
P15	You feel safe when interacting with the healthcare professionals in this unit	1	2	3	4	5	6	7
P16	The healthcare professionals of this unit are polite	1	2	3	4	5	6	7
P17	The healthcare professionals have the technical support from the service to perform their tasks correctly	1	2	3	4	5	6	7
P18	This unit gives individual attention to each patient	1	2	3	4	5	6	7
P19	This unit gives personalized attention to each patient	1	2	3	4	5	6	7
P20	The healthcare professionals of this unit know the patient's needs	1	2	3	4	5	6	7
P21	This unit has the goal of answering to the patient's interests	1	2	3	4	5	6	7
P22	The healthcare professionals of this unit always try to minimize your discomfort and protect your privacy	1	2	3	4	5	6	7

Finally, answer the next question by marking an (x), given a scale where 1 represents “Very Weak” and 7 represents “Very High”.

Items		Scale						
		Very Weak						Very High
P23	How do you evaluate the overall quality of the obstetrics emergency service on <i>Hospital de Faro</i> ?	1	2	3	4	5	6	7

Thank you for your collaboration.

Annex C - Semi-structured interview with service's patients

Interview with patients from the obstetrics emergency department in *Hospital de Faro*

My name is Sofia Gomes, and I am currently developing a thesis on HRQoL and PSQ by patients in this obstetrics ED in the scope of the master's in Management of Services and Technology at ISCTE. The purpose of this interview is to understand which might be the reasons for a less positive assessment in some aspects related to the provision of care in this obstetric ED.

In order to assess the quality perceived by patients in this service, questionnaires were developed with patients of the obstetrics emergency service of this hospital. The idea now is to understand what might be the causes that justify some less positive evaluations. At this point, and based on the answers given, the aspects with the worst evaluations are the following: facilities and equipment; waiting time; and availability of information.

Do you agree that these aspects are less positive in this service?

If "yes":

In your opinion, what could be the reasons explaining less positive evaluations on the physical facilities and equipment?

What about waiting times?

What about the information provided by health professionals?

If "no":

What would then be the aspects to improve in this service, specifically aiming to improve the service dimensions we discussed above (facilities and equipment; waiting time; and availability of information)? Why?

Do you think that one of the reasons that could justify this inferior performance in these aspects (facilities and equipment, waiting time and availability of information) could be the pandemic of COVID-19?

(For example: it was not possible to adapt existing physical facilities to the pandemic control needs; the new pandemic control measures require more time from the professionals, which prevents them from dedicating to the tasks they were previously more available to perform)

- Define interviewee profile (age and previous visits/deliveries in this service)

Annex D –Independent variables analysis

Table D. 1 – Absolute and relative frequencies for the independent variables

Independent Variable		AF	RF (%)
Age	18-24 years old	18	17,5
	25-34 years old	54	52,4
	35-44 years old	31	30,1
	Total	103	100
Residence	Faro	26	25,2
	Olhão	17	16,5
	Loulé and São Brás de Alportel	34	33,0
	Tavira and Vila Real Santo António	12	11,7
	Albufeira and Silves	14	13,6
	Total	103	100
	9 th year of schooling or less	19	18,5
	12 th year of schooling	44	42,7
	Bachelor's degree	26	25,2
	Master's degree or higher	14	13,6
	Total	103	100
	Total	103	100
Marital Status	Single	66	64,1
	Married	37	35,9
	Total	103	100
Living Arrangement	Alone	6	5,8
	With Someone	97	94,2
	Total	103	100
Trimester of pregnancy	1 st trimester	37	35,9
	2 nd trimester	21	20,4
	3 rd trimester	45	43,7
	Total	103	100
Out-of-hospital follow-up	Yes	24	23,3
	No	79	76,7
	Total	103	100
Chronic or pregnancy-related diseases	Yes	11	10,7
	No	92	89,3
	Total	103	100

Previous Pregnancies	None	36	35,0
	One	38	36,9
	Two	16	15,5
	Three or more	13	12,6
	Total	103	100
Triage Color	Blue	9	8,7
	Green	35	34,0
	Yellow	47	45,6
	Orange	12	11,7
	Total	103	100

Table D. 2 – Dependent variables’ mean by age

	Age		
	18-24 years-old	25-34 years-old	35-44 years-old
	Mean	Mean	Mean
PSQ	0,155	-0,064	0,022
Overall PSQ	5,83	5,35	5,45
HRQoL Improvement	0,06	0,07	0,05
VAS Improvement	7,78	10,09	10,16

Table D. 3 - Dependent variables’ mean by residence

	Residence				
	Faro	Olhão	Loulé and S.B.Alportel	Tavira and V.R.S.António	Albufeira and Silves
	Mean	Mean	Mean	Mean	Mean
PSQ	-0,113	0,116	-0,032	0,342	-0,146
Overall PSQ	5,27	5,71	5,32	6,00	5,43
HRQoL Improvement	0,07	0,03	0,08	0,03	0,08
VAS Improvement	10,38	5,88	12,79	7,92	7,14

Table D. 4 - Dependent variables' mean by education

	Education		
	9th year of schooling or less	Bachelor's degree	Master's degree or higher
	Mean	Mean	Mean
PSQ	0,057	0,003	0,049
Overall PSQ	5,84	5,50	5,50
HRQoL Improvement	0,07	0,04	0,09
VAS Improvement	9,74	9,09	10,00

Table D. 5 - Dependent variables' mean by marital status

	Marital Status	
	Single or Divorced	Married
	Mean	Mean
PSQ	0,030	-0,054
Overall PSQ	5,47	5,46
HRQoL Improvement	0,06	0,06
VAS Improvement	7,80	13,11

Table D. 6 - Dependent variables' mean by living arrangement

	Living Arrangement	
	Alone	With Someone
	Mean	Mean
PSQ	0,220	-0,014
Overall PSQ	5,83	5,44
HRQoL Improvement	0,03	0,07
VAS Improvement	5,83	9,95

Table D. 7 - Dependent variables' mean by trimester of pregnancy

	Trimester of Pregnancy		
	1st Trimester	2nd Trimester	3rd Trimester
	Mean	Mean	Mean
PSQ	0,010	0,052	-0,032
Overall PSQ	5,68	5,38	5,33
HRQoL Improvement	0,09	0,06	0,05
VAS Improvement	10,00	12,86	8,00

Table D. 8 - Dependent variables' mean by out-of-hospital follow-up

	Out-of-Hospital Follow-up	
	Yes	No
	Mean	Mean
PSQ	-0,006	0,002
Overall PSQ	5,46	5,47
HRQoL Improvement	0,05	0,07
VAS Improvement	7,50	10,38

Table D. 9 - Dependent variables' mean by chronic and pregnancy-related diseases

	Chronic and Pregnancy-related Diseases	
	Yes	No
	Mean	Mean
PSQ	-0,060	0,007
Overall PSQ	5,27	5,49
HRQoL Improvement	0,10	0,06
VAS Improvement	10,00	9,67

Table D. 10 - Dependent variables' mean by previous pregnancies

	Previous Pregnancies			
	None	One	Two	Three or more
	Mean	Mean	Mean	Mean
PSQ	-0,014	0,065	0,027	-0,183
Overall PSQ	5,28	5,55	5,63	5,54
HRQoL Improvement	0,06	0,07	0,02	0,09
VAS Improvement	10,28	9,87	5,31	13,08

Table D. 11 - Dependent variables' mean by triage color

	Triage Color			
	Blue	Green	Yellow	Orange
	Mean	Mean	Mean	Mean
PSQ	-0,033	0,050	0,042	-0,284
Overall PSQ	5,33	5,37	5,70	4,92
HRQoL Improvement	0,00	0,04	0,09	0,08
VAS Improvement	3,89	8,00	11,49	12,08

Annex E – SERVPERF analysis

Table E. 1 – SERVPERF's dimensions' Cronbach's alpha if item removed

	Cronbach's alpha if item deleted
Tangibility	0,741
P1: This unit has up-to-date equipment	0,672
P2: The physical facilities are visually appealing	0,639
P3: The employees are well dressed and appear neat	0,779
P4: The appearance of the physical facilities is suitable for the type of services provided	0,598
Reliability	0,803
P5: When this unit promises to do something by a certain time, it does so	0,748
P6: When you have a problem, the employees are sympathetic and reassuring	0,782
P7: This unit is trustworthy	0,747
P8: The employees provide the service at the time they promise to do so	0,747
P9: This unit keeps your records updated and without flaws	0,797
Responsiveness	0,794
P10: This unit informs you exactly when the service will be provided	0,803
P11: The healthcare professionals of unit provide prompt service	0,765
P12: The healthcare professionals of this unit are always willing to help you	0,719
P13: The healthcare professionals of this unit are always available to answer promptly to your questions	0,689
Assurance	0,824
P14: The behavior of the healthcare professionals in this unit inspires trust	0,720
P15: You feel safe when interacting with the healthcare professionals in this unit	0,736
P16: The healthcare professionals of this unit are polite	0,737
P17: The healthcare professionals have the technical support from the service to perform their tasks correctly	0,895
Empathy	0,901
P18: This unit gives individual attention to each patient	0,882
P19: This unit gives personalized attention to each patient	0,879
P20: The healthcare professionals of this unit know the patient's needs	0,877
P21: This unit has the goal of answering to the patient's interests	0,875
P22: The healthcare professionals of this unit always try to minimize your discomfort and protect your privacy	0,885

Table E. 2 – SERVPERF's reliability if item deleted

	Cronbach's alpha if item deleted
Global Instrument	0,945
P1: This unit has up-to-date equipment	0,945
P2: The physical facilities are visually appealing	0,944
P3: The employees are well dressed and appear neat	0,943
P4: The appearance of the physical facilities is suitable for the type of services provided	0,945
P5: When this unit promises to do something by a certain time, it does so	0,943
P6: When you have a problem, the employees are sympathetic and reassuring	0,941
P7: This unit is trustworthy	0,942
P8: The employees provide the service at the time they promise to do so	0,943
P9: This unit keeps your records updated and without flaws	0,942
P10: This unit informs you exactly when the service will be provided	0,946
P11: The healthcare professionals of unit provide prompt service	0,943
P12: The healthcare professionals of this unit are always willing to help you	0,941
P13: The healthcare professionals of this unit are always available to answer promptly to your questions	0,940
P14: The behavior of the healthcare professionals in this unit inspires trust	0,941
P15: You feel safe when interacting with the healthcare professionals in this unit	0,941
P16: The healthcare professionals of this unit are polite	0,941
P17: The healthcare professionals have the technical support from the service to perform their tasks correctly	0,942
P18: This unit gives individual attention to each patient	0,941
P19: This unit gives personalized attention to each patient	0,941
P20: The healthcare professionals of this unit know the patient's needs	0,940
P21: This unit has the goal of answering to the patient's interests	0,940
P22: The healthcare professionals of this unit always try to minimize your discomfort and protect your privacy	0,941

Table E. 3 – SERVPERF's descriptive analysis

					Scale – RF (%)						
	Mean	SD	Min	Max	1	2	3	4	5	6	7
Tangibility	5,24	1,426	1	7							
P1: This unit has up-to-date equipment	4,82	1,412	1	7	1,9	2,9	12,6	21,4	30,1	17,5	13,6
P2: The physical facilities are visually appealing	4,48	1,434	1	7	2,9	5,8	14,6	24,3	32,0	10,7	9,7
P3: The employees are well dressed and appear neat	6,21	0,997	3	7	0	0	1,9	6,8	8,7	33,0	49,5
P4: The appearance of the physical facilities is suitable for the type of services provided	5,44	1,177	2	7	0	2,9	4,9	6,8	34,0	34,0	17,5
Reliability	5,51	1,444	1	7							
P5: When this unit promises to do something by a certain time, it does so	4,76	1,505	1	7	2,9	5,8	5,8	29,1	27,2	12,6	16,5
P6: When you have a problem, the employees are sympathetic and reassuring	5,80	1,263	1	7	1,9	0	4,9	3,9	21,4	35,0	33,0
P7: This unit is trustworthy	6,13	0,997	1	7	1,0	0	1,0	3,9	11,7	42,7	39,8
P8: The employees provide the service at the time they promise to do so	4,92	1,446	1	7	2,9	3,9	4,9	23,3	34,0	13,6	17,5
P9: This unit keeps your records updated and without flaws	5,96	1,407	1	7	2,9	1,9	1,0	5,8	13,6	28,2	46,6
Responsiveness	5,26	1,574	1	7							
P10: This unit informs you exactly when the service will be provided	4,5	1,743	1	7	7,8	2,9	16,5	26,2	13,6	16,5	16,5
P11: The healthcare professionals of unit provide prompt service	4,91	1,449	1	7	3,9	1,9	7,8	22,3	26,2	25,2	12,6
P12: The healthcare professionals of this unit are always willing to help you	5,79	1,384	1	7	3,9	1,0	1,0	6,8	13,6	41,7	32,0
P13: The healthcare professionals of this unit are always available to answer promptly to your questions	5,84	1,266	1	7	1,9	1,9	1,9	3,9	16,5	41,7	32,0
Assurance	5,87	1,247	1	7							
P14: The behavior of the healthcare professionals in this unit inspires trust	5,87	1,250	1	7	2,9	0	1,9	2,9	20,4	37,9	34,0
P15: You feel safe when interacting with the healthcare professionals in this unit	6,04	1,128	1	7	1,9	0	1,0	3,9	14,6	39,8	38,8

P16: The healthcare professionals of this unit are polite	6,09	1,253	1	7	2,9	0	1,0	3,9	12,6	33,0	46,6
P17: The healthcare professionals have the technical support from the service to perform their tasks correctly	5,48	1,275	2	7	0	2,9	4,9	9,7	33,0	23,3	26,2
Empathy	5,70	1,277	1	7							
P18: This unit gives individual attention to each patient	5,77	1,156	1	7	1,0	1,9	1,0	5,8	23,3	39,8	27,2
P19: This unit gives personalized attention to each patient	5,60	1,294	1	7	1,0	4,9	1,9	3,9	24,3	41,7	22,3
P20: The healthcare professionals of this unit know the patient's needs	5,56	1,348	1	7	3,9	1,0	2,9	1,9	30,1	37,9	22,3
P21: This unit has the goal of answering to the patient's interests	5,77	1,230	1	7	2,9	0	1,0	5,8	22,3	39,8	28,2
P22: The healthcare professionals of this unit always try to minimize your discomfort and protect your privacy	5,81	1,351	1	7	2,9	1,9	0	7,8	15,5	37,9	34,0
P23: How do you evaluate the overall quality of the obstetrics emergency service on Hospital de Faro?	5,47	1,187	1	7	1,9	1,9	1,0	7,8	33,0	38,8	15,5

Annex F – PCA dimensions Cronbach's alpha if item deleted

Table F. 1 – PCA dimensions Cronbach's alpha if item deleted

	Cronbach's alpha if item deleted
Dimension 1	0,946
Q6: When you have a problem, the employees are sympathetic and reassuring	0,936
Q13: The healthcare professionals of this unit are always available to answer promptly to your questions	0,933
Q12: The healthcare professionals of this unit are always willing to help you	0,935
Q16: The healthcare professionals of this unit are polite	0,938
Q22: The healthcare professionals of this unit always try to minimize your discomfort and protect your privacy	0,938
Q14: The behavior of the healthcare professionals in this unit inspires trust	0,937
Q20: The healthcare professionals of this unit know the patient's needs	0,943
Q7: This unit is trustworthy	0,947
Dimension 2	0,902
Q9: This unit keeps your records updated and without flaws	0,885
Q18: This unit gives individual attention to each patient	0,876
Q19: This unit gives personalized attention to each patient	0,885
Q21: This unit has the goal of answering to the patient's interests	0,873
Q3: The employees are well dressed and appear neat	0,901
Q15: You feel safe when interacting with the healthcare professionals in this unit	0,887
Dimension 3	0,779
Q4: The appearance of the physical facilities is suitable for the type of services provided	0,621
Q2: The physical facilities are visually appealing	0,702
Q1: This unit has up-to-date equipment	0,786
Dimension 4	0,827
Q8: The employees provide the service at the time they promise to do so	0,748
Q10: This unit informs you exactly when the service will be provided	0,808
Q5: When this unit promises to do something by a certain time, it does so	0,784
Q11: The healthcare professionals of unit provide prompt service	0,817
Q17: The healthcare professionals have the technical support from the service to perform their tasks correctly	0,804

Annex G - Absolute and relative frequencies for the EQ-5D-5L instrument

Table G. 1 – Absolute and Relative Frequencies for EQ-5D-5L instrument

Dimension	1 st moment		2 nd moment	
	AF	RF (%)	AF	RF (%)
Mobility				
I have no problems in walking around	82	79,6	89	86,4
I have slight problems in walking around	12	11,6	13	12,6
I have moderate problems in walking around	7	6,8	1	1,0
I have severe problems in walking around	2	1,9	0	0
I am unable to walk	0	0	0	0
Total	103	100	103	100
Self-Care				
I have no problems washing or dressing myself	95	92,2	95	92,2
I have slight problems washing or dressing myself	6	5,8	8	7,8
I have moderate problems washing or dressing myself	1	1,0	0	0
I have severe problems washing or dressing myself	1	1,0	0	0
I am unable to wash or dress myself	0	0	0	0
Total	103	100	103	100
Usual Activities				
I have no problems performing my usual activities	63	61,2	68	66,0
I have slight problems performing my usual activities	23	22,3	29	28,2
I have moderate problems performing my usual activities	13	12,6	5	4,9
I have severe problems performing my usual activities	3	2,9	1	1,0
I am unable perform my usual activities	1	1,0	0	0
Total	103	100	103	100
Pain/Discomfort				
I have no pain or discomfort	27	26,2	46	44,7
I feel slight pain or discomfort	41	39,8	52	50,5
I feel moderate pain or discomfort	26	25,2	5	4,9
I feel severe pain or discomfort	6	5,8	0	0
I feel extreme pain or discomfort	3	2,9	0	0
Total	103	100	103	100

Anxiety/Depression				
I do not feel anxious or depressed	64	62,1	71	68,9
I feel slightly anxious or depressed	32	31,1	25	24,3
I feel moderately anxious or depressed	4	3,9	4	3,9
I feel severely anxious or depressed	2	1,9	2	1,9
I feel extremely anxious or depressed	1	1,0	1	1,0
Total	103	100	103	100