Quality in health care: A systematic literature review applied to hospital care

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Thesis to obtain the Master of Science Degree in

Industrial Engineering and Management

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November 2022

Acknowledgments

Antes de mais quero agradecer aos meus orientadores Prof. Ana Sara Silva Rodrigues da Costa e Prof. Diogo Filipe da Cunha Ferreira por todo o apoio e suporte dado ao longo desta dissertação.

Gostava também de agradecer aos meus pais porque sem o seu esforço e dedicação certamente que nao conseguiria ter tido esta oportunidade. Obrigada pelo carinho, pela paciência, pela compreensão, por nunca duvidarem das minhas capacidades e especialmente pelo apoio dado. Vou guardar para sempre uma frase que me faz acreditar que sou capaz "As dificuldades nao são um obstáculo mas sim um desafio".

Quero dar um agradecimento especial aos meus avós por me terem dado toda força do mundo para completar esta fase. Foram vocês que me fizeram acreditar e foi por vocês que lutei para que conseguisse acabar este curso em 5 anos! Tenho a certeza que vos deixei muito orgulhosos.

Quero também agradecer ao meu namorado por me ter dado todo o apoio moral possível e imaginário, pelas horas perdidas a explicar-me matéria, pelos passeios e principalmente por ter sido um pilar e ter feito destes 5 anos um pouco mais fácies.

Por fim e não menos importante, gostava também de agradecer aos meus amigos pelo apoio e por me terem ajudado a crescer enquanto pessoa. Obrigada por terem estado sempre comigo nos bons e maus momentos da minha vida. Obrigada à Mariana Calado, pela comprensão, pelas tardes de estudo, pelos cafés e todos os apoios morais dados desde o 7ºano. Obriagda à Sara, à Guida, à Carolina, ao Tomás e ao Marcelo que desde o 11º ainda não se cansaram de mim e que os tenho no meu coração.

Para todos vocês - Obrigada.

Abstract

Since the begging of humankind, several authors have tried to define and quantify health care quality. However, there is no consensus since there are multiple perspectives and different social-economic situations. A few articles were found regarding this matter, but most are outdated or focus on different topics such as types of hospitals, technologies, services, etc.

Considering this, a literature review was done using the PRISMA methodology, to understand how authors quantify hospital quality and fulfill the current literature gap. More than 32 thousand articles were found, but only 66 were selected and posteriorly analyzed. This data provided a better understanding of the trends between dimensions, measures and surveys used, and the correlations between the most used dimensions in each country, the way health care is financed, and the development of each country. Analyzing the articles showed a clear interest in quantifying quality based on the services, especially using the SERVQUAL framework. In addition, a total of 50 different dimensions and 650 measures were found in the articles, however, just a few had a high rate of use. Finally, another conclusion is the necessity of different dimensions depending on the country's development, which does not happen when considering how health care is financed.

The main conclusions demonstrate the difficulty of a general acceptance of what quality in health care should be. The first step should be to uniformize the existing dimensions and measures since some are very similar, and most of them can cause some overwhelm.

Keywords

Resumo

Desde os primórdios da humanidade, diversos autores têm tentado definir e quantificar a qualidade da saúde. No entanto, não existe nenhum consenso, pois existem múltiplas perspetivas e situações socioeconómicas. Foram encontrados poucos artigos sobre o tema, mas a maioria está desatualizada ou foca-se em temas específicos como tipos de hospitais, tecnologias, serviços, etc. Diante disso, foi feita uma revisão literária utilizando a metodologia PRISMA, para entender como os autores quantificam a qualidade hospitalar e preenchem a lacuna existente na literatura. Mais de 32 mil artigos foram encontrados, mas apenas 66 foram selecionados e analisados. Esses dados permitiram uma melhor compreensão das tendências entre as dimensões, medidas e pesquisas utilizadas, e as correlações entre as dimensões mais utilizadas em cada país, a forma como os cuidados de saúde são financiados e o desenvolvimento de cada país. A análise dos artigos mostrou um claro interesse em quantificar a qualidade com base nos serviços, principalmente usando o framework SERVQUAL. Foi encontrado um total de 50 dimensões diferentes e 650 medidas nos artigos, porém, a frequência de utilização é reduzida. Por fim, outra conclusão é a necessidade de diferentes dimensões dependendo do desenvolvimento do país, o que não acontece quando se considera a forma como a saúde é financiada. As principais conclusões demonstram a dificuldade de uma aceitação geral do que deve ser a qualidade na assistência à saúde. O primeiro passo deve ser uniformizar as dimensões e medidas existentes, pois algumas são muito semelhantes, e a maioria delas pode causar alguma complexidade.

Palavras Chave

Qualidade hospitalar, Saúde, Revisão literária, PRISMA, Meta-analysis.

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Acronyms

ACS   American College of Surgeons

EC   European Commission

GDP   Gross Domestic Product

HCQI   Health Care Quality Indicator

IOM   Institute of Medicine

JCAHO   Joint Commission on Accreditation of Hospitals

OCDE   Organisation for Economic Co-operation and Development

PRISMA   Preferred Reporting Items for writing Systematic reviews and Meta-Analyses

PRO-ADESS   Projeto de Avaliação do Desempenho do Sistema de Saúde Brasileiro

QUOROM   Quality of Reporting of Meta-analyses

RCTs   Randomized Controlled Trials

SDGs   Sustainable Development Goals

UNGA   United Nation General Assembly

WHO   World Health Organization

1

Introduction

Contents

This chapter aims to briefly contextualize the problem experienced and how it will be handled throughout this dissertation. In addition, a brief explanation of how the document is organized will be presented to make it easier to keep on.

1.1 Purpose

Over the years, health care has become more present nowadays mainly due to the tremendous impact observed in people's lives. It is proven that there is a direct proportionality between health care innovation and the increasing average life expectancy of the population (President United States and Council of Economic Advisers, 2008). An enthusiastic example that exposed the importance of health care quality occurred during the Crimea war in 1854, where with expertise and technological advances, the quality in health care improved visibly. It is proven that with these implementations, the death ratio related to cholera and diarrhea reduced from 42,7% to 2.2%. Bearing this in mind, governments are becoming more aware of the importance of improving health since they believe it is crucial to have a more sustainable long-term development of the economy and societies. Thus they are raising their efforts to increase human health, affordability of access, and the quality in health care provided (Gurría, 2008).

Although there is countless awareness regarding the importance of this topic, just a few decisive and critical developments have been made in this area of study. Various organizations and individuals have tried to define and quantify quality in health care, however, it is a very complex process, and many opinions misalign with each other. These conflicts make this whole process uncertain, and the existence of a universally accepted definition is far from being consider.

This complexity arises mainly from a critical factor: each individual/organization has different visions and objectives of what hospital quality should be. This idea can be corroborated by Nylenna et al. (2015), Kapoor (2011), and Piligrimienė and Buciuniene (2008), as they define the existence of three different perspectives, namely the perspective of the patient, health professionals, and hospital managers. Although there are some similarities between them, there are clearly topics that are opposites from each other. We have the case of patients who are more focused on their well-being and getting the best treatments possible, while on the opposite side, we have managers who are more focused on the economic sustainability of the hospital itself. In addition of the existence of different perspectives, the complexity increases when considering different dimensions that aim to help define/quantify quality. These dimensions increase the complexity of the process, since there are a panoply of dimensions that are similar and each author uses what they think makes the most sense in the situation.

With this in mind, despite the efforts made, the difficulty in defining and quantifying quality in health care is evident. This problem needs to be solved since there are many issues found. A problematic situation is that many authors try to understand the impact that some decisions/ technology bring to

health care, and what is observed is a severe inconsistency in the dimensions considered to calculate it. This can be dangerous since it able to have deviations in the results observed according to the authors' personal interests.AL-Ahmadi and Roland (2005), Aljuaid et al. (2016), Conry et al. (2012), Simou et al. (2015), Vos et al. (2009), Hussey et al. (2009) support the creation of a comprehensive framework to universally compare situations and countries, monitor results, easily track progress, help implement the best strategies and help improve patients' health.

1.2 Objectives

As mentioned, making a universal formula to quantify health care quality would be a significant step since it will bring many benefits to the general population and facilitate many decisions making. However, we are far from achieving this goal.

After a long research, it was noted that there is a lack of literature regarding the measurements of quality in health care hospitals. The articles published related to this topic are outdated and do not express the needs and interests of today. Furthermore, it is essential to mention that, nowadays, more and more authors are interested in this topic. However, they are deviating and converging into more specific ones, concentrating more on hospital departments, diseases, levels of each hospital, etc. Even though the challenge of defining and quantifying quality seems to be already solved as authors are already specifying this topic, the bases are permanently misaligned, making it a universal problem that should be studied as soon as possible. Beyond this problem, Machado et al. (2013) and Simou et al. (2015) also mentioned that creating a universally accepted framework is a challenge since it depends on the scope and motivation of health professionals, the challenges of the data sources used, the increase in the amount of performance indicators, and methodological concerns.

That said, this dissertation is critical to understand what has already been done to bring some clarity to the topic. The objective is to fill the literature gap, taking a break and trying to understand everything that has already been done and organizing the ideas of each one of them. In other words, this dissertation aims to collect all articles that try to quantify hospital quality and do a literature review about it. This helps understand which measures/dimensions authors use and understand if there are correlations with other factors, such as the countries that have more interest in this topic, the type of financing the health care, the development of the country as the surveys used, and so on.

It is also fundamental to clarify the two main questions of this dissertation: 1) what are the dimensions and measures most used by authors to quantify quality? 2) Is there any consensus regarding the dimensions/ measures used? Besides these questions, one hypothesis that needs to be validated that some authors corroborate is the existence of any correlation between the dimensions used and the socio-economic situation of a country.

In conclusion, the first step of this dissertation is to contextualize what has been done regarding this topic and understand if exists any gap in the literature. Then, after realizing the nonexistence of literature reviews about this matter, it is necessary to describe what is a systematic review, the PRISMA methodology, the search strategies, and the inclusion criteria of the study. For this literature review, the PRISMA method was chosen since it is a widely used tool by authors, as it is accurate and transparent. With all these characteristics, using PRISMA methodology can lead to a higher quality study and be easier to publish. After all the articles selected and with the data sorted, an analysis needed to be done using Microsoft Excel. After all the analysis, the main conclusions of the research are shown, followed by the study limitations and future research.

1.3 Structure

Chapter 2 - Focused on giving the contextualization and description of what quality in health care is:

Chapter 2.1 - Aims to show in chronological order the progress that quality in health care has had and its central historical moments;

Chapter 2.2 – Mentions the different perspectives that health care can have;

Chapter 2.3 – Shows which dimensions are most recognized by organizations;

Chapter 2.4 – Analyzes the possibility of having a universal method to measure quality in health care.

Chapter 3- Presenting and understanding what already exists concerning quality in hospital care:

Chapter 3.1 - How the search was conducted;

Chapter 3.2 - Reviews related to hospital quality;

Chapter 3.3 – Reviews related to quality indicators/measures;

Chapter 3.4 - Reviews related to technology;

Chapter 3.5 - Reviews related to burnout of health care professionals;

Chapter 3.6 - Reviews related to the impact of optimization methodologies;

Chapter 3.7 – Conclusions of this chapter.

Chapter 4 - Describes what is a systematic review, the PRISMA method, the search strategies, and the inclusion criteria of the study:

Chapter 4.1 - Contextualization of literature and systematic review and description of the steps to do it;

Chapter 4.2 - Contextualization and the history behind PRISMA methodology. Description of the tools available in this methodology, such as the 27-item checklist, the flow diagram, and extensions already available;

Chapter 4.3 - Search strategy and inclusion criteria for the PRISMA methodology.

Chapter 5- Analysis of all the articles that pass the PRISMA methodology.

Chapter 5.1 - Gives an overview of the articles, as a statistical overview regarding the samples, number of dimensions/ measures, years published, countries that have publications, surveys and methodologies used, and a list of all the measures and dimensions found in all the articles.

Chapter 5.2 – Tries to understand some correlations between the dimensions used during the years and the type of economy of the countries or the type of financial health system.

Chapter 6- Main conclusions of the research, followed by the study limitations and future research.

Chapter 6.1 – Conclusions of all the analyses done in the previous chapter;

Chapter 6.2 – Presents all the limitations that occurred during the study;

Chapter 6.3 – Indicates the future research and the focus that should be take.

2

Quality in health care

Contents

2.1   Contextualization of quality in health care

Since we started to comprehend the history of humanity and how our ancestors lived, several events have become recurrent, including wars, deadly diseases, and a lack of hygienic conditions. With this events in mind, just in the past century, some advances and innovations have arisen and started to develop awareness about the importance of health care quality. During this subchapter, some relevant events will be presented chronologically concerning the evolution of this theme, which is summarized in Table 2.1. Nevertheless, Sheingold and Hahn (2014) strengthens the idea that it is crucial to recognize that the history of quality in health care prior to 1960 is a fragmented time chronology with unrelated events rather than a clean and organized timeline.

Rodkey and Itani (2009) once wrote that the first documented attempt to define quality in health care was written in 1700 B.C. in King Hammurabi's Code. History.com Editors (2022) defines this code as a set of 282 rules that established standards for commercial interactions and set fines and punishments to meet the requirements of justice:

"218. If a physician performed a major operation on a seignior with a bronze lancet and has caused the seignior's death, or he opened the eye-socket (nakkaptu) of a seignior and has destroyed the seignior's eye, they shall cut off his hand" (Prioreschi, 1996).

This first attempt at defining health care quality was based on the death of the patients and their side effects, not considering the patient conditions, which objectively obfuscates the evaluation of quality in health care (Rodkey & Itani, 2009).

After this attempt, it was only in the 19th century onwards that people realized how important quality in health care is to save people's lives, and several events related to it started to appear. One of the first events that may have raised the concern about quality in health care was with Dr. Ignaz Philip Semmelweis when in 1847, he was given a 2-year appointment as an assistant in obstetrics. He noticed that using a solution based on chlorinated lime instead of just using water and soap drastically reduced the mortality rate of women giving birth and the spread of diseases (Neville, 2003).

After this date, some wars began worldwide, creating some developments in this matter. According to Sheingold and Hahn (2014), Cantiello et al. (2016) and Chun and Bafford (2014), when British troops were fighting in Crimea in 1854, the government sent some nurses to the field to help the soldiers. With some expertise and advances such as ventilation and disinfection, the death rate from cholera and diarrhea dropped from 42.7% to 2.2%. This significant drop in death rates made it realize that with minor changes, people's lives can be saved, and life expectancy can be increased. A special nurse called Florence Nightingale reported all those improvements during the war representing a critical present-day statistical quality measurement. On top of that, Sheingold and Hahn (2014) also commented another vital moment that occurred in 1861 when the American civil war started, leading to the foundation of the Sanitary Commission. This commission was created to transmit all the insights of good practices of the

Crimean war by focusing on the inspection of the conditions in hospitals, the diet of the patients, and so on. The foundation made a significant impact since it was considered critical to the war's success.

Saveleva et al. (1976) recognized that until now, all the approaches are not conceptualizations of what health care is. However, we can see the growth of efforts to assure that patients are treated correctly, improving quality in health care.

From 1900 onwards, significant figures played a central role and greatly contributed to this matter. According to Hines et al. (2020), Schiavo (2021), Saveleva et al. (1976) and Flexner (2002), in 1910, Abraham Flexner published a report to the Carnegie Foundation, where he visited 155 medical schools to see if they were delivering good training to future physicians. The result of the report described a poor organization of major schools and hospitals and a need for improving their methods. He also defends that the United States should focus on creating excellent professionals, even though they are few, then creating many doctors, regardless of their quality.

Chun and Bafford (2014), Harolds (2015), Rodkey and Itani (2009), Hines et al. (2020) and J. R. Wright (2017) agrees that Ernest Amory Codman is one of the most vital figures in this matter, who they consider to be the founder of the contemporary health care quality movement. The first important action he took was between 1900-1910, when he created a method called "End Result Idea" (Donabedian, 1989). Chun and Bafford (2014) and (Donabedian, 1989) explains that this method is based on following up patients regarding their demography, diagnoses, treatments, and outcomes in order to understand why treatments were unsuccessful and improve the care of patients.

In 1913, Ernest Codman and the gynecologist Edward Martin founded the association of American College of Surgeons (ACS) Chun and Bafford (2014). During the years, the association started to have more influence, and in 1918 they established a hospital standardization program to maintain minimum quality standards during surgical procedures (J. R. Wright, 2017). This program was based on the "End Result Idea," and the goal was to have the result of every procedure available to be posteriorly investigated (Donabedian, 1989). James S. Roberts et al. (1987) put in evidence the five standards that in summarizing are: 1) Need of hospital organization concerning the staff; 2) Only physicians and surgeons with graduation, licenses, competence, and ethics should be approved; 3) The staff needs to create rules, regulations, and policies with the help of the administration board of the hospital; 4) Every patient should have their hospital record, and it should be accessible; 5) Have facilities available to study, diagnose and treat patients.

Hines et al. (2020) showed that the number of hospitals, nonsurgical specialties, and complexity of health care continued to grow, and ACS could not handle the amount of financing required to support quality in the hospitals. For that reason, in 1952, the non-profit association Joint Commission on Accreditation of Hospitals (JCAHO) was constituted by ACS , American Hospital Association, American Medical Association, and briefly the Canadian Medical Association. However, J. R. Wright (2017) explains that

even though it was a fantastic idea to improve the quality of health care, many hospitals accommodated and were satisfied with having the minimum standards instead of wanting to improve it even more.

According to Rodkey and Itani (2009), the second greatest figure of the 20th century regarding the quality in health care is Dr. Avedis Donabedian, who dedicated his life studying health care. After years of studying and teaching, Donabedian wrote a paper called "Evaluating the Quality of Medical Care", where he tried to create a framework to examine health care in three domains: structure, process, and outcome (Donabedian, 1966). Besides having some errors, it continues to be widely accepted nowadays (Harolds, 2015). This framework will be approached in more detail in the Section 2.4, and the main focus is measuring the quality in health care. Besides that, in 1990, he published what he believed the concept of quality in health care could be, where he grouped this concept into seven headings described as seven pillars in medicine: efficacy, efficiency, optimality, acceptability, legitimacy, equity, and cost (Donabedian, 1990).

In 1970 the Institute of Medicine (IOM) was founded in the US to accessorize the government regarding all the social, economic, and political aspects of health. The institute published over 50 well-vetted reports and having a goal of having better coordination regarding the quality that is given to the population (Hines et al., 2020). Although some advances were made, the technology at that time was not involved compared to other industries.

Havens and Boroughs (2000) and (Kohn et al., 2000) affirms that in December of 1999, IOM published a report called "To err is human", where they estimate that nearly 44,000 to 100,000 people die annually due to medical errors. Furthermore based on World Health Organization (2020) and Busse et al. (2019), over the years, several renowned institutions have been formed. The first one is the World Health Organization (WHO), which the main objective is to give the best possible quality level of health to the population. Secondly, it was created the European Commission (EC), which recognizes quality as an essential component of health system performance. And finally, the United Nation General Assembly (UNGA) that creates the Sustainable Development Goals (SDGs). These SDGs pay attention to quality by saying that it is imperative to create a universal health care service, giving the population quality and access to health care services, financial risk protection, and access to safe and affordable equipment and medications.

Table 2.2 briefly summarizes definitions that were published over the years from 1980 with Donabedian to 2018 with the WHO.

As can be concluded, over the years, the quality in health care has been increasingly studied, and various individuals/ organizations are trying to define and quantify it. It has not been an easy process since several conflicts arise, reflecting the inexistence of a definition that is universally accepted.

Table 2.1: *Summary of principal events adapted from Sheingold and Hahn (2014)*

Year	Events	Individuals and / or organizations	Country of origin
1700 B.C.	First attempt to define quality in the health care	Babylonian king Hammurabi	
1847	Antiseptics	Ignaz Semmelweis	Hungary
1854	Report of quality improvement	Florence Nightingale	England
1900-1910	Follow up patients to ensure treatments were effective	Ernest Codman	
1910	Improvement of scientific methods and strengthening validity of medical licensure	Abraham Flexner	USA
1918	Program to maintain the minimum quality during surgical procedures	American College of Surgeons	USA
1945	Foundation of United Nations General Assembly	51 countries from all geographic areas of the world (UK, USA, Australia, Brazil, Russian Federation, etc.)	UK
1948	Foundation of WHO	UNGA members	Switzerland
1952	Foundation of the Joint Commission on Accreditation of Hospitals	ACS, American Hospital Association, American Medical Association, and Canadian Medical Association	USA
1966	Framework to measure quality in health care	Avedis Donabedian	USA
1970	Foundation of Institute of Medicine	National Academy of Sciences	USA
1990	7 Pillars of Quality	Avedis Donabedian	USA

Table 2.2: *Health care definitions adapted from Nylenna et al. (2015) and Legido-Quigley and European Observatory on Health Systems and Policies (2008)*

Authors	Definition
(Donabedian, 1980)	"(...) the application of medical science and technology in a manner that maximises its benefit to health without correspondingly increasing the risk"
(Steffen, 1988)	"Accordingly, quality medical care is the capacity of the elements of that care to achieve legitimate medical and nonmedical goals."
(Lohr, 1990)	"(...) the degree to wich health care services for individuas and populations increase the likelihood of desired outcomes and are consistent with current professional knowledge"
(Ovretveit, 1992)	"Provision of care that exceeds patient expectations and achieves the highest possible clinical outcomes with the resources available"
(World Health Organization, 2000)	"Quality of care is the level of attainment of health systems' intrinsic goals for health improvement and responsiveness to legitimate expectations of the population"

2.2 Perspectives

As is shown in Section 2.1, several organizations and individuals tried to define what quality in health care is. Nevertheless, they all present criteria that may have different weights depending on the existing perspectives. In this subchapter, we will address the different existing perspectives and what each one values the most. Additionally, the perspectives that will be addressed are practically accepted by all authors. Having that said, there are three different perspectives according to Kapoor (2011), Nylenna et al. (2015) and Piligrimienė and Buciuniene (2008):

- Patients and their relatives;

- Health care professionals;

- Health care managers.

On top of that, Nylenna et al. (2015) wrote that it is fundamental to notice that each perspective can be applied to each level of care, and each perspective is related to roles and stakeholders.

Concerning what patient values, Kapoor (2011) claims that this point of view is critical to make changes regarding what is provided and how. This believes surge since they are the only source of information able to expose if treatments are being done with respect and dignity. They also state that patients will tend to value the accessibility delivered, affordability of health care, and how they are treated. Piligrimienė and Buciuniene (2008) highlights that patients also recognize quality regarding the results – recovery, mortality, and functional status.

When it comes to health care professionals, Blumenthal (1996) and Donabedian (1988) mention that the most valued characteristics are the results of care provided, the technical excellence (doing the right

thing right and the interactions between the provider and the patient), the existence of trust between them and the patients, good communication, and the possibility to treat patients with dignity, privacy, honesty, empathy, tact, and sensitivity.

Finally, Nylenna et al. (2015) recognized that managers are more concerned about allocating resources, having more efficiency, and increasing the sustainability of education, the economy, and research.

Piligrimienė and Buciuniene (2008) made an interesting comment saying that managers and patients may have more similarities since they focus more on functionality attributes, unlike professionals who focus on technical attributes. As we can conclude, different attributes are valued and prioritized for each perspective, making the standardization process complex and questionable for many.

2.3 Dimensions

In addition of having several perspectives of what health care quality should be, it is noted that for each definition, several dimensions are brought up. The main issue with the dimensions is the fact that there is not an universal selection of what should be considered, and authors choose what they think are the most important ones. This issues happen because knowing which dimensions should be chosen becomes complicated as they depend on the definition chosen, the perspective, and the time this issue is brought up. Suppose we are in a situation of calamity. In that case, it is expected that an important topic will be the accessibility of health care, as opposed to a situation where health care is practically taken for granted. As a result, several characteristics or attributes are brought up, leading to an extensive list of dimensions - some of them can be quantified, and others are unmeasurable- leading to enormous complexity.

Despite all these obstacles, some individuals/organizations have taken a step forward to clarify this issue. This topic began to be addressed by Donabedian (1990) when in 1990, he published a list of seven well-known pillars that he considered important:

- Efficacy - Improvement of health care with the ability of science and art of health care;

- Effectiveness - Improvement of health care based on ordinary circumstances;

- Efficiency - Improvement of health care with less possible cost;

- Optimality - Validation of the effects based on a balance between costs and benefits;

- Acceptability - Adaptability of care based on the wishes of patients, have a patient-centered relationship, great access to obtain care, and observe the cost preferences of patients;

- Legitimacy - Concern the acceptability of individuals and the welfare of the community;

- Equity - Fairness between the care given to the individual and the benefits among the society.

After this publication, the seven pillars of Donabedian became a reference, and new publications from various authors and organizations were followed with different ideals/dimensions of their perspective of what would be the best way to describe quality. Table 2.3 gives us an overview of some of those visions, especially by some well-known organizations, and what they believe should be the dimensions to consider.

After the IOM published "To err is human", Medicine and America (2001) mentioned that this report had a significant impact on the media, the population, and medical personnel since it brought some awareness regarding how medical error is a chronic threat to public health. After two years, in 2001, IOM published a report called "Crossing the Quality Charms" in response to "To Err is Human", proposing six components to improve health care: Safe, patient-centered, timely, efficient, and equitable (Berwick, 2002) and (Medicine & America, 2001). Busse et al. (2019) strengthnes the idea that although many organizations have adopted these components as quality dimensions, the IOM has defined them as "performance expectations". Five years later, WHO tried to adapt these principles as quality dimensions however, it contributed to more entropy between quality versus performance.

In 2006, Organisation for Economic Co-operation and Development (OCDE) published a framework called the Health Care Quality Indicator (HCQI) that uses a developed set of common indicators and comparable data to be able to compare the quality in health care across countries and raise questions to further investigation (Kelley & Hurst, 2006), (Arah et al., 2006) and (OCDE, 2021). The three dimensions selected were safety, effectiveness, and patient-centeredness (OCDE, 2021). Arah et al. (2006) and Kelley and Hurst (2006) also highlight that this framework refers two crucial points where the first one the outcomes are not statical and will vary between the preferences of the individuals, and the second point refers that exists factors can not be controlled by the patient and the provider organization and will affect the outcome of health. Thus, they report that only these three dimensions contribute directly to the increasing likelihood of desired outcomes (Busse et al., 2019).

Then, as seen in Table 2.3, several proposals were presented over time, and specific dimensions are starting to become recurrent such as efficiency, equity, patient-center, safety, and effectiveness. However, some of them can be considered health system performance, which makes this process even more complicated to define as there is a fine line between quality and performance (Busse et al., 2019).

In addition, another problem is the fact that there are a huge amount of different dimensions, and they can have different values for each organization. Finally, Nylenna et al. (2015) stated that Donabedian made an interesting comment saying there is no correct answer about which dimensions to consider since it depends on the definition chosen to define quality, the dimensions that have a relevant impact, and how they are going to be operationalized.

Table 2.3: *Dimensions in each definition adapted from Busse et al. (2019)*

	Donabedian (1980)	Medicine et al. (1990)	Europe and Ministers (1998)	Medicine and America (2001)	World Health Organization (2006)	European Comission et al. (2014)	World Health Organization (2015)	World Health Organization (2018)
Effectiveness		X	X	X	X	X	X	X
Safety			X	X	X	X	X	X
Responsiveness			X	Patient-centredness	Patient-centredness	X	Patient-centredness	Patient-centredness
Acceptability					X			
Appropriateness			X					
Continuity								
Timeliness				X			X	X
Satisfaction		X	X					
Health improvement		X	X					
Efficiency			X		X	X	X	X
Access			X		X			
Equity				X	X	X	X	X
Other	Patient Welfare		Assessment of care process			Patient's preferences	Integration	Integration

2.4 Measures

One of the biggest questions related to quality in health care is how we can measure and quantify it. This is a very important topic since several advantages can be brought up if we could solve this issue. These topics are:

- Comparisons can be made - whether between hospitals, countries, and so on;

- Possibility to understand if development was made over the years leading to an improvement in quality;

- Ables regulation, accreditation, supervision, and report of what is being done;

- Implement the best tactics or strategies in the service;

- Better allocation of funds or investments;

- Comprehend what services need to be reevaluated.

It is essential to use indicators while quantifying quality in health care because according to the Cambridge Dictionary, it shows how the situation is like in the present or how it is changing over time. Scobie et al. (2006) defends that indicators should have a panoply of characteristics, such as being valid, reliable, accurate, timely, collectible, meaningful, relevant, and essential for the people who will use them. Besides that, the author defends that they can be quantified and qualitative since both of them have their own advantages and disadvantages and need to be completely clear about the meaning. Busse et al. (2019) recognize that each indicator should have a quality goal, a measurement concept (how to collect data and calculate the indicator), and an appraisal concept (why is the indicator useful to judge quality).

One of the main challenges in measuring quality is deciding which indicators need to be considered. These indicators depend on several factors, such as the different perspectives (mentioned in Section 2.2), the purpose of the study, the definition of quality chosen, the level of the health care system, etc. Regarding the different perspectives, each stakeholder has different purposes that are going to be now addressed. Nylenna et al. (2015) made a state that when we talk about health care managers, they should be more focused on efficacy. A good example is the allocation of funds to assure that they are being well assigned and know if patients are receiving good health care quality. For Health care professionals,Blumenthal (1996) states that they tend to give much importance to the results. For that reason, Nylenna et al. (2015) claims that they need indicators that allow them to understand which areas of health should be reviewed and the best methods to use for the best outcome. Finally, patients will focus more on their own experience, effectiveness, and safety (Nylenna et al., 2015) . This quantification will benefit the patients as this transparency allows them to make more conscious decisions and

have more realistic expectations. The problem with having three different perspectives is that they are complicated to integrate since some preferences collide between them.

Despite all these contradictions, Donabedian tried to classify the measures into three types: structure, process, and outcome. According to Adirim et al. (2017) , structural measures can tell if the organizational structure has sufficient resources and if they have a proper system.Rodkey and Itani (2009) complemented, saying that this category includes a certification of the providers and the adequacy of the facilities. Regarding the process measures, Derose and Petitti (2003) states that these measures are preferred by providers since it helps them to directly find the areas where improvements needed to be done. Adirim et al. (2017) also wrote that outcome measures are based on the effect of the treatments delivered and their results and have into consideration the patient's perspective. Hines et al. (2020) also mentioned in other words that this measure is important since it can help understand which intervention had success and should be implemented.

Finally, it is essential to mention that besides having these three types, none of them is more important than the other, having a non-hierarchy (Adirim et al., 2017) . Until 2019,Endeshaw (2020) highlights that five main models have been identified to measure the health care quality services/processes: Donabedian's model, SERVQUAL, HEALTHQUAL, PubHosQual, and HospitalQual.

The first model mentioned in this paper is Donabedian's model. In this model Donabedian's tried to create a linked sequence (structure-process-outcome) using the seven pillars already indicated in Section 2.2 (efficacy, effectiveness, efficiency, optimality, acceptability, legitimacy, and equity). Still, some suggested that this model was too simplistic, as Donabedian claimed it followed a linear sequence, which many do not agree with because each metric influences the other (Harolds, 2015).

In 1985 Parasuraman, Zeithaml and Berry created a non-medical model called SERVQUAL that pretended to determine the impact of five dimensions: reliability, assurance, tangibles, responsiveness, and empathy in the perceptions and expectations of the patients (Kalaja et al., 2016). This model contains 44 questions related to the five dimensions above, which is used a five-level format of the Likert scale (Jonkisz et al., 2021). Although this is a very known model, it was created to be used in several services. For that reason, it misses some dimensions regarding professional service quality, which has a key role in health care (Endeshaw, 2020).

Since this model was not implemented based on the health industry, Lee (2017) created HEALTHQUAL, claiming to be appropriate for modern health care services. Lee and Kim (2017) highlights that HEALTHQUAL has five factors: empathy, tangibles, safety, efficiency, and degree of improvements of care service.

Regarding the PubHosQual method, it was created specially to identify the strong and weak points of the services in public hospitals (Almomani et al., 2020).

Lastly, it is was published the HospitalQual model which is more useful for hospital administrators since it ables them to "monitor, control and improve the inpatient service quality" (Itumalla et al., 2014).

In addition to the five models mentioned, many others were created, and some of them are based on these five models. This array of methods occurs for several reasons, which may be due to the purpose of the research as well as the place where the research will be carried out. If methods are created in different environments to where they will be used, some things will fail. This way, since the realities are not homogeneous, it becomes almost impossible to have a universal method for all countries, services, etc.

3

Literature Review

Contents

This chapter is focused on presenting and understanding what already exists about the quality of hospital care. The main goal is to understand what has been already searched, the main gaps, the recommendations/questions of the authors, and what are the most common methods. This is a vital topic since it orients what needs to be done in the following chapters.

3.1 Search Strategy

In order to understand what has already been done, it was necessary to search several databases, choose keywords, types of articles, language, and so on. Many of the reviews found were related to particular topics, from the impact of quality in health care on specific diseases to the impact of technology.

For the search of these reviews, it was used Google Scholar, Science Direct, Europe PMC, and PubMed databases. The keywords chosen were "primary health care quality", "hospital health care quality", and "hospital quality assessment", all followed by "review" OR "dimensions review" OR "measures review" OR "technology review". Besides that, it was taken into consideration the rankings of the journals using the Scimago Journal & Country Rank, and the reviews selected needed to be in English and in Portuguese.

Since only a few reviews related to our topic were found, it was decided to widen the topics to have a better overview of the questions, types of reviews made, and future studies suggestions. Having all this information in consideration, this subchapter is going to be divided into the following topics:

- **Quality in hospital care** – Reviews related to the hospital quality and services;

- **Indicators/measures** – What type of indicators/measures have been more claimed;

- **Technology –** The impact of telemedicine/ telehealth and burnout –Implement the best tactics or strategies in the service;

- **Burnout** – The impact that burnouts of health care professionals have in the quality in health care in hospitals;

- **Lean/Six Sigma**- The impact of optimization methodologies in health care quality.

3.1.1 Quality in hospital care

The first subchapter is related to reviews about the quality in hospital care and is one of the sunchapters that most relates to the topic of this dissertation. A total of six reviews were found, and they are all synthesized in Table 3.1.

When we make a more superficial analysis, we realize that some relevant characteristics should be mentioned. The first characteristic that needs to be brought up is the fact that most of the reviews

are specific to one topic – or they are related to a country, to a university hospital that is different to a standardized hospital, or they are only focusing on hospital services. Besides that, the first half of the reviews have more than nine years old, and between 2016 and 2021 no reviews were published. The review that best fits the topic of this dissertation was published in 2012 and is related to health care services.

The review that provides the most significant impact is Conry et al. (2012), where they did a systematic review to understand the interventions made to improve the quality of care in hospitals, collecting articles over ten years (2000-2009). After analyzing the articles, they realized that several improvements were made in this matter, however, they did not follow a theoretical and universal acceptability analysis that allows them to identify the positions of the improvements along with a quality of care spectrum. Along with other authors, they suggest it is necessary to bring together all stakeholders who are directly or indirectly related to this topic, from hospital managers, patients and their families, policymakers, and academic researchers, because they believe that this way will create more effective, valuable and sustainable interventions as they can identify some unique requirements.

Unlike Conry et al. (2012), the remaining reviews correlate the quality of hospitals/services provided with countries, as is the case of Saudi Arabia, Brazil, Iran, and some European countries. All of the articles aim at improving health quality, however, only the Saudi Arabian reviews are the most complete ones since they take into consideration the three Donabedian factors - structure, process, and outcome, unlike Brazil, Iran, and Europe, that are more focused on the services/processes.

Two reviews of Saudi Arabia were found in 2005. The first one written by AL-Ahmadi and Roland (2005) is focused on improving primary health care based on two dimensions that they believed were the most important ones: Access and Effectiveness. Using this two dimensions, they discovered several aspects that needed to be improved. This way, an exhaustive list of problems was created from the lack of communication between patients and doctors, decreased staff morale to the lack of effective leadership. The author also pointed out that there is no integral and coordinated strategy to implement a comprehensive quality assessment to improve primary health care. Eleven years later, Aljuaid et al. (2016) had a different perspective regarding the most critical dimensions to achieving quality, considering: Patient Satisfaction, Access, Outcomes, and Efficiency. Although the dimensions are different, it was stated that specific problems are still the same as in 2005, giving the example of the failure in leadership and the lack of communication. Besides that, they also claim that good communication and instructions given to the patients are fundamental to obtain improvements in patient-centered care. Both reviews understand that it is necessary to study ways to increase the quality and recognize the problems and ways to improve them.

According to Machado et al. (2013), over the years, Brazil began to develop concerns about hospital quality services, creating several associations to evaluate the health system. One association called

Projeto de Avaliação do Desempenho do Sistema de Saúde Brasileiro (PRO-ADESS), created a conceptual matrix to evaluate the hospital system. This matrix argues that the dimensions that should be considered to evaluate the quality of hospital services are Adequacy, Effectiveness, Safety, and Efficiency, as opposed to the most frequently used indicators at the international level, which are: Clinical Effectiveness, Patient Safety, and Efficiency. Machado et al. (2013) recognized several concerns in the construction of indicators like the challenges of the sources of data used, the increased amount of performance indicators, and methodological concerns, being necessary to define a priori the aspects to be measured and the methodological mechanisms to become more reliable.

Gilavand and Torabipour (2022) focused on the quality services of the university of Iran, and it used the SERVQUAL model that has already been discussed in Section 2.4. This model is based on five dimensions - reliability, assurance, tangibles, responsiveness, and empathy in the perceptions and expectations of the patients- and it is very different from the factors of PRO-ADESS.

Finally, Tuczyńska et al. (2022) wanted to understand the impact that COVID-19 brought to the quality of hospital services in some European counties. They analyzed several studies published, however, each study presents different dimensions to measure quality. This limitation corroborates the objective of this dissertation since if there was a universal measure, the comparison between countries would be more reliable. However, the factors that appear the most to measure the quality of services regarding patients' opinions are communication between patients and health care professionals, remote assessment, monitoring of patients, and the delay of treatments. In addition, it argues that using a triage of patients via teleconsultation increases the quality of services.

Table 3.1: *Literature review about Health care definitions*

Authors	Journal	Type of article / Data collection methodology	Research Questions /Aim of the review	Main Conclusions
AL-Ahmadi and Roland (2005)	International Journal for Quality in Health Care	Comprehensive review; Databases: Embase and Medline; Keywords: 'primary care', 'primary health care', 'general practice', 'community medicine', and 'family medicine, along with the term 'Saudi Arabia'.	Aim: Focus on Saudi Arabia's country; Research questions: How to improve primary health care due to the challenges faced - increased demand in health services, rising costs, and pressure to have better services.	• A combination of access and effectiveness identifies quality; • Some aspects that can improve quality: Training professionals about evidence-based medicine, communication, effective leadership, morale and motivation of the staff, and congruence between the patient demands and what should be provided; • It is essential to objectively evaluate clinical services and understand where the effectiveness can grow; • Points out that there is no integral and coordinated strategy to implement a comprehensive quality assessment to improve primary health care.
Aljuaid et al. (2016)	BMJ Open	Systematic review; Databases: Medline, ISI Web of Knowledge, PubMed, Embase, and Cochrane; Keywords: 'quality' OR 'quality of care' OR 'health care quality' OR 'safe' OR 'effective'OR 'patient-centerred',OR 'timely', 'efficient'OR 'equitable' AND 'university hospital', OR 'teaching hospital' Or 'medical school' AND 'KSA' OR 'SA'.	Aim: Focus on the quality of the university hospitals in Saudi Arabia; Research questions: 1. What is the quality of care in university hospitals of the Kingdom of Saudi Arabia (KSA); 2. What are the common issues, problems, barriers, and challenges, particularly concerning the health services and the quality of care in university hospitals in KSA?; 3. How does the quality of care in university hospitals compare with other health sectors in KSA?	• Dimensions mentioned to improve quality: Patient satisfaction, Access, Outcomes, and efficiency; • The quality measurement was based on patient safety, clinical effectiveness, and patient-centeredness; • They found some problems, such as failures in leadership and poor management. They stated that good communication and instructions given to the patients are fundamental to obtain improvements in patient-centered care; • Future studies should focus on improving the quality services of KSA university hospitals and provide more objective assessments.

| Machado et al. (2013) | Cad. Saúde Pública | Systematic review Databases: Medline, LILACS, SciELO and banco de teses da coordenação de Pessoal de Nível Superior. | Aim: Focus on the quality of hospitals services in Brazil. | • Dimensions mentioned to achieve better quality service: adequacy, effectiveness, safety, and efficiency;

• Although there is an increase in international research on this topic, Brazil is still limited and lacks health professionals and suitable environments to provide health care;

• The most frequent international indicators are clinical effectiveness, patient safety, and efficiency;

• Mentions that a significant concern in the construction of indicators is related to the challenges of the data sources used, the growing increase in performance indicators, and methodological problems;

• Strength the idea that there are indicators that present methodological flaws in their construction, and it is necessary to define a priori the aspects to be measured and the methodological mechanisms to become more reliable. |
| Tuczyńska et al. (2022) | Frontiers in Public Health | mini-review; Databases: PubMed, Google Scholar, and Science Direct; Keywords:'Health care Quality', 'Assessment of Health care Quality', 'Health care Quality, Access, and Evaluation', adding the words' 'COVID-19', 'pandemic', and 'SARS-CoV-2'. | Aim: The impact of COVID-19 on health care quality services. | • Several dimensions can significantly affect health care quality, such as communication between patients and health care professionals, remote assessment, patient monitoring, and treatment delays;

• One way to increase quality is to use teleconsultation, patient triage, and make home visits to older patients. |

Gilavand and Tora-bipour (2022)	Frontiers in Public Health	Systematic Review; (Meta-Analysis) Databases: ID, MA-GIRAN, Iranmedex, GoogleScholar, Embase, PubMed, Scopus, Doaj, Science Direct; Keywords: SERVQUAL, health care services, hospital, and Iran.	Aim: Focus on the services of university quality of Iran.	• Use SERVQUAL methodology to measure the quality; • Existence of a gap between the expectations and the reality of the patients in university hospitals; • The dimension that has a significant gap is responsiveness; • Study of solutions to improve patient-centered in hospitals is needed. The dimensions must be periodically monitored, especially the ones with higher quality gaps.
Conry et al. (2012)	BMC Health Services Research	Systematic review; Databases: PubMed, PsychInfo, Medline, EmBase, and CinNahl databases.	Aim: Focus on the improvements made to increase quality in hospitals; Research questions: 1. Establish what hospital-based interventions have been implemented to improve quality of care; 2. Make recommendations to in- crease the accessibility and utility of future interventions.	• Most of the improvements made by the hospitals were not based on the existing dimensions of health quality, and it misses the theoretical part of it; • This paper suggests creating a theoretical framework with interventions and then monitoring the results.

3.1.2 Measures/ Dimensions

Few reviews were found about dimensions/measures in hospital health care, and in total, only four reviews were selected, which are summarized in Table 3.2. Only one review is focused on hospital health care and has very similar objectives to this dissertation, which can add much value to it. However, it should be noted that this article can be considered outdated since it was published thirteen years ago. Furthermore, all four used the Preferred Reporting Items for writing Systematic reviews and Meta-Analyses (PRISMA) method and were published more than four years ago, inclusive.

Regarding the review that relates the most to this dissertation, Vos et al. (2009) tried to understand and answer two questions: what is the best strategy to implement indicators and how to quantify the efficiency of their use. This review reports a problem previously addressed in this dissertation, where it states that there is a lack of reviews that focus on hospital care in general, although there is a large number of reviews that focus, for example, on diseases. This corroborates the objective of this dissertation as in thirteen years, nothing seems to have changed, being necessary to do a literature review in order to have an overview of this topic. Lastly, Vos et al. (2009) also stated several conclusions. The first conclusion is the fact that feedback can make a considerable contribution on having a practical implementation of quality indicators. Secondly, the existence of a ton of different strategies that are mainly focused on process measures compared to outcomes may be because of the possibility of the easiness of obtaining process data rather than outcomes. Finally, for future reports, it is necessary to study the implementation of quality indicators more minutely to have the greatest success.

Simou et al. (2015) review, despite being focused on primary health care indicators, it stated that the number of indicators depends on the availability of the data sources. Besides this information, it was also mentioned the struggle to have a universalized acceptance of the indicators, due to the different motivation and scopes of health professionals and the lack of patronization of the collection of data and definition of indicators.

Hussey et al. (2009) highlighted that efficiency indicators are one of the few indicators from standard practices and have a lack of rigorousness respecting the sensibility, reliability, and validity. Besides this conclusion, they believe that future studies must find a balance between accurate and reliable measures and the enormous desire to create tools that help improve health.

Lastly, Fatima et al. (2019) made an analysis regarding the dimensions used in developed and developing countries, which can be an interesting study to apply in the following chapters.

Table 3.2: *Literature review about measures / dimensions*

Authors	Journal	Type of article / Data collection methodology	Research Questions /Aim of the review	Main Conclusions
Simou et al. (2015)	Journal of Public Health Management and Practice	Systematic Literature Review; Keywords: 'quality indicator(s)' AND 'primary health care' AND ['assess' OR 'evaluate'].	Research questions: 1. What are quality indicators used to evaluate the quality of access and resources in primary health care?	• The number of indicators depends on the availability of the data sources, the focus, and the general purpose; • Health professionals have different scopes and motivations, leading to a problematic universalization of indicators, except for some basic indicators such as access, comprehensiveness, and continuity; • It is fundamental to discuss this topic for future studies to become universal, comparable, and easier to track progress.
Vos et al. (2009)	International Journal for Quality in Health Care	Literature Review; Databases: MEDLINE and the Cochrane Library; keywords: 'quality indi*' with the text words 'hospital care' or 'quality improvement'.	Aim: Focus on hospital health care; Research questions: 1- Which is the best strategy to implement indicators? 2- How to quantify the efficiency of the use of indicators?	• Mention that there is a lot of data focused on processes, as opposed to outcomes, maybe because it is quite possibly due to the difficulty of obtaining long-term follow-up from patients; • It is more probable to have effective implementations when it is received feedbacks reports combined with knowledge and quality improvement plans; • They didn't cover all clinical areas such as intensive care and obstetric; • For future reports, it is necessary to do more detailed studies about the implementation of indicators to help future deployments.

Hussey et al. (2009)	Health Services Research	Systematic Review; Databases: MedLine and EconLit; Keywords used: 'efficiency', 'inefficiency', 'productivity', and 'economic profilin'.	Aim: Focus on efficiency measures.	• Efficiency is one of the few quality measures that comes from standard practices and lacks rigorousness in sensibility, reliability, and validity; • For future research it is intended to find a balance between accurate and reliable measures and have an enormous desire to use tools that help improve health.
Fatima et al. (2019)	International Journal for Quality in Health Care	systematic review Databases: Google, Google Scholar, PubMed, and Social Science and Citation Index.	Aim: Focus on measuring dimensions of health care services.	• SERVQUAL is the model that is more used to measure quality health care services; • They compare the dimensions used in developed and developing counties.

3.1.3 Technology

The next three subchapters, as already mentioned, are not generally related to quality in health care. They are subchapters that highlight some articles focused on some specific matters. However, they can be beneficial to understand the biggest concepts, problems and future research about quality in health care. In this subchapter, some articles related to technology will be covered, whether it is telework/ telemedicine and blockchain. These technologies are important since they are starting to have more impact on daily bases, and some of them were brought up due to the repercussions of COVID-19. After the research was done, four reviews were chosen, analyzed, and summarized in Table A.1.

Starting with the first review in the table, Campanella et al. (2016) tried to understand the impact of electronic health records in health care services using the PRISMA methodology. 47 articles out of 23 398 citations identified were included in the analysis which allows him to discovered that if this system is properly implemented, it can have a slight improvement in the quality in health care. This happens because it helps increasing the time efficiency, guideline adherence and medical errors reduction.

The next two articles focused on the impact of telemedicine in primary health care, hospital service and mental health. G. M. Peters et al. (2021) did a meta-analysis and de Albornoz et al. (2022) opted to use PRISMA methodology and both discover a very positive impact since they can reduce and increase the efficiency of time, decrease costs and improve accesss to health care.

The last review, Elangovan et al. (2022) tried to understand the benefits/ harms of blockchain technology by using PRISMA methodology where in 271 articles they selected 22. Based on the data collected, it was found that this technology can have an incredible impact in health care, and they additionally described five reasons to applicate this technology from the data integrity to nonrepudiation.

As we can see all the articles have two things in common. First, the main goal is to increase the quality in health care based on techonology. The second thing in common is that immediately caught our attention is the fact that most of the reviews were published less than one year ago, inclusive. This is presumably the direction that health care is taking, thus leading to an increased interest in studying and publishing these topics.

It is important to also notice that three articles focus hospital quality of care in specific areas such as primary and mental hospitals and the services instead of focusing in the quality of general hospitals .

All reviews tried to understand each technology's impact on health, but they did not define what health care quality was and only focused on dimensions that they believe were relevant and could have more impact on health care. The first example that can be given is the case of Campanella et al. (2016) which tried to understand the impact of electronic health records on health care quality. Nonetheless, they only considered some dimensions that they think are in accordance with quality, such as efficiency, cost management, outcomes, and patient satisfaction. In addition to this review, de Albornoz et al. (2022) also tried to understand the effects of telemedicine in health care services and mental health, and once

again, it was focused only on a few dimensions- access, effectiveness, cost, and outcomes. However, it was the only one that concluded and understood how important it is to define quality and its dimensions to comprehend the real effects of teleconsultations.

Finally, it should be noted that even though the reviews did not follow an ideology of what quality is, they all found it pertinent to study the effects and the actual outcomes.

3.1.4 Burnout

Another topic that has also draw attention is burnout in medical staff. Few reviews were found regarding the correlation between burnout and quality in health care. Only two reviews were analyzed due to the limited time and access, as well as being once again focused on very specific topics. Both reviews are summarized in Table A.2.

The first review Salyers et al. (2017) used the PRISMA methodology to understand the relationship between the burnout of medical professionals with the quality and safety of health care. From 1644 articles, 102 were selected, and based on them it was found negative correlations between burnout and perceived quality and safety. The burnout it was included the exhaustion of the staff, depersonalization, and reduced personal accomplishment. Regarding the quality and safety in health care, this review was the least rigorous one since it only related patient satisfaction with health care quality and assumed that safety (e.g., medical errors) is not included in the quality factors. Another conclusion found in this review is the fact that the relationship between burnout, quality, and safety is higher across Europe countries rather than in North America. One of the positive points is the fact that the author tried to generalized the type of hospital even though he choose what he consider quality. The second and last review of this subchapter Tawfik et al. (2019) tried to figure out the relations that can exist between the burnout and quality of care. Once again it was used the PRISMA methodology where in 11703 articles, 123 were included in the study. Comparing to the first review this had a more complexity way to quantify quality where it was decided to categorized quality in metrics within five groups as best practices: communication, medical errors, patient outcomes, and quality and safety. They highlight that quality, safety, and medical errors categories were the most frequent metrics to appear when trying to correlate emotional exhaustion with low quality of care. Even though this review had a more complex way to define quality, both describes the necessity to increase the rigoursness of this reviews since it impacts the true effect size of the burnout.

To conclude, the final observation is regarding the general study of hospital quality. One of the things in common between these two reviews is the fact that both tried not to focus into specific areas of the hospitals as opposite to other reviews that choose to focus and deviate que quantification of quality based on this deviation.

3.1.5 Lean/ Six Sigma

The last topic that will be addressed is the study of lean and six sigma methodologies that are used to optimize processes. Two reviews were selected as they relate to quality in health care and are summarized in Table A.3.

The first review Terra and Berssaneti (2018) aim to understand the impacts that lean methodology has on hospital services using a bibliometric approach and analyzing the network of relationships between publications. The results were clear, and the analysis reported the continuous improvement of the processes and a strong relationship between the quality of service delivered and the safety of patients. In other words, studying patient safety is becoming increasingly influential regarding the optimization process as it has more correlation with the final client. Finally for the future researches, they claimed that would be usefull to point the efforts into the contradictions between lean methodology and managerial factors, which encompass large multidisciplinary groups/ teams which englobes specific points of the processes involved.

The second and final article, Niñerola et al. (2020) had the aim to identify opportunities to implement the six sigma to improve patient safety and quality based on the literature reviews. Whith this mind, PRISMA methodology was used where in 766 articles founded 196 articles where included in the review. They concluded that this methodology focuses on processes and services, thus reducing costs, errors, and time. For these reasons, the United States is the country with the most significant interest in implementing these types of methodologies that are focused on efficiency and cost reduction, since not having a health care system makes cost reduction and profit increase indispensable. For future researches, the authors made a disclaimer to not only focus on six sigma since exists various methodologies that can be interesting for the future and can help increase the quality management of the hospital quality sector.

Once again, the two articles focused on only few dimensions. However, they stated that the reviews identified and selected were more interested in studying the impacts of six sigma and lean methodologies on patient satisfaction, safety, and efficiency. This issue can generate some bias since even if these methodologies have great impacts in reducing costs, they can have serious harms and implications in the long term health of the patients and that are not being studying. Besides this focus, it is once again observe the necessity to only quantify quality based on the services.

3.2 Conclusions

After intensive research, nineteen reviews were summarized to understand what has been done in the past and the necessities for future studies.

It was clear that the vast majority of reviews selected are distinct to the topic of this dissertation

and are not wide enough. Besides that, the reviews that relate the most to the dissertation can be considered outdated, and an observed trend is that recent studies focus on specific topics. Although there is this trend, a fundamental problem keeps coming up: the lack of theoretical and objective tools/ studies regarding the dimensions to measure quality. AL-Ahmadi and Roland (2005), Aljuaid et al. (2016), Conry et al. (2012), Simou et al. (2015), Vos et al. (2009) and Hussey et al. (2009) claimed that it is necessary to provide a more comprehensive framework to compare universally situations, countries, etc, to monitor results, to easily track progress, to help implement the best strategies and to help improve health. So even if the studies focus on more specific themes, the bases are permanently misaligned, making it a universal problem that should be studied as soon as possible. Machado et al. (2013) and Simou et al. (2015) also mentioned that the construction of indicators presents many obstacles, from depending on the scope and motivation of health professionals, the challenges of the data sources used, the increase of performance indicators, and methodological concerns. Machado et al. (2013) also states that it is crucial to define these indicators a priori to be more reliable. These facts are observed in all reviews since each author, when trying to understand the impacts a decision would bring to health, uses indicators/dimensions that had no basis.

Other factors that should be mentioned are:

- PPubMed, Embase (Elsevier), Medline were the most used databases;

- Outcomes, Efficiency, Patient Satisfaction, and Safety were the most studied dimensions;

- Authors focus on primary health care and hospital services instead of hospital care;

- Terra and Berssaneti (2018) claims that patient safety is starting to have more influence on the subject studied since has more correlation to the final client;

- PRISMA methodology was widely used;

- The country's type of health care system leads to different interests in studying it.

4

Systematic review and PRISMA Method

Contents

After analyzing the literature, we realized a clear gap regarding the dimensions used to measure quality. The next step of this dissertation will be to conduct a systematic review to understand which measures/dimensions authors use and determine if there are correlations with other factors. Nevertheless, this chapter will first focus on describing a systematic review, the method that will be used, which in this case will be the PRISMA methodology, and the search strategies and criteria that will be included.

4.1   Literature and systematic review

According to Card (2015), the number of articles published in some areas of study are exponentially increasing, which, combined with the fact that human beings have low ability to organize and synthesize information, turns out to be complicated to keep up to date everything that is being published and studied. In addition, the authors also mentioned that many reviews published have only slight differences. This leads to an accumulation of reviews, an increase in difficulty in trying to understand why there are differences in the results between studies and what conclusions should actually exist when there are differences in results when sampling fluctuation is expected.

Having this in mind, it is necessary to analyze what has been studied/published to not get lost with so much information and stay updated. Taking this issues into account, one of the solutions is to carry out a literature review, which according to Xiao and Watson (2019), it is a summarization, an analysis, and a synthesis of all the literature available related to a subject field. This solution allows the development of new theories and evaluates the current work in terms of validity and quality. Rowley and Slack (2004) believes that literature reviews help to understand theoretical concepts, suggest research methods, analyze and interpret results and create a bibliography of sources that impacted the field. Paul and Criado (2020) highlighted that literature reviews can be done in multiple ways and the most popular ones are the systematic and meta-analysis reviews.

Considering systematic reviews, they were established to make health care decisions as they help find the best answers for clinical decisions by summarizing research and understanding the potential benefits and harms of an effect like drugs, devices, etc. (Medicine et al., 2011). This happens since there are some conflicts in the use of some practices, and systematic reviews help to solve this issue by identifying if they are using the best/ relevant pieces of evidence, if they have quality, and understanding if any kind of uncertainty exists in the clinical decision (Munn et al., 2018). All conclusions can be considered defensible since it is a straightforward and reproducible method and may or may not use statistical synthesis (Gopalakrishnan & Ganeshkumar, 2013). Welch et al. (2022) claims that since systematic reviews use stricter methods and reliable research, bias is drastically reduced. However, it is not infallible, and authors should always try to minimize it because a conflict of interest can arise by not being transparent with the literature chosen. It should also be aware that the quality of the studies

is directly proportional to the quality and strength of the reviews' recommendations (Harris et al., 2014). Gopalakrishnan and Ganeshkumar (2013) also affirms that to write a systematic review, several steps need to be accomplished, which are:

1. Defining a priori a legible question;

2. Reviewing the literature;

3. Screening the literature to find eligible studies and identify the relevant ones;

4. Evaluate the quality of the studies;

5. Create standardized measures for outcomes and combine studies;

6. Draw conclusions from the results;

7. Do a sensitivity analysis.

It is vital to have in mind that an excellent a prior question is fundamental and imperative to have since it can affect the whole review in a way that if the question is too narrow, only a few reviews will appear and cannot be generalized to other areas, and if it is too wide it is difficult to have important conclusions (R. W. Wright et al., 2007). To help with this process, Gupta et al. (2018) mentioned a very well-known model that can be used called PICOS (participants/problems, interventions, comparison, outcomes, and study design). According to Liberati et al. (2009) and Gupta et al. (2018), the participants/ problems are related to identifying the population that is going to be studied, i.e., the characteristics used as age, the disease of study, and risk factors; the interventions are referring to which interventions, treatments, diagnosis, risk factors, etc. are going to be analyzed; the comparison is based on identifying the control population that is going to be used to compare to the population previously chosen; the outcomes are defining a priori what is going to be measured such as mortality, symptoms, etc.; and finally, we have the study design that is where the authors report which study design type is going to be included.

The reviewing literature step is when the author specifies the eligibility criteria for the search method to obtain the best articles for the study. This includes identifying the databases used, the language, the period when articles were published, the types of documents, etc.

The literature screening is based on understanding if the articles presented met all the inclusion and exclusion criteria and if they meet all the requirements. This step is made in a sequence where the authors primarily read and select the articles based on the title, followed by the abstract, and finally based on the full text to comprehend if the article in question really meets the goal of the study.

The evaluation of the quality of the studies can be used to assist the authors in understanding if the studies already screened have rigor and quality to validate theories and hypotheses. Some researchers recommend evaluating if the articles' quality influences the study results (Templier & Paré, 2015). As

examples of tools Gupta et al. (2018) and McGowan et al. (2016) recommend the use of Peer Review of Electronic Search Strategies, more specifically PRESS 2015 Evidence-Based Checklist, since it improves the quality and comprehensiveness of the search and reduces bias/errors.

The creation of standardized measures for outcomes is a step where authors define what data they want to extract from the articles and the strategy to do it (Templier & Paré, 2015). Gopalakrishnan and Ganeshkumar (2013) suggested that these types of strategies can rely on odds ratios, risk ratios, means, etc, depending on the type of outcomes as they can be, for example, binary or continuous.

Finally, Gupta et al. (2018) describes the last two points as steps where the authors should process, analyze, and interpret the data collected perceptibly and then do a sensitivity analysis to understand if the results can easily vary if the data changes.

4.2 What is PRISMA methodology?

4.2.1 History and contextualization

The following chapters will approach a well-known method called Preferred Reporting Items for writing Systematic reviews and Meta-Analyses (PRISMA). As the name implies, this method is used to write systematic reviews and Meta-analyses and is one of the most used tools by authors due to its characteristics. Very succinctly, this method is evidence-based and has a minimum set of recommendations (Sarkis-Onofre et al., 2021). According to Page, McKenzie, et al. (2021a), PRISMA is known for its characteristics, such as accuracy and the ability to write a transparent and complete work, since several items must be followed, leading to a higher quality study. This happens since it is a very rigid methodology where it is difficult to change or manipulate the question made, the way reports were selected, and deviate the conclusions.

The history of this method began in 1987 when MULROW (1987) conducted a systematic review of over 50 reviews published between 1985 to 1986 in four major journals. The goal was understanding if they met eight criteria based on published guidelines. The results were surprising, only one review met six criteria, 32 studies satisfied only five criteria, and the previous 17 studies satisfied three. Based on these numbers, the lack of rigorousness is evident when authors try to write a systematic review of a subject. The author also highlighted the importance of having a good method to do a systematic review to have more quality and made a significant advance in acknowledgment.

In 1999, Moher et al. (1999) claimed that since it did not exist a consensus on the standards to do a systematic review, a group of 30 professionals made a conference to solve this issue by deciding what items should be analyzed when doing a systematic review in order to reduce bias. They were nominated as Quality of Reporting of Meta-analyses (QUOROM), with the goal of improving the quality of reporting of meta-analyses of clinical Randomized Controlled Trials (RCTs). The result of the conference was a

creation of a checklist organized into 21 headings and subheadings, and a flow diagram. This ables to be transparent about the numbers of RCTs founded and included, and the ones that were excluded and why.

Ten years later, Liberati et al. (2009) claimed that a few conditions have emerged, such as the exponential increase in the number of systematic reviews published, conceptual advances of terms, and the increasing misuse of literature reviews. This leads to a necessity to transform QUOROM into a more rigorous method, and one solution found was expanding the number of items of the checklist and the flow diagram. Having that said, it was in 2009 that QUOROM was updated and renamed PRISMA (ming Tao et al., 2011). Moher (2009) mentions that the checklist was all analyzed and revised 11 times, creating a 27 item-checklist, and the name changed since they wanted to cover both systematic reviews and meta-analyses. it was in 2009 that PRISMA came out and was updated to guide the authors to write the most viable literature review at that time.

After several years, this methodology suffered another update, more specifically in 2021, where PRISMA 2009 was updated to PRISMA 2020. Rethlefsen and Page (2021) wrote that the main change between PRISMA 2009 and 2020 was the flow diagram, as the authors have a better way to represent the process of searching. This happens since initially, it was only necessary to identify the number of studies that match the inclusion criteria on other sources, and nowadays, it is necessary to describe every step. It is necessary to fill several boxes with the number of studies found in other sources, the ones that were retrieved and ones excluded to have the final number of studies selected. This way, the transparency of the method increases because it is necessary to do a more descriptive study. Besides that, it allows the authors to have four different templates to run the flow diagram, which will be approached in more detail during Section 4.2.3. Beyond these changes, the 27 item-checklist was also modified. Dina (2021) highlighted the existence of more inclusive words in the checklist, allowing it to be more comprehensive regarding other fields (like interventions and economic analysis), the subdivision of the items to be more explicit and clear of what should be done, the addition of new items and sub-items, and reorganization of some items. Additionally to this update, Rethlefsen and Page (2021) mentioned that an extension of PRISMA was released in the same year, called PRIMA-S, which is associated with report literature searches where it is recommended to show all the strategies used when doing the searches. Dina (2021) strengthen the idea of using these extensions, although it is not mandatory, since some items of the checklist can not be applied to some situations and can increase the study's quality.

Before starting to execute this method, it is necessary to understand in more detail the two fundamental steps, which in this case is to follow a checklist of 27 items and fill in a flow diagram. Therefore, these descriptions will be discussed in Section 4.2.2 and Section 4.2.3.

4.2.2 Checklist

In this subchapter, we will approach the 2020 PRISMA checklist that can be downloaded in pdf and word format at the PRISMA Website. It was previously stated that the checklist consisted of 27 items, followed by some sub-items released in 2021. The more complete it is, the higher the chances to have more quality, be reproducible, and be published in top journals.

To make the explanation more perceptible, the checklist for this study is already filled out and can be found in Appendix B.0.2. This checklist is composed of 4 columns: (1) the sections and the respective items and sub-items, (2) enumerations of the items to be easily identified, (3) the details/ description of each item, and (4) the location of where the item was reported to keep track and be easier when needed approval to be published.

As we can see, 27 items must be addressed, and if there are any questions about each one of them, participant communities come together to clarify them. Until now, there are few studies that explain the points of PRISMA 2020, since it is a recent methodology and the studies that exist are mostly related to PRISMA 2009. However, the guidelines that should be considered while writing based on PRISMA 2020 are, for example, Page, Moher, et al. (2021) and Page, McKenzie, et al. (2021b), since in addition to explaining each of the points in full, they provide examples to make everything more understandable. Besides these explanations, Page, McKenzie, et al. (2021a) also elucidates how we should use PRISMA and highlights the existence of a user-friendly interface created to fill the checklist (https://prisma.shinyapps.io/checklist/) as it ables to generate and download the checklist to a word or pdf format.

To better understand the checklist, a description of the sections was made based on Arya et al. (2021) and MD Anderson Cancer Center (2022), which can be found in Table B.1.

4.2.3 Flow diagram

The flow diagram, as the name implies, is a diagram that represents a flow of information during the steps of the study and, is used in the result section. It is also openly available on the PRISMA website, and with the new actualization, four templates are now offered. It should also be mentioned that it is possible to generate a flow diagram depending on the necessities of each authors with an Open Source R package and web-based Shiny app available at eshackathon.

This flow diagram, combined with text, is ideal for describing the number of articles identified in the selected data sources, the ones that were included and excluded, and why (PRISMA, 2021). As Page, McKenzie, et al. (2021a) explained, this diagram gives readers a better perception of what happened during the identification, selection, and exclusion of articles. Besides that, it allows them to compare/analyze the number of articles identified from different sources like bibliographic, references, or experts.

As mentioned, four templates are available on the website, where 2 of them are focused on creating new systematic reviews and the other two are focused on updating existing ones. In addition, each pair of templates is differentiated in case the author includes reviews beyond the databases identified.

Figure 4.1 demonstrates a flow diagram where the grey parts are optional and is divided into 3 phases: Identification, Screening, and Included. The identification phase is where the authors search on databases with certain constraints such as keywords, period of time, and which articles they want to study. Then articles are shown, and authors must exhibit the number of articles that were found and the number of articles that need to be excluded when they are duplicated. This exclusion can be made manually or using the help of some tools, for example reference managers like Mendeley, Zotero or Endnote.

The next phase is the screening, where the author needs to exclude the articles that do not match the scope of the study. To do this step, the author has to read the title of the articles first and identify the ones that did not match the goal of the study. Is important to know the number of articles excluded to set in the flow diagram. Then the author has to repeat this analysis but now with the abstract and then with the complete text. This step is effective since it only leaves the articles that are ideally related to the study in question. It is important to notice that in the step where articles are eliminated when reading the full text, it is necessary to identify the reasons why the studies were eliminated and the number of studies for each reason, as opposed to exclusions regarding the titles and abstract.

The last phase, entitled Included, is just to identify the total number of articles screened and, in other cases, to add to this number the number of articles from the previous review and/or the ones found via other methods.

The third column, identified by "identification of studies by other methods", is used when authors want to include studies that are not from databases and registers, like websites, organizations, and citation searching (Rethlefsen & Page, 2021). This column is processed in the same way as the second one, although it does not have the box where the articles are removed because of the title.

The first column is identified as "Previous studies" and is used when the authors want to upgrade an existing review. This column only identifies the number of studies searched and included in the previous review (Page, Moher, et al., 2021).

As we can see this diagram is very complex and brings a lot of clarity to the readers since it is very transparent with the selections that are made.
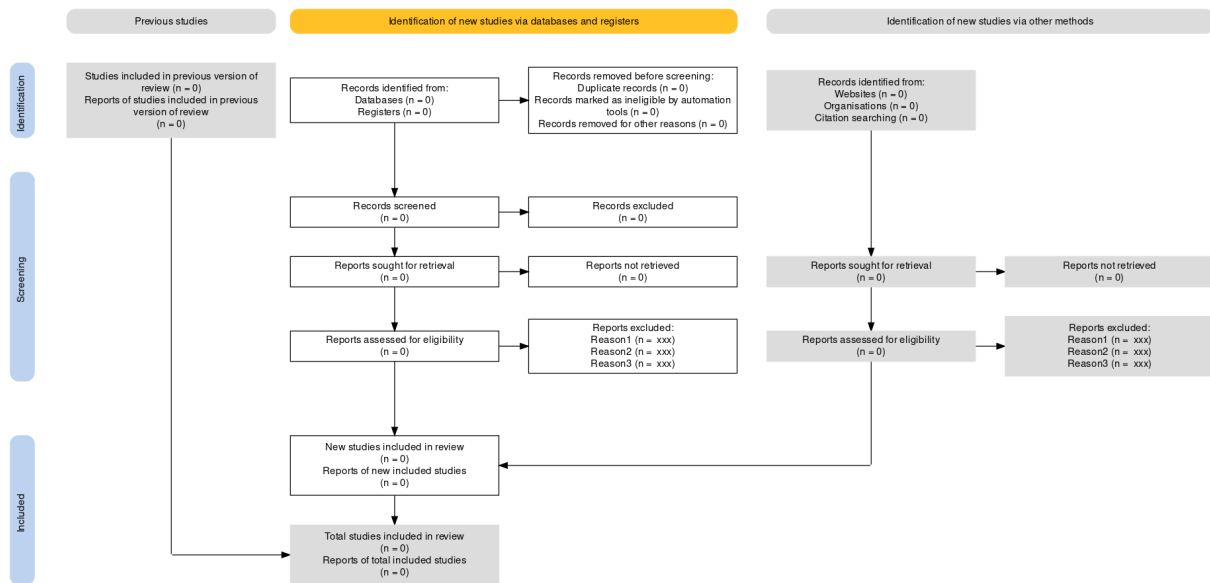
Figure 4.1: Overview of PRISMA flowdiagram

4.2.4 PRISMA extensions

Until now, only one checklist was presented which is the main checklist composed buy 27 items. However, more checklists were released to help and guide authors in several parts of the article in a more extensive way. We have the case when the PRISMA sections were explained in table 9, and in the abstract section appeared a suggestion to use a checklist called PRISMA Abstract that was published together with PRISMA 2020, which consists of a 12-item checklist that helps authors condense in a proper way all the work done to be easily published in a journal (Selcuk, 2019). Besides the PRISMA Abstract, it is currently available 10 more checklists in the PRISMA website that are now summarized based on (Selcuk, 2019), (X. Wang et al., 2019), (Korevaar et al., 2021), (McInnes et al., 2018), (O'Dea et al., 2021), (Welch et al., 2016), (Zorzela et al., 2016), (Stewart et al., 2015), (Hutton et al., 2015), (Shamseer et al., 2015), and (Tricco et al., 2018):

- **PRISMA for Acupuncture/ PRISMA-A:** a new checklist with modified and added sub-items of the main checklist that need to be addressed in acupuncture interventions;

- **PRISMA for Diagnostic Test Accuracy (DTA):** 27-item checklist for test accuracy studies to be more transparent, and replicable, to assist in the validity and applicability, and to be more useful;

- **PRISMA for Ecology and Evolutionary Biology /PRISMA-EcoEvo:** New checklist for primary research in ecology and evolutionary biology;

- **PRISMA-Equity:** For equity-focused systematic reviews to increase judgments made of the policymakers in order to have better policies and programs and a reduction of health inequalities;

- **PRISMA for reviews including Harm outcomes**: 4 new extension items to the main PRISMA checklist for harm reporting in reviews;

- **PRISMA Individual Patient Data/ PRISMA-IPD:** 3 new items to the main PRISMA checklist for IPD reviews;

- **PRISMA for Network Meta-Analyses/ PRISMA-NMA:** modification of the PRISMA checklist to guide and give useful information to the authors to do a good network meta-analysis;

- **PRISMA for Protocols/ PRISMA-P:** Minimalistic list to guide authors when preparing a systematic review protocol;

- **PRISMA for Scoping Reviews/ PRISMA-ScR:** 20-item checklist plus two optional items to include in Scoping Reviews;

- **PRISMA for Searching / PRISMA-S:** 16-item checklist to use in the methods section as it is needed to show all the strategies used when doing the searches.

Besides these checklists, three more extensions are currently in development in collaboration with the PRISMA group. As we can see, the PRISMA methodology presents vast tools to guide authors to create reviews that are more transparent, reproducible, and with the best quality possible.

4.3   Methods

In this subchapter, a systematic review was done with the aim of understanding what kind of dimensions and measures are used to monitor the quality of hospitals by using the PRISMA guidelines. It took into account the 27 steps of the checklist and the flow diagram and will describe in detail what is being done.

4.3.1   Identification

This is one of the central parts of the study since it will influence all the work that will follow. Therefore, it is necessary to do well-considered research that only includes articles related to the scope of the work.

Regarding the eligibility criteria, the articles needed to be published between 2000 and 2022 in order to be as complete as possible, they needed to be written in English, be an article in the final publication stage, and finally, their source needed to be a journal. The articles excluded were Reviews, conference papers, notes, editorials, book chapters, letters, short surveys, conference reviews, books, erratum, retracted, data papers, and undefined since some do not peer review processes and may contain incorrect information. Besides that, it is important to notice that the only articles included must be related to the measurement of the quality of standardized hospitals, excluding more specific ones

like military, university, home care, and primary care, and besides that can not be related to single departments of the hospitals, specialties, diseases, and procedures. Having that said, the articles must present all the dimensions/ measures that they consider relevant to measure general hospital quality.

Concerning the Information sources and Search strategy, the systematic review is going to the based on the consultation of the Scopus database with the following keywords: TITLE-ABS-KEY (Hospital AND (quality OR health care quality) AND (dimensions OR measures)). The selection of the keywords was established on finding the best arrangement of words that would not miss some of the literature and best relate to the dissertation topic. Considering this, the research was conducted on August 5th, 2022, to collect all articles based on the search strategies. The total number of articles found, just using the keywords, was 35 305 articles, and when using the eligibilities criteria, this number was reduced to 25 587, which is less than 9 718 articles to screen.

After collecting all the remaining articles, a selection was made which the first step was screening all the titles. That said, 24 959 reviews were removed, leaving only 628 articles to be screened based on the abstract. After the abstract screening, the number of articles suffered a reduction of 520, with only 108 left. After these vast exclusions, the next step was screening based on the complete text, where it was necessary to download all the remaining articles and see if they were accessible to the public and compatible with the eligibility criteria. Based on this, 66 articles passed all the screening, where 42 were excluded for several reasons: no availability (13), not related to general hospitals, and instead focused on cirugies departments, in-hospitals, QI-teams, primary hospitals, nurse facilities, governmental hospitals and Medicare beneficiaries (10), do not refer the proper dimensions/ measures to use (18), and finally do not focus on quality (1). To make all the decisions previously made, easier to visualize and be more perceptible, the entire screening is represented in Figure 4.2 in the PRISMA diagram flow.
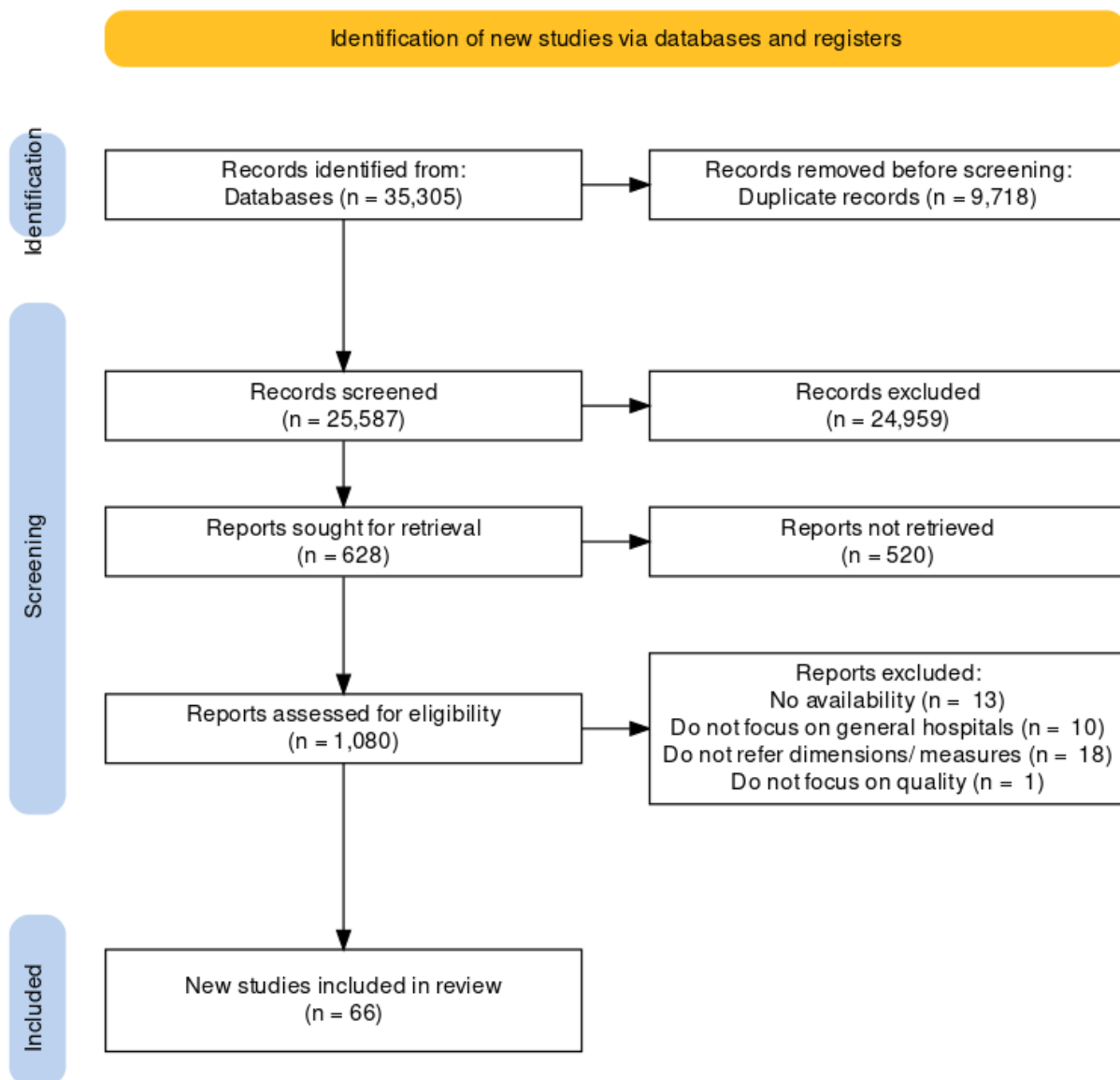
Figure 4.2: PRISMA checklist

5

Analysis of PRISMA

Contents

In this chapter, all articles that passed through the entire PRISMA method will be analyzed. This way, all 66 articles that went through the screening of the full text are going to be used. In order to make a robust analysis, it is necessary to define all the information that must be extracted from the articles. Thus, all outcomes that needed to be collected, if possible, were the country where the study was performed, the samples used whether they can be the number of participants/staff or hospitals, the year of publication of the article, the number of year/s when the study was made, the surveys used to measure quality (example: SERVQUAL), the dimensions and measures that were considered by each author, the methodology used to aggregate the dimensions and the measures, and finally the aim of each article. If it was not possible to collect an outcome, it was identified as Not Applicable, i.e., N/A. All this information was collected in an excel table, which is available in Appendix B.0.3. All of this information will be taken into consideration so that in addition to trying to understand if the authors use some universal measure to quantify quality, it is necessary to study if exists any relationship between the different countries, health systems, and the dimensions/measures used, if exists any tendency over the years of how the quality is measured, the most used measures for each dimension, etc.

To conclude the next subchapters will approach several analyses related to measuring quality in health care. Besides that, this chapter is going to be divided into two sections: The Section 5.1 gives an overview of the articles and the outcomes and the Section 5.2 gives all the relationships and correlations made and that seems necessary to refer.

5.1 Literature and systematic review

As it was said, before starting to understand possible correlations, a more general analysis will be reported to have an overview of the articles.

5.1.1 Data overview

With this in mind, an analysis was performed using statistical measures, more specifically, the mode, the median, the mean, and the maximum and minimum value that each output returns. In this case, a more focused analysis was accomplished based on the number of years that each study was carried out, the sample of each study separated by participants and hospitals, the number of dimensions and the number of measurements considered to measure the quality. This analysis is available in Table 5.1.

Regarding the year/s of the study, and despite the average being two years, most of the articles analyzed the measures/dimensions of quality during one year due to the value of the mode. This deviation can be explained mainly by the disparity of some values, as is the case of the article studied during 31 years. Making a subjective analysis, the articles studied in a short period, especially those focused on trying to understand the best dimensions to quantify the quality. In this way, the risk of bias for each

article is higher. However, this literature review did not consider the conclusions of the articles, but the dimensions/measures that were considered and were used initially to quantify the quality. Having that said, the quality of the article will not be compromised. It should be noted that despite the short period of years on which the articles were based, it is necessary to consider the number of participants and hospitals used for their studies. The average for each article was 13,750 participants and 913 hospitals, which could be considered a high value and would increase the representativeness of each study despite the years studied. However, the standard deviation is relatively high, which represents a high dispersity of the number of each sample and looking again at the mode, the most used samples range from 104 participants and three hospitals.

In short, the average is not a good statistic in this case since the range of values is quite large. A real example can be the number of participants, where the difference between the minimum and the maximum value of the samples are 6 and 300200 participants. This is a perfect example since the values range between values that do not reach the order of the tens, as we also have values that are in the order of hundreds of thousands. Another analysis that can be done is the number of dimensions and measures that author considered. There is an apparent similarity between the mean and the mode, and we can consider that most authors unanimously consider that quality should be measured using four to five dimensions and between 20 to 22 measures. That said, an analysis will be done in the following chapters to see if there is also unanimity between the dimensions/measures each author considered. However, the disparity in values between the minimum and maximum value of measures that each author interprets as necessary to measure quality is notorious, and this difference is 63 articles.

Table 5.1: *Overview of the articles*

	Year/s of study	Sample (participants)	Sample (hospitals)	Number of dimensions	Number of measures
Mean	2	13750	913	4	20
Mode	1	104	3	5	22
Minimum value	1	6	1	1	4
Maximum value	31	300200	4856	11	67
Standard deviation	5	54551	1521	2	13
Median	1	441	31	5	20

5.1.2 Articles published during the years

A critical analysis that was made is the frequency of articles that have been published over the years. This analysis allows us to comprehend if the topic of measuring the quality of hospitals is becoming less relevant to the population's daily life due to fewer articles being published, if this topic has always been considered essential and every year the average number of articles published was constant or if even more authors are publishing articles because they think that this is an issue that has a significant impact on the daily life of the population. With this being considered, two histograms were made, as shown

in Figure 5.1 and Figure 5.2, where the first indicates the number of articles published each year and the second serves to get a more comprehensive idea of the trend of articles published over five years. Having a primary focus on the first histogram, we denote a percentage growth rate of approximately 43% between each year from 2000 to 2014. From the latter year, the number of published articles started to become increasingly constant, with values of approximately five articles per year. This growth and these constant values can also be seen in Figure 5.2, where the frequency of published articles has increased from 4 to 23, with this value remaining the same for another five years. Between 2021 and 2022 cannot be an example since it only contains the sum of articles published in two years instead of five.

A note that should be given regarding why the number of articles is primarily constant after 2013 is that the authors increasingly specify the measurements of hospital environments. This point has already been mentioned before and, it may be the main reason why the publication of these articles does not increase throughout the year. Since they specify and relate to a topic, they will not be considered in this literature review. Thus, although this value does not increase over the years, it does not imply that there are no concerns about this subject, there is only an increase in less generalized concerns, such as focusing more on more specific departments or hospitals.

Finally, 2021 was the most recent year that had a sharp drop in published articles, however, as has happened over the years, this is the perfect example of more and more articles starting to specialize the quality measurement. This reduction does not imply that there has actually been a decrease in interest in the area, but mainly for two main reasons that led to the cut of half of the articles that passed the abstract screening: two articles were not available for reading (despite the abstract they give the idea that the article would be pretty remarkable and that it would give a considerable contribution), and three articles were more focused on departments/hospital types.

In short, we can say that over the years, the authors continue to be interested and concerned in measuring the quality of hospitals, with no prospects of slowing down in their studies.
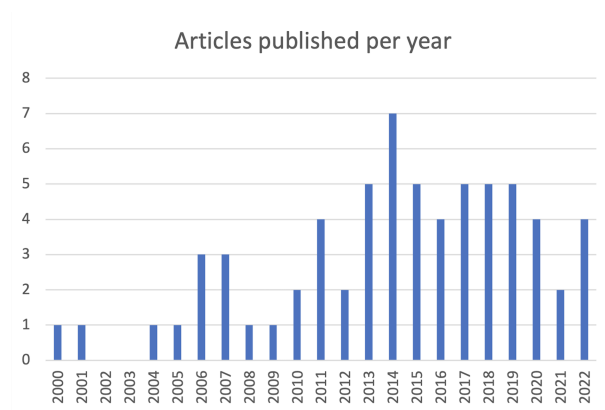
Figure 5.1: Frequency of articles published during the year
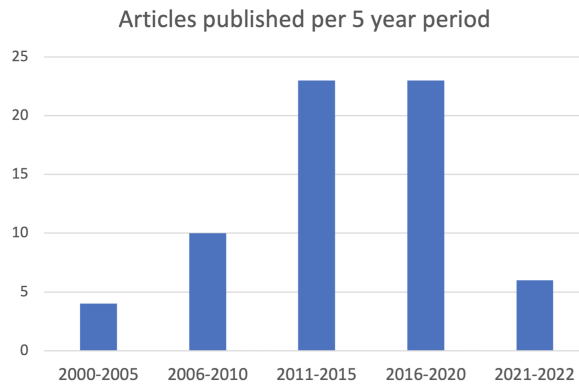
Figure 5.2: Frequency of articles published during five-year periods

5.1.3 Measures, dimensions and countries

Before starting to carry out more in-depth analyses, it is necessary to have an overview of the dimensions and measures used by the authors, as well as the countries that have hospital quality as a concern. Thus, a list of all dimensions and measures that appeared in each article was made, which can be found respectively in Table C.1 and Table C.2 . In total, 54 different dimensions and 649 measures were counted. It should be noted that there may be identical dimensions, however, these were not aggregated, so as not to increase the bias of this study. The same applies to measures that showed only slight differences and were not aggregated. Once again, all these groupings and reformulations would increase the bias as it is a very subjective process that is not intended in a literature review. The smaller the intervention in changing outcomes, the more reliable it becomes.

Now that the vast lists of dimensions and measures have been presented, the next step will be to look at the countries that have studied hospital quality. In Figure 5.3, we can see the countries that are in this spectrum and the frequency of studies published by country. We can see that by analyzing the image, the US is visibly ahead when it comes to the interest in measuring the quality of hospitals with 17 published articles, followed by Iran with only six published articles. Then there were four articles published from India, then three publications were made by UK, France, Greece, Saudi Arabia, and Turkey, two publications were made in Poland, China, Pakistan, UAE, and finally the countries that published only one article were Australia, Bangladesh, Belgium, Czech Republic, Spain, Netherland, Croatia, Ethiopia, Finland, Sweden, Denmark, Norway, German, Ghana, Italia, Jordan, South Korea, New Zealand, Singapore, South Africa, Taiwan, Thailand, Uganda and Vietnam.
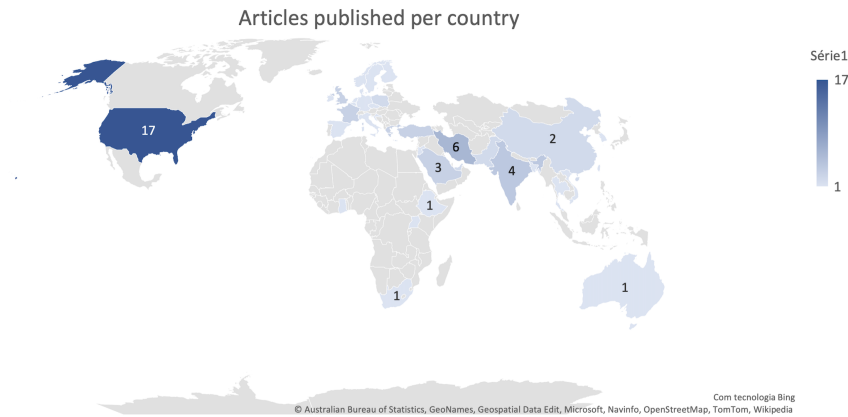
Figure 5.3: Frequency of articles published per country
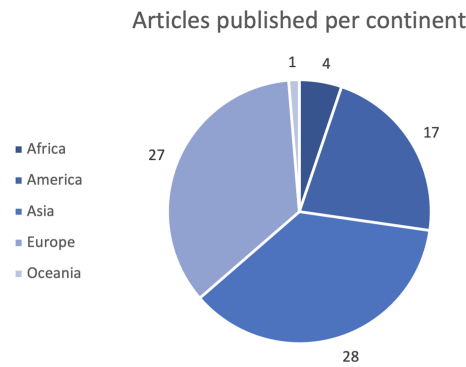
Figure 5.4: Frequency of articles published per continent

Through the number of publications and the visualization of the image, we can see that only a percentage of countries are concerned with the measurement of hospital care, with approximately a quarter of the articles coming from the United States. Making a more macro analysis, an aggregation of all countries by continent and the respective frequency of published articles was made(see Figure 5.4). It is necessary to make a note regarding Turkey since it belongs to the European and Asian continents. Having that said, the 3 Turkeys articles were added to the values of both Europe and Asia, thus making an analysis of 69 articles. This way, we can notice that approximately 28 articles published had origin in the Asian and European continent, 17 articles was originated in the US and with less than 5 articles came from Oceania and the African continent. It is noteworthy that Europe has one of the most outstanding dispersions of countries with interest in this subject, where 18 of the 50 countries in the European continent made one publication. This indicates that since European countries have essentially the same health and economic conditions they share the same concerns regarding hospital quality. The opposite corner of this spectrum is the American continent, where only one country (US) is interested in measuring this quality.

In short, it can be seen that despite having found 66 articles on the subject, there is not a great dispersion in terms of countries' concerns.

5.1.4 Most surveys and methodologies used

While reading the articles, it was observed that there are indeed authors who use surveys to quantify what they consider to be quality. Some of these surveys have already been addressed in Section 2.4, such as SERVQUAL and SERVPERF. Thus, we thought it would be interesting to have an output related to the surveys so we can see if there is one that stands out among the others. That said, a frequency analysis was performed with all surveys that the authors used according to Appendix B.0.3. This analysis is represented in Figure 5.5, with the frequency of all surveys.

According to Figure 5.5, we realized that 17 different surveys were used, of which only four stand out, as is the case of SERVQUAL, which leads with 12 uses. Then we have surveys based on SERVQUAL with six uses and finally, the HCAHPS and the HSOPSC with three uses. Clearly, there is great acceptance of the SERVQUAL survey and surveys based on it, which in total the two surveys represent 48% of published articles. Another relevant analysis is that 56% of published articles use surveys, most likely because of their practicality since they define which measures should be used to quantify hospital processes that is directly correlated to hospital quality. This percentage shows the need to have standard and universal measures to facilitate the quantification of hospital quality and not deviate according to the authors' interests.
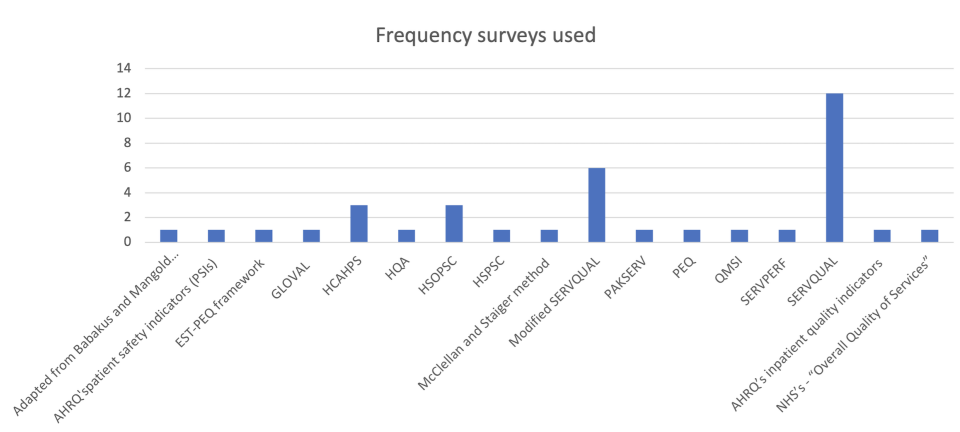
Figure 5.5: Frequency of surveys used

Another analysis that is considered relevant is to understand how the authors aggregate the dimensions used to understand if there is any universal methodology used. This way, outputs were collected and an analysis was made regarding the frequency represented by the circular graph in Figure 5.6.

As it can be seen from the graph, there is clear unanimity, where approximately 70% of the authors preferred to associate equal weights for all dimensions. That is, they defined that all dimensions have

the same importance and impact on quality. This philosophy has both positive and negative aspects, and it is necessary to understand that the fact that weights are associated with dimensions leads to an increase in bias. One of the examples is the fact that for the same perspective, as in the example of patients, they give different weights to each dimension. There is a high probability that some patients give more value to some dimensions than others, making universality more difficult.

Regarding the authors who gave weight to the dimensions, they adopted four strategies. Some used the preferences-weight approach, others used a software made by AHRQ'S, others used an entropy technique and others were based on ratios made depending on the number of admissions and how the processes were performed based on the risks and outcomes. As we can see, there is no method that stands out since no method had a frequency greater than 1. Thus, it is concluded that if there is any measure to quantify the quality, it is necessary to pay attention to the weights given by the dimensions. There is no consensus on whether to choose to give different weights to each dimension for the reasons mentioned, and most authors who wanted to aggregate dimensions wanted to give equal weights.
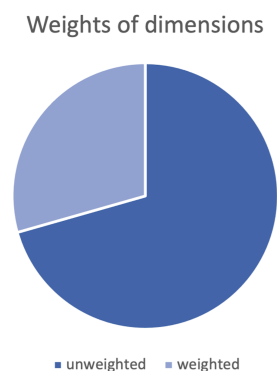
Figure 5.6: Frequency of dimensions weighted

In short, this subchapter reports that there is a great propensity on the part of authors to use surveys being SERVQUAL the most used, and in addition, the authors prefer not to give weight to dimensions.

5.2   Analyses

In this chapter, as already mentioned, more detailed analyses will be done to try to make certain relationships that are considered critical, from the 20 most used measures to calculate the dimensions, to the type of health system in each country and the dimensions used. It is hoped to create logical relationships that will help develop the best way to quantify the quality of hospitals.

5.2.1 Most dimensions and measures used

As seen in Section 5.1.4, there is a wide range of dimensions and measures used by the authors, where more than 50 dimensions and 650 measures were used. Due to the high numbers, it is difficult to make extensive and understandable analyses. This way, only the dimensions and measures that were most used were taken into consideration.

That said, only the ten dimensions with the highest frequency were considered: Tangible, Assurance, Outcomes, Reliability, Empathy, Responsiveness, Human Resources, Safety, Process, and Patient-centered. It did not make sense to go beyond the ten dimensions, since the remaining ones present between 3 to 1 uses by the authors, being a relatively low value when the sample is 66 articles.

It should be noted that the frequency of each of the ten dimension is represented in Figure 5.7. When we look at this image, we can see clear differences in levels. We noticed that the tangible dimension is used in approximately 58% of the articles, which makes it a very common dimension and probably a dimension that needs to be take into account when talking about the quality of hospitals, since it can have a great impact on quality. Another level found refers to the five dimensions – Assurance, outcomes, Reliability, Empathy and Responsiveness – which have practically the same frequency and were found in approximately 30% of the articles. Also, it is possible to consider that these dimensions are widely used despite of not having the same high frequency as the tangible one. The remaining dimensions present a percentage between 13% and 7% relative to the number of occurrences of the articles. These values are already relatively low, which demonstrates a certain lack of consensus about what dimensions should be used to quantifying the quality of the hospitals.
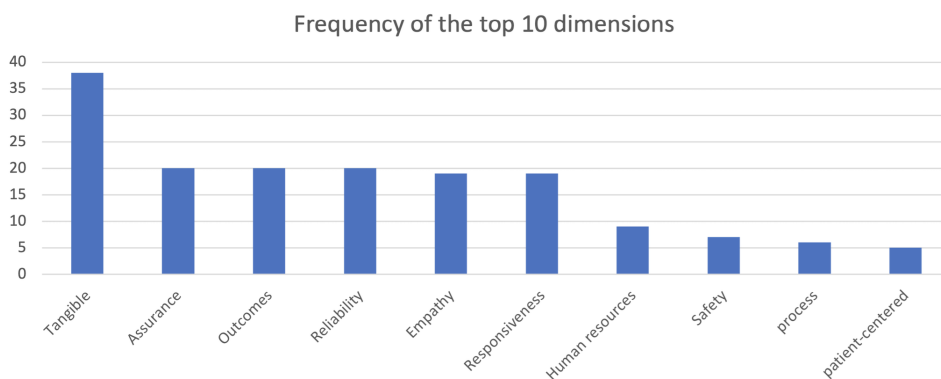
Figure 5.7: Frequency of top 10 dimensions

After defining the ten dimensions with the highest frequency of use, an analysis was also carried out with the measures that were used at least seven times. This number was chosen because it represents a minimum of 10% usage in all 66 articles. In this way, a graph was made with the frequency of use of each measure that is found in Figure 5.8. Unlike the dimensions, the differences between the measures

are not abrupt, especially when the frequency of use is less than 17. Adding this information with the fact that the variation in the use of each measure varies between 10% and 40% , we realize that there are no consensual measures, since less than half of the articles use them. Observing the five most used measures, we can see that the measures that were most taken into account and that the authors think it makes sense to add in the quality quantification were those related to the neatness of the professionals, followed by the reliability of the hospital, the facilities, the equipment used and the environment
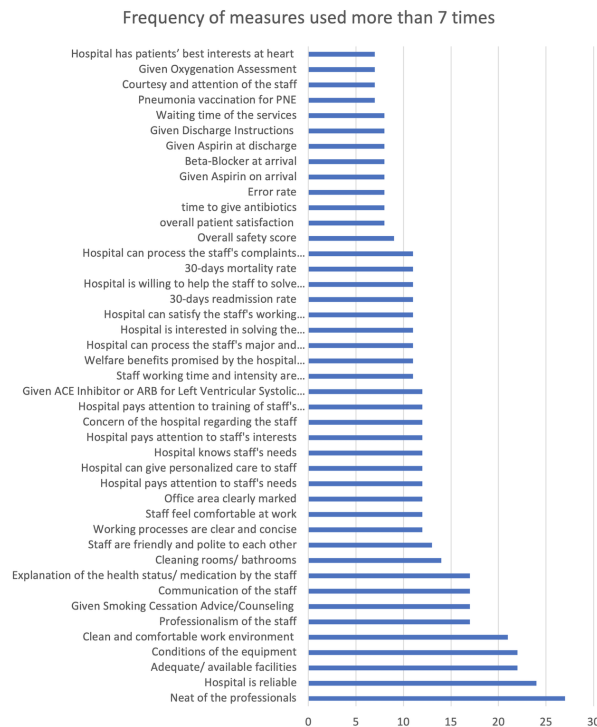
Figure 5.8: Frequency of each measure

The subsequent analysis that is important to do is for each of the ten most used dimensions mentioned above define which are the five most used measures and if there is any consensus among authors. That said, several pie charts were made for each dimension to make it easier to see if there is any measure with a high frequency for each dimension (see Figure 5.9). One note is that all graphs have "others" which includes all the remaining measures of each dimension. After analyzing all the graphs for each dimension, we realize that there are typically two scenarios:

1. Dimensions with practically unanimous measures by the authors - These measures are characterized by the fact that the "others" component is relatively small. This indicates that the five most used dimensions have a significant expression/weight, making it virtually unanimous among the authors that these are fundamental measures to calculate the dimension.

   • Empathy and Processes – these two dimensions have five unanimous measures, since all

59

the other measures together have practically the same weight as each of these 5. This is the typical case where the five measures are considered fundamental to calculate dimension;

- Assurance and Tangible – In these dimensions there are four measures that present a great expression and can be considered fundamental. However the expression of "others" is relatively large comparing to the 5th measure that does not present the same expression as the others four most used measures;

- Outcomes- Although the section "others" have a great expression, this dimension presents two measures that are pretty used that together constitute 48% of the set;

- Reliability and Responsiveness– These two dimensions present measures with some expression, however, there is a panoply of measures that need to be considered.

2. Dimensions that are not unanimously measured by the authors - These dimensions are characterized by the great expression of the others component and the small weight of the five most frequent measures. These measures generally have a panoply of measures, each with a low frequency.

- Human resources, safety and patient-centered- Unlike the dimensions already mentioned, these three dimensions do not have measures with great weight. The "others" have more than 50% of the total weight, and all the other measures do not have a great expressiveness, however, each one of them presents the same weight.
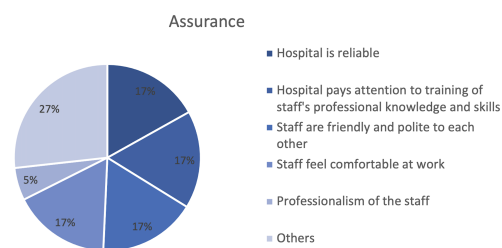
(a) Assurance
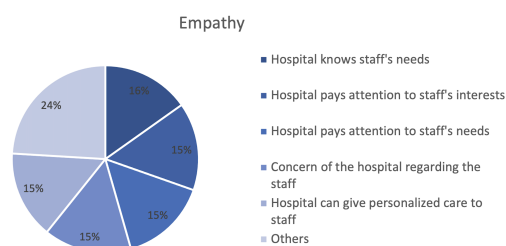
(b) Empathy

Patient-centered

- satisfaction with the organization and service
- Clean and comfortable work environment
- Clearly defined responsibilities in staff
- Continuous education for health professionals
- Explanation of the health status/ medication by the staff
- Others

13%
6%
7%
7%
7%
60%
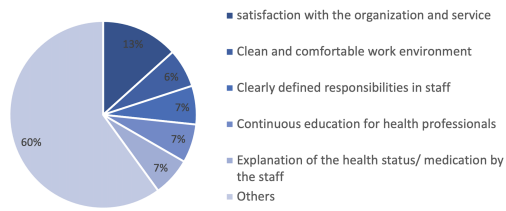
(c) Patient-centered

Process

- Accute treatment
- automatic
- completness
- image
- Timeliness of reporting
- Others

16%
16%
17%
17%
17%
17%

(d) Process

Reliability

- Hospital is interested in solving the problems at work
- Hospital is reliable
- Staff working time and intensity are appropriate
- Welfare benefits promised by the hospital can be realized
- Working processes are clear and concise
- Others

11%
13%
12%
12%
13%
39%
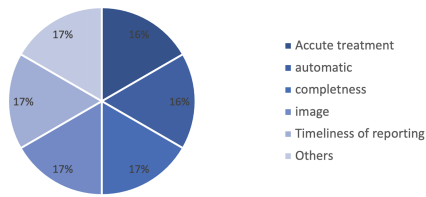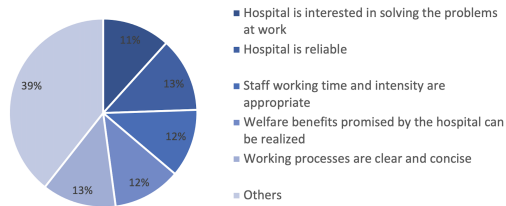
(e) Reliability

Responsiveness

- Hospital can process the staff's complaints in a timely fashion
- Hospital can process the staff's major and unexpected events actively
- Hospital can satisfy the staff's working needs
- Hospital is willing to help the staff to solve working problems
- Staff are friendly and polite
- Others

15%
15%
15%
15%
3%
37%

(f) Responsiveness

61
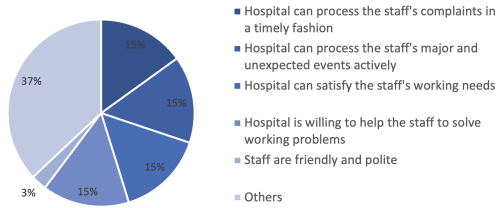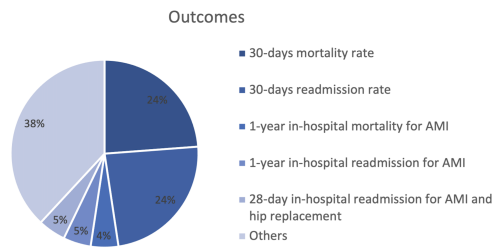
(g) Outcomes
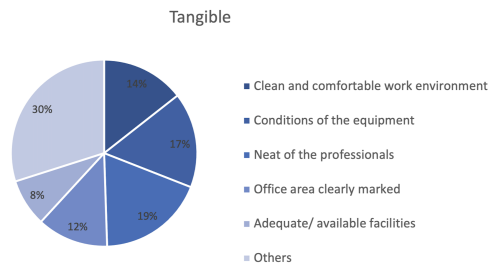
(h) Tangible
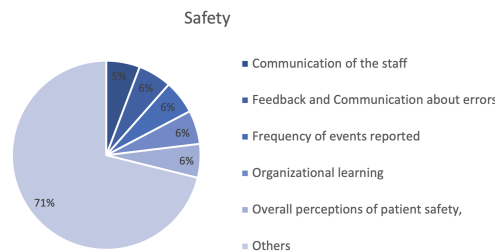
(i) Safety
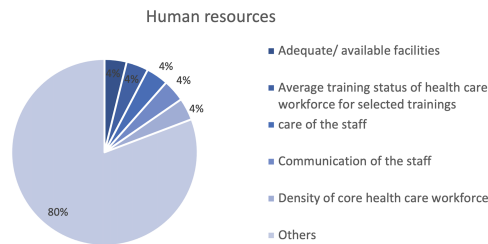
(j) Human Resources

Figure 5.9: Frequency of the top 5 measures in each dimension

Another analysis that can be done is to analyze the dimensions that were most used over the years to see if there is any repeatability and correlations. In this way, a table was created (see Table C.5) with the ten most used dimensions and every year since there are records, and the occurrences of these dimensions in the respective year were marked with the number 1. It should be noted that 2019 does not have many dimensions, possibly because although not many articles were collected from this year, half of them the authors did not define any type of dimensions. Therefore, it is impossible to draw many

conclusions from this year and all analyses cannot be influenced by it.

One of the first conclusions that can be drawn is that there are dimensions that are repeated and generally come together every year, such as the Tangible, Reliability, Assurance, Empathy and Responsiveness dimensions. From what we can observe, the authors consider them to be relevant dimensions to measure quality since they are unanimous over the years. The opposite is true for Processes, Human resources and Patient-centered, since despite being widely used dimensions, they only had a high expression in a short period of time. Another conclusion that can be drawn is the increase in the expressiveness of the Outcomes and Safety dimensions, which ten years ago did not have any kind of expressiveness and is increasingly emerging and becoming more used by the authors.

This analysis is quite interesting, since it expresses that over the years the interests and weight that individuals give to the respective dimensions can differ.

5.2.2 Economy and type of health systems of each country of study

In this last subchapter, two analyses will be done, mainly related to the type of development of each country and the type of financial health system.

The first analysis will refer to the economic situation of each country, where each one will be referred to as a developed or developing country. This characterization was based on Department of Economic and Social Affairs (2022) and is more explicit in Table C.3. Before we begin to address all the graphs made, it is necessary to understand this characterization that was based on the Gross Domestic Product (GDP)of each country.

According to Surbhi (2020) , a developed country, also known as an advanced country, is a country with high levels of industrialization and individual income and has high standards of health care with a low mortality rate, death rate and high life expectancy rate. Having that said, we can characterize a developed country as a country with high availability of resources and health care is assured with the best treatments. On the opposite side, Surbhi (2020) characterized a developing country as a third-world country where literacy, education, transport rates are low, the medical facilities are not good and the mortality rate, birth rate, and malnutrition rate are extremely high. To corroborate this idea, D. H. Peters et al. (2008) also mentions that there is a lack of access by the population to obtain health care, the general quality and acceptability is low

Taking these characteristics into account, two macro analyses were carried out. The first analysis will specify the frequency of articles published regarding the developed and developing countries for each year, thus being represented in Figure 5.10 and Figure 5.11, and the frequency of dimensions used by each of these countries, which are represented in Figure 5.12 and Figure 5.13.

As we can see when analyzing Figure 5.10 , the number of published articles did not vary depending on the type of country, as 19 articles published were from developed countries and 18 were from

developing countries. Nonetheless, this analysis can not give a huge amount of information, so a more detailed analysis was carried out, so that it is possible to understand if these publications have changed over time. As shown in Figure 5.11, there is a clear difference between publications from both types of countries. Although the number of published articles is practically the same, their dispersion over time is relatively different. We can see that for the developed countries, the distribution of articles is relatively uniform over time, unlike the developing countries that have more exposure from 2013 onwards. This provision may indicate a growing predisposition of developing countries to want to change the quality of hospitals, realizing their shortcomings, unlike developed countries, which show a particular concern from a very early age.
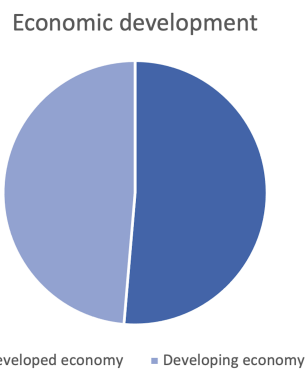
Figure 5.10: Frequency of articles published in developed and developing countries
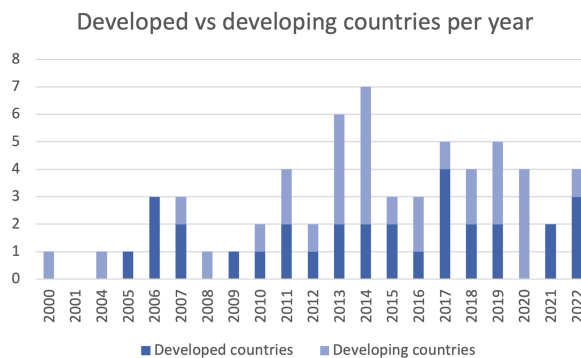
Figure 5.11: Frequency of articles published in developed and developing countries per year

In addition, as mentioned, an analysis was carried out in order to understand whether there are differences between the most used dimensions between the two types of countries. Thus, after analyzing Figure 5.12 and Figure 5.13, we noticed a large discrepancy in the dimensions used. One conclusion we can reach is that developed countries have fewer dimensions needed to quantify quality of hospitals compared to developing countries. Most likely, it will be because the developed countries already

have several situations/equipment/medicines/conditions considered basic, unlike the developing countries which may not be considered guaranteed. Thus, this data is important because it reflects the difficulty of universalizing hospital quality, since the needs are different for each situation.
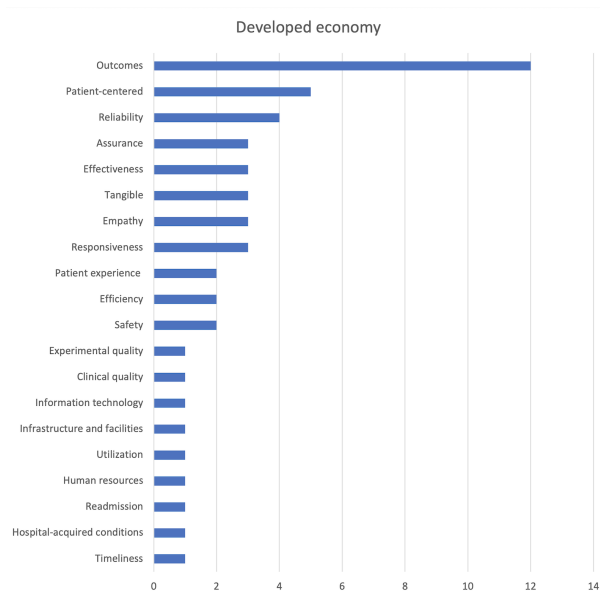
Figure 5.12: Frequency of the most used dimensions in developed countries
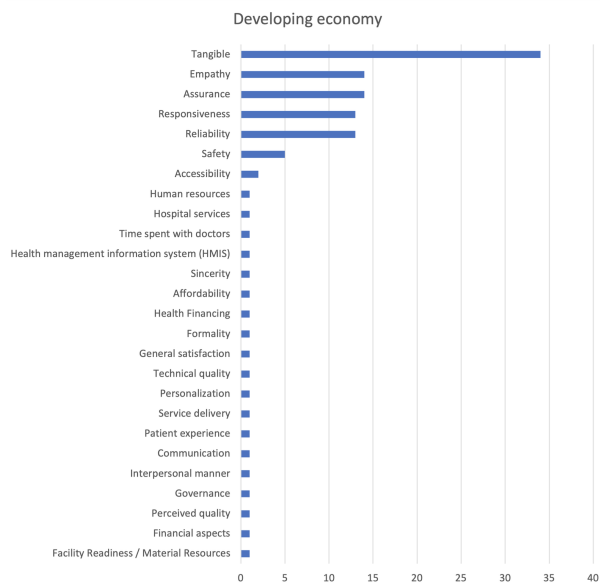
Figure 5.13: Frequency of the most used dimensions in developing countries

The second macro analysis that will be carried out is related to the type of health care system in each country and whether it has an influence on the dimensions considered. Thus, for each country, the form of financing of the health system was associated, and it is possible to visualize these associations

in Table C.4. Nevertheless, first, according to Columbia University Irving Medical Center (n.d.), Vera Whole Health (2020), World Economic Forum (2020), and OECD (2021), there are four types of health systems health that are defined as follows:

- **Beveridge model** – in this model, the health care is free and available for all citizens, tax deductions finance it, and most hospitals are owned and operated by the government. Besides that, there is a risk of overutilization since the access is free;

- **Bismarck model** – in this model the health care is delivered to employees and employers and they are the ones who finance health care with their private insurance. Most of the hospitals are generally private though insurers are public. The disadvantage of this model is based on the fact that health care is not available to the general population that are unable to work or can not afford contributions;

- **National health insurance model**– this model is a mist between the beveriage and the Bismarck model since the government founds health care but the providers are private. That said, health care is founded by direct income tax deductions and is available to all the population. It is however known for its long waiting lists;

- **Out-of-pocket model**– this model is used in most developed countries and it is a model where patients need to pay for each required procedure. That said, people can get treated if they have enough money to pay.

In addition to these four dimensions, another form of financing was created, named private health insurance, which is integrated in the US. This happens because United States does not have a specific model, as shown in OECD (2021), where 35% of these countries use the voluntary health system, another 23% use the bevirage model, 27% use the out-of pocket, etc. As we can see, there is no model that stands out and therefore cannot be included in the four models mentioned.

Bearing this in mind, the first analysis that was made refers to each country/financing model's interest in quantifying hospital quality. In this way, a frequentist analysis was used to determine the weight each model has in the publication of articles that are represented in Figure 5.14. As we can see, few articles are published by countries with a National health insurance model, which could indicate a lack of interest in promoting the idea of hospital quality. However, this idea is annihilated from the moment when two of the three countries that present this model are in the top 2 of countries with the best health system, according to (Ireland, 2021). In this way, another theory can be formulated: the worse the health system, the greater the interest in this matter. This theory can be corroborated, since the countries that study this subject the most have an out-of-pocket model, with a percentage of 36%. This model, as already mentioned, is not the best alternative for the population as it is not accessible to everyone. In this

way, there may be an increase on the part of the population/government wanting to circumvent this situation, leading to a growing interest in these matters. The example of Vietnam can be given, where the government has been trying to expand the use of social health insurance since 1992, with the aim of financing the poorest groups, minorities, children and the elderly (Ahmed et al., 2015).
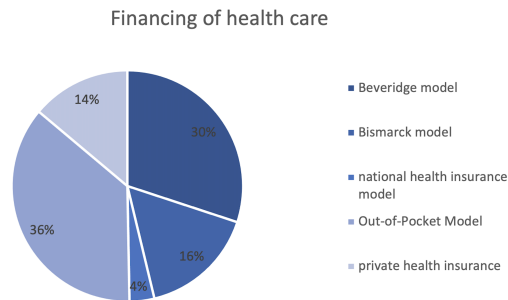
Figure 5.14: Frequency of articles published by type of health care financing

Finally, the last analysis that is considered necessary is to understand which five dimensions are most used by each model. This analysis is represented in Table 5.2, where all five dimensions most used by each model are identified with the number 1. Observing the table, we notice that there are almost four dimensions in common with all the models: Assurance, Tangible, Empathy and Responsiveness. Thus, we can conclude that regardless of the type of model, economic situation, availability of resources and facilities, the general population considers these 4 dimensions important to quantify hospital quality.

Table 5.2: *Dimensions used in each finance model*

	Beveridge model	Bismarck model	National health insurance model	Out-of-pocket model	Private health insurance
Reliability	1	1	1	-	-
Assurance	1	1	1	1	-
Tangible	1	1	1	1	-
Empathy	1	1	1	1	-
Responsiveness	1	1	1	1	-
Outcomes	-	-	-	-	1
Effectiveness	-	-	-	-	1
Experimental quality	-	-	-	-	1
Patient Experience	-	-	-	-	1

6

Conclusions, limitations and future research

Contents

In this chapter, all the relevant conclusions will be mentioned, which were based on all the analyzes carried out throughout this dissertation. In addition, it will be explained all the limitations that emerged throughout this study, which had a significant impact and influenced all analyses. Finally, future research will be defined to make it easier to guide the path that should be followed if it is intended to continue this study and why this study is important.

6.1   Conclusions

At the beginning of this dissertation, we tried to understand if there was any universal definition of what would be the quality in health care. What was most felt during the research is that a wide range of institutions and individuals publish what they think health care quality should be. However, all of them have different points of view, so there is no consensus between them.

In addition to this challenge, where there are different perspectives between organizations, it was concluded that at least three stakeholders have different views and perspectives on what hospital quality should be and what it should be considered. These three perspectives mentioned are patients, health professionals, and health care managers. Since each of the three stakeholders has different goals, values , and priorities, it is expected that there are different interests and, therefore, different visions of what quality should be. Furthermore, all perspectives are valid and all professionals/patients play a fundamental role in this spectrum. However, it was visible that many of the ideologies clash with each other, making it difficult to manage them in the best way. An example that can be given is the fact that a doctor wants to give the best treatment to a patient, regardless of cost, whereas in the eyes of a manager this cannot be possible.

In addition to these conflicts, we tried to understand how organizations/individuals quantify health care quality, which is divided into dimensions and by the following measures. The conclusion reached is that there are dimensions that occurred the most along the definition, however, it is not something stable since there are changes in a short period of time and because there are organizations that still present different ideals. With this in mind, there is no consensus on what should be considered. Regarding measures, it was noticed that, once again, the universalization of quality measures is a complicated process since there are indications that priorities and interests change whenever one goes to a different environment. Thus, since the world is not homogeneous, it becomes complicated to have an ideology in which all individuals/organizations have the same interests, since the socio-economic and environmental environments are different.

Thus, it was proposed to study the dimensions and measures used by different authors when they aim to study hospital quality. Before proceeding with this study, a preliminary analysis was carried out in order to understand if there were similar reviews, and a total of 19 were found. Despite this high

number, when reading the articles, it was concluded that most of them focused on specific topics, such as lean technologies and methodologies, burnout, etc. There were a few reviews that were general and related to the topic of this dissertation, however, all of them were considered outdated. Thus, the interest in doing a review on the topic increased exponentially, since no current reviews related to this topic were found. In addition to these conclusions, it was noticed that some articles mentioned that it was necessary to have a universal framework to quantify the quality in order to make it easier to compare situations/countries, to monitor results, to easily track progress, to help implement the best strategies and help improve health. This Framework would also be necessary so that the authors, when studying the impact of some technology, methodology, etc. not deviate the results by defining their own dimensions/measures in order to improve their own results. To finalize the conclusions gathered, it was also mentioned that the type of health care that each country has brings different interests when quantifying hospital quality, and this analysis was made later to corroborate this conclusion.

Through the research, it was tried to define what hospital quality was, and what dimensions and measures were used when analyzing the reviews published on this topic. It was noticed that there is a lack of studies that compile all the articles that try to measure hospital quality, not allowing to have an overview of what has been studied over the years and what has been considered. Thus, a literature review was carried out using the PRISMA method, to understand what dimensions and measures are used to monitor the quality of hospitals. After an extensive analysis over that 35000 articles, 66 articles were screened and ready to do a full text analysis where several conclusions were made.

The first conclusion taken regarding the analyses carried out is that over the years the interest in the quality of hospitals increased until 2013, and from this year onwards the values started to stagnate. However, this stagnation does not fully reflect the lack of interest in this topic, since what has happened is that authors are increasingly focusing on specific quality issues such as measuring quality in surgical departments, in-hospitals, IQ teams, primary hospitals, nurse facilities, governmental hospitals and Medicare beneficiaries, which is not the focus of this work. It is also important to mention that the most recent articles appeared to be very relevant to this thesis. However, many of them were not available for reading. In this way, we can say that articles on this topic continue to be published and that there are no prospects of slowing down. The following analysis was made since it was a recurring theme throughout the selected articles, which is related to the surveys and the methodologies used by the authors. It was noticed that the surveys significantly impacted the analysis of hospital quality, since more than half of the authors used a survey (53%). This percentage can either indicate that the authors prefer to use predefined dimensions/measures so that it is easier and more practical to quantify the quality, as well as make their article more universal since many authors use these surveys, as well as associating quality only with services/process disregarding the other two types of measures defined by Donabedian, these being the structures and the outcomes. Another important conclusion to be noted is the fact that

only 1% of articles that use surveys do not use the SERVQUAL survey or a modified survey based on SERVQUAL. In this way, there is a clear interest and acceptance on the part of the authors in quantifying quality according to the dimensions and measures indicated by this survey. Finally, we also wanted to understand how the authors aggregated the dimensions, with 70% of the authors preferring to aggregate considering that each dimension has the same weight, that is, they all have the same importance in defining and quantifying quality. Regarding the authors who wanted to include a weight for each dimension, it was noticed that there is no consensus on how this attribution should be made, since some were based on available software, others were based on ratios related to admissions, etc..

Regarding the dimensions and measures used throughout the articles, a total of 54 dimensions and 649 different measures were found. However, this number could be reduced if there was a universalized acceptance of them, since many of them were calculated practically the same way. This issue appear, as there were small nuances these could not be aggregated so as not to increase the bias of this dissertation. Due to this high number of dimensions and measures, the next analyses were made using the ten most used dimensions and the measures that were used more than seven times. It was concluded that the tangible dimension was the most accepted by the authors, being present in more than 58% of the articles, followed by Assurance, Outcomes, Reliability, Empathy and Responsiveness with 30%. Despite being the most used dimensions, we can observe that they present a considerably low value when seen as a top 10 of the most used dimensions. Having that said this demonstrates a clear lack of consensus between which dimensions to use. It is also worth noting that these dimensions present these percentages of use because more than half of the authors used surveys that include these dimensions, increasing their frequency of use throughout the articles.

Regarding the measures, the same happens where the use percentage varies between 10% and 40%, never reaching high levels among the authors. Another analysis that was taken into consideration is to understand how each of the ten dimensions was calculated, that is, how the top 5 measures of each dimension behaved to calculate them. It was concluded that there are mainly two types of dimensions. The first case is when the dimensions empathy, processes, assurance, tangible, outcomes, reliability and responsiveness present an entirely consensual measures to calculate each one of them. The opposite spectrum, both human Resources, Safety and Patient-centered, were characterized by not presenting measures consensual since they present a panoply of measures used and each one of them presents a low frequency. Finally, the last analysis carried out on this subject showed that there are dimensions that repeat every year, such as Tangible, Reliability, Assurance, Empathy and Responsiveness, which show that regardless of the year in which we find ourselves, they continue to be aspects fundamental to quantify quality. It was also concluded that both the Outcomes and the safety are gaining more and more expressiveness, and in the future their frequencies may be increasing and they will be included in the dimensions whose frequency is at 30%. Furthermore, this analysis is quite interesting, since it

expresses that over the years the interests and weight that individuals give to their respective dimensions can differ.

Regarding the countries studied, three major analyses were carried out. In the first analysis that was conducted it was concluded that the US was the country that had the most prominence in terms of the number of articles published, however, it was in the European continent that had a more significant number of articles published and a greater number of countries with interest in this field. This may have happened, since the vast majority of European countries have similar ideologies and socio-economic conditions, which leads them to possibly have interests in common, with hospital quality being one of them. In the second analysis, the economic capacity of each country was taken into consideration, and the countries were characterized on being developed or developing countries. The first conclusion reached is that both countries have practically the same percentage of published articles, however, developed countries show a relatively constant interest, unlike developing countries that since 2013 are increasing their exposure. In addition, developed countries have a lower need to use dimensions to quantify quality, unlike developing countries, which indicate a range of necessary dimensions. Quite possibly this discrepancy occurs because in developed countries certain equipment, medicines, conditions are considered as acquired, unlike in developing countries where nothing can be taken as granted, thus needing to use more dimensions to check the quality of their hospitals. The third and final analysis was related to the type of financing/health system that each country had, being divided into the bevirage model, bismarck model, national health insurance model, out-of-pocket model and private insurance model. The conclusion reached is that the worse the type of financing/health system is, the greater the interest of the country in quantifying the quality of health. This interest may come from the great desire to change the conditions of the country, since many of the population does not have access to health care since there is no governmental help and they have to pay out of their own pocket whenever they need health care. However, despite this discrepancy between the interests of each country, all models present practically the five most used dimensions.

So to conclude, the process of creating a universal measure seems to be far from achievable. While there are dimensions that are almost universal across countries like Tangible, Assurance, Reliability, Empathy and Responsiveness, many need to consider more dimensions. This is because the socio-economic environment of the country will have a great influence on the way in which hospital quality is measured. Furthermore, it must be necessary to standardize the measures since there are dimensions that have poorly defined ones.

6.2   Limitations

In this subchapter will be recognized potential actions made during the thesis that can have an impact during all the analysis.

Several limitations arise mainly during the PRISMA methodology. The first limitation that can occur is the fact that the keywords chosen may not reflect all the articles available even if it was tested several times in order to atchieve the biggest number or articles founded. Besides that, and continuing with the pre-selection of articles, it was decided to do a strict selection where only articles would pass which they needed to be written in English and be focus on generalized hospitals. Continuing with the PRISMA methodology only one databased was selected which can diminished the number of articles selected and posteriorly be analyzed. Regarding the screening process this should be done by more than two people in order to diminish the risk of bias. Having that said, it is possible to have human error during the selection since more than thirty thousand articles were found and needed to be carefully and manually selected. Finally, the screening phase where it was necessary to read the full articles may have some flaws since a generous amount of articles were not available using University of Lisbon VPN and seemed to be interesting and may had an impact in the results of the analyses. This can be one of the motives why the number of articles published in the last years didn't increase.

The last limitation regarding the analysis, there is a risk of bias of the selected articles, since some have a reduced amount of samples.

6.3 Future research

After doing an intensive research, it was obvious that this topic is very relevant for the population in general. The ability to quantify the quality of the hospitals can open a lot of possibilities, since it helps the individuals understand the flaws that occur in the hospitals and where we should focus on improving them. However, this path is far from being reached and several studies must be carried out.

First, since this analysis was done with the help of the PRISMA methodology, it is possible to continue searching since it is reproducible. However, it is recommendable to try other methodology since many articles were not identified in various countries. The next step should be to increase the number of articles that passed the last screening step so that the analyses can be more robust. To accomplish this step, the number of databases should be increased. Another possibility is to lower the search restrictions so that it is possible to have more articles that could be interesting for this topic, such as conferences given by world-renowned organizations.

In addition, a universalization acceptance of the dimensions and measures used can be done, since many of them have small nuances that may not be significant and make the analysis difficult. Finally, and the most ambitious step is to start trying to create a formula to quantify hospital quality. This measure should possibly be split into two, with one being more focused on developed countries and the other on developing countries, until this differentiation exists. As we have seen, it may not make sense to differentiate according to each country's type of health system, as there were not many differences in relation to the dimensions that gave more importance.

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A

Appendix A

Table A.1: *Literature review about technology*

Authors	Year of publication	Journal	Data collection methodology	Aim of the review	Main Conclusions
Campanella et al. (2016)	2015	European Journal of Public Health	Databases: PubMed, Web of Knowledge, Scopus, and Cochrane Library.	To assess the impact of electronic health records on health care quality.	• Quality was not defined and just considered some factors such as efficiency, cost management, outcomes, and patient satisfaction; • EHR can positively impact substantially, especially in the dimensions mentioned above; • For future studies, they recommend study strategies to implement EHR to be more known and easily acceptable.
G. M. Peters et al. (2021)	2021	Journal of Medical Internet Research	Systematic review and meta-analysis; Databases: PubMed, Scopus, and the Cochrane Library.	Focus on seeing the effect of telehealth on the use of hospital services.	• Claims that telehealth has low to moderate effects on the outcomes of the patients; • For future research, they suggest obtaining more information on the impacts of telemedicine on other diseases.

de Albornoz et al. (2022)	2021	Family Practice	Systematic review; Databases: Cochrane Library, Embase and PubMed.	Focus on seeing the effect of telemedicine on efficiency and costs in health care services and mental health.	• The main concern of the use of teleconsultation is the lack of effects on access, effectiveness, cost, and outcomes; • For future studies, it is necessary to understand when it is required to implement teleconsultations based on the patient's group and clinical conditions and the effects this decision can bring.
Elangovan et al. (2022)	2022	JMIR MEDICAL INFORMATICS	Systematic review; Databases: PubMed, SpringerLink, IEEE Xplore, Embase, Scopus, and EBSCOhost.	Focus on implementing blockchain in health care.	• Blockchain technology has a lot of usabilities and is mainly directed to data records since it can be easier to share patient records with the stakeholders and be more transparent and trustworthy.

Table A.2: *Literature review about burnout*

Authors	Year of publication	Journal	Data collection methodology	Aim of the review	Main Conclusions
Salyers et al. (2017)	2016	Journal of General Internal Medicine	Meta-Analysis; Databases: Ovid MEDLINE, PsycINFO, Web of Science, CINAHL, and ProQuest.	Focus on the link between burnout of health care providers and quality and safety.	• The only measure analyzed was patient satisfaction which they claimed to be a helpful indicator since it allows to study the performance of quality; • The relationship between burnout, quality, and safety is higher across Europe countries than in North America; • The studies used were mostly self-reports, and few were objective quality indicators.
Tawfik et al. (2019)	2019	Annals of Internal Medicine	Meta-Analysis; Databases: MEDLINE, PsycINFO, Health and Psychosocial Instruments (EBSCO), Mental Measurements Yearbook (EBSCO), EMBASE (Elsevier), and Web of Science (Clarivate Analytics).	Focus on understanding the actual relationship between burnout and quality of care.	• The review categorized quality into metrics of five groups: best practices, communication, medical errors, patient outcomes, and quality and safety; • Quality and safety and medical errors categories were the most frequent metrics to appear when tried to correlate emotional exhaustion with low quality of care; • Most of the reports regarding the focus of this review have low rigorousness, and it is necessary to do some trials.

Table A.3: *Literature review about lean methodology*

Authors	Journal	Type of article / Data collection methodology	Aim of the review	Main Conclusions
Terra and Berssaneti (2018)	Production	Literature review; Databases: ISI Web of Science, Scopus, Lilacs, PubMed, and Cinahl.	Focus on analyzing the application of lean in hospital services.	• Process and services are the most influential subjects when it is trying to study lean and its impacts; • The dimensions that were more studied were efficiency and patient safety; • They claimed that patient safety is starting to have more influence on the subject learned since it has more correlation to the final client.
Niñerola et al. (2020)	Health Policy	Systematic review; Databases: EDLINE, Web of Science (Core Collection) and Scopus.	Focus on analyzing the benefits of implementing six sigma in a health center, hospital, or other organizations in the sector.	• Claims that six sigma has a significant positive impact on patient care and safety in different services and specialties; • Six sigma can reduce costs, time, and errors; • The United States is the leading country to study/ implement this type of health care methodologies since they do not have a health system and need to be more conscious about maximizing profits/ reducing costs.

B

Appendix B

B.0.1 Summary of PRISMA Checklist

Table B.1: *Summary of each section of PRISMA checklist based on Sarkis-Onofre et al. (2021) and MD Anderson Cancer Center (2022)*

TITLE	The main goal is to identify the type of study in the title, i.e., it should be written in the title if the study is a systematic review or meta-analysis.
ABSTRACT	How to write and what needed to be included in the abstract, which they believe should follow the 16 items of the PRISMA extension called PRISMA 2020 for Abstracts.
INTRODUCTION	Description of what is already known in this field and the gaps in the literature.
METHODS	This is one of the most extended sections and the one that explains how the search was made in order to be easily reproducible. It is where we need to specify the criteria and the strategies used when doing the searches, the databases, how the data was collected and processed, the risks of bias and the quality of the studies, and the methods used to synthesize results and provide a rationale for the choice, etc. It also highlighted the need for two or plus individuals to do this section independently to prevent bias.
RESULTS	Identify and discuss the chosen studies, especially using the PRISMA flow diagram. It is necessary to show the total number of studies identified, the ones that were legible, and the ones that were excluded and why. It was claimed that item #20 is only relevant for meta-analysis.
DISCUSSION	It shows all the interpretations made and findings based on the literature collected. It is also where authors explain what needs to be done in the future, i.e., the suture reaches and the limitations of the study.
OTHER INFORMATION	It is relevant to demonstrate the quality and transparency of the work and be easily accepted by the journals to be published. One of the steps of the section is to register the systematic review. According to ? (?), the systematic review should be registered at the begging of the study on the PROSPERO website. This registration gives previous information about what they want to study, the restrictions they want to do while searching, etc. This helps authors not duplicate the same theme/ study unnecessarily and waste resources. Besides that, since it is required to explain how they will do the research, it makes it possible to understand if everything has been done as planned and if they did not deviate from their goal. That way, the transparency increases and the bias diminish since it is more complicated to deviate the results depending on personal interests.

B.0.2 PRISMA Checklist

Link for PRISMA checklist

B.0.3 PRISMA Analysis

Link for the analysis of the documents accepted by the PRISMA methodology

C

Appendix C

C.0.1 Analysis

Table C.1: *List of measures based on the documents accepted by the PRISMA methodology*

Measures	
1-year in-hospital mortality for ami	Image
1-year in-hospital readmission for ami	Immediate attention
24*7 anesthesia availability	Implementation of cpd
24*7 availability of doctors/ nurses	In facility, people treat each other with respect
24*7 availability of medicine store	In-hospital
24*7 maternity services	In-hospital admissions
24*7 queries desk availalibity	Incidence of potentially preventable vte
24*7 surgery availability	Incineraion on site and functional
28-day in-hospital readmission for ami and hip re-placement	Individual attention
30-day in-hospital mortality for acute stroke	Individual physician profiles of quality performance
30-day in-hospital mortality for ami	Infection due to medical care
30-day in-hospital mortality for ami and hip replace-ment	Infection rate
30-day in-hospital mortality for congestive heart fail-ure (chf)	Infection rates for c/s documented

30-day in-hospital mortality for gastrointestinal hemorrhage
30-day in-hospital mortality for hip fracture
30-day in-hospital mortality for pne
30-day in-hospital mortality rate for abdominal aortic aneurysm repair
30-day in-hospital mortality rate for ami
30-day in-hospital mortality rate for coronary artery bypass graft (cabg)
30-day in-hospital mortality rate for craniotomy
30-day in-hospital mortality rate for hf
30-day in-hospital mortality rate for hip replacement
30-day in-hospital mortality rate for pne
30-day in-hospital readmission rate for ami
30-day in-hospital readmission rate for hf
30-day in-hospital readmission rate for pne
30-days mortality rate
30-days readmission rate

A choice of sports and recreational programs are provided
A higher price had to be paid to obtain better nursing
A vailable and clear information at the hospital

Absorptive capacity of districts
Acceptability
Acceptance ratio
Access controllability
Access to the neonatal nursery is controlled by door locks
Accessibility of the instalations

Accidental cut, puncture, or haemorrhage during medical care
Accidental puncture or laceration
Accuracy of records
Accurancy of the diagnosis
Accute treatment
Acute
Adequate/ available facilities
Admission/discharge rate
Admissions for acute conditions
Adverse events

After we make changes to improve patient safety, we evaluate their effectiveness
Air-conditioning facilities in patients' rooms
Alcohol hand rub dispensers are available in patient areas
All adult patients are identified by a bracelet
All babies are physically identified by a bracelet

Influenza vaccination for pne

Information at entrance
Information can be easily obtained
Information of rights to community

Infrastructure design is available for handicaps
Initial antibiotics within 6 hours

Innovation of the staff
Inpatient mortality rate
Integrated management of childhood diseases
Inter-operability
Interaction with staff
Interest in solving patients' problems
Intolerance
Intra-sector nurses to physicians ratio
It is just by chance that more serious mistakes do not happen around here
It is socially very well considered

It takes too long at billing section for discharge
It takes too long at reception for admission process to complete
Job satisfaction level of nurses
Job satisfaction level of outreach workforce
Job satisfaction level of physicians
Job satisfaction levels of administrative workforce
Job satisfaction levels of clinical workforce

Knowing the exact time when service will be performed
Laboratory safety

Laparoscopic/open surgery rate
Leadership, commitment, and support
Length of stay
Local data availability
Machine utilization
Management committee meets weekly
Management of hospital waste
Management support for patient safety
Manager says a good word when he/she sees a job done according to established
Manner

Many people i know go there
Maternal death audits

Mattresses are in good repair
Mean time to pci

All fire exits are clearly signed, useable and unobstructed

All required investigations (lab and radiology) are quickly done and completed

All the necessary medical specialties are available in the hospital

Anaesthesia and sedation use

Analyzing care processes

Analyzing professionals

Antenatal care guidelines available

Anticoagulation overlap therapy

Anticoagulation therapy for atrial fibrillation/flutter

Antithrombotic therapy by the end of hospital day 2

Appointment at the hospital runs on time

Approachability for subordinates

Appropriate initial antibiotic selection

Appropriate manner

Appropriate treatment advise

Appropriatness

Assessed for rehabilitation

Assessment of left ventricular ejection fraction

Attitude of doctors/staff should instil confidence in patients

Attributable days stay

Autoclave

Automatic

Availability and functionality of drugs

Availability and functionality of equipment

Availability and functionality of furniture

Availability and functionality of furniture

Availability of adequate seating

Availability of basic amenities

Availability of basic amenities

Availability of family planning counseling and referral

Availability of pre-test and post-test counseling and hiv testing

Availability of the staff

Availability, content and use of patient records

Average training status of health care workforce for selected trainings

Beds are in good repair

Beds per sector

Benchmarking

Beta-blocker at arrival

Beta-blocker at discharche

Beta-blocker at discharger

Birth trauma

Mean time to thrombolysis

Measurement of hospital performance

Medical records management manual to guide use

Medication dispensed from the pharmacy is labelled with the name of the patient, name of the drug, concentration or strength, dosage and expiration date

Meeting by nurses

Mission of hospital is known

Mortality audits carried out at least monthly

Motivation levels of administrativeworkforce

Motivation levels of clinical health care workforce

Motivation levels of outreach workforce

My family was told what they needed to know.

My supervisor/manager overlooks patient safety problems that happen over and over

N-hospital avoidable vte*

Neat of the professionals

No foul language

Noise level of corridors

Noise level of wards

Non-punitive response to errors

Non-punitive response to errors

Not respecting visitors

Number of beds

Number of beds

Number of doctors

Number of employees per bed

Number of nurses

Number of wainting areas

Nurses attended to you sincerely when needed

Nurses gave individual attention to patients

Nurses were quite willing to respond when needed

Nursing staff are polite and well-mannered

Nursing staff give prompt and timely attention.

Ob trauma vaginal with instrument

Ob trauma vaginal without instrument

Obstetric trauma

Obtaining information from hospital administrative personnel (e.g., admission, treatment, discharge) is easy

Office area clearly marked

Operation audibility

Organizational learning

Overall patient satisfaction

Overall perceptions of patient safety

Overall quality

Blood culture performed before first antibiotic received in hospital
Caesarian section rate
Cafeteria
Cancer patients successfully surviving surgery/chemotherapy/transplant
Capability for problem resolution
Cardiac surgery patients with controlled 6 a.m. Postoperative blood glucose
Care of the doctor
Care of the nurses
Care of the staff
Catheter-associated urinary tract infections [cautis]
Central line-associated bloodstream infections [clabsis]
Clean and comfortable work environment
Clean equipment and devices
Cleaning rooms/ bathrooms
Cleanliness of the dishes
Clear signs
Clearly defined responsibilities in staff

Clinical
Clinical management guidelines for drugs
Comfortable ambient conditions with proper lighting.

Comfortable waiting area

Communication of the staff
Communitacion of the staff
Community participation through rks
Compared with other hospitals, the level of satisfaction was high
Completeness of records
Completness
Complication rates after hip and knee surgery
Complications of anesthesia
Computers for the personnel
Computers with internet access
Computers with modern applications
Conceptual understanding
Concern of the hospital regarding the staff
Concern of the staff
Conditions of the equipment
Confidentiality of patient information
Consumer participaition/ choice
Contacting to physician
Continuous education for health professionals
Continuous improvement

Overall quality of administration

Overall safety score
Oxygen facilities in patients' rooms
Pain relief

Paramedical and support staff competency and skill
Parking space provided

Patient assessment
Patient feedback management
Patient focus
Patient privacy
Patient records were well maintained

Patient release procedure was properly followed
Patient satisfaction regarging the staff
Patient surveys is carried out annually
Patient-centered
Patients leaving without being examined
Patients told about the time limit for delivering and completing the service
Patients visiting the er department
People support one another in this facility
Percentage of newborns whose deliveries were scheduled early (1–3 weeks) when a scheduled delivery was not medically necessary
Percutaneous coronary intervention for less than 90 minutes
Performance indicators for maternal deaths
Performing service in the promised time
Performing services right the first time
Perinatal mortality due to complications (mother, child)
Perioperative mortality
Permanent personnel (per discipline)
Personnel educational level (per discipline)
Phc density
Physical facilities are visually appealing
Physical safety
Physically acessible
Pleasent personnel
Pneumonia vaccination for pne
Policy and strategy for motivating and retaining staff
Policy for handling vulnerable groups
Policy on management of medical records
Politness
Position occupancy of core health care workforce
Post-partum hemorrhage and management protocol
Postoperative hemorrhage or hematoma postoperative physiologic & metabolic derangement postoperative respiratory railure

Continuous monitoring and supervision
Cost of accomodation
Cost of inpatient services per patient day
Cost of the doctor's consulation feee
Cost of the drugs
Cost of the labs
Cost of the service
Cost of the service
Cost of the service is justified
Cost of the travel
Cosy inventory and furniture
Courtesy and attention of the staff
Cross-border patient-centredness
Cssd equipment functional
Customized solution

Decubitus ulcer
Delay in responding
Delay or content of the letter that has to be send to the patients' general practitioner at the end of the hospitalization
Density of core health care workforce
Detached personnel
Dhfws meetings

Diagnosis is only made after careful examination.

Discharge information
Discharge planning
Discharged on antithrombotic therapy
Discharged on statin medication
Displayed core values in visible areas
Disrespect
Dissatisfied with some aspects about the medical care received
Dock in and dock out system
Doctor appropriately discussed your previous condition
Doctor gave clear advice to patients about the prescriptions
Doctor listened to you attentively.
Doctor was willing to answer any question.
Doctors act too business-like and impersonal towards me
Doctors are competent and skilful
Doctors are good about explaining the reason for medical tests
Doctors ask pertinent questions

Doctors do not shy away from their responsibility
Doctors explained the purpose of the diagnostic tests

Postoperative hip fracture
Postoperative pe or dvt postoperative sepsis
Postoperative physiologic & metabolic derangement
Postoperative respiratory railure
Postoperative urinary catheter removal
Postoperative wound dehiscence
Presence of essentialadministrative skills
Preventable
Prevention/ early detection
Procedure mortality rate
Procedures and tests
Process management
Professionalism of the staff
Promises are kept by the employees
Prophylactic antibiotic discontinued within 24 hours after to surgical incision
Prophylactic antibiotic selection for surgical patients
Provider productivity at chcs
Provider productivity at dhs

Provider productivity at phcs
Provider productivity at scs
Provides right patient services the first time, every time
Provision of inhaled esthetics equipment suction is available for resuscitation
Public health spending per capita (in inr)
Published and disseminated hospital annual report
Pulmonary embolism/deep vein thrombosis sepsis
Quality improvement project results
Quality management
Quality of basic amenities
Quality of food

Quality of the bed
Quality policy documents

Quality process indicators are established

Quantity of food
Quickly resolving problems of patients
Quickness of the procedures

Quiet waiting area
Ramp or lift for high buildings

Received cardiac stress testing before low-risk outpatient surgery
Recomendation
Regular outreach programs

Doctors explained the test results.
Doctors followed up on the treatment
Doctors provided correct treatment the first time
Doctors sometimes ignore what i tell them
Doctors spent enough time examining the patient
Doctors usually spend plenty of time with me
Drug storage locations are locked
Drugs availability

Drugs kept according to expiration date
Ease of finding one's way around the hospital
Easiness of application
Economic cost
Effective doctor presence rate
Effectiveness
Effectiveness of documentation
Efficient use of medical imaging
Emergency department diversion rates
Employee focus
Employees are courteous
Employees are knowledgeable
Employees ask for money first
Employees who manage medical records
Equal treatment
Equality among subordinates
Equipment
Equipment for monitoring patient blood pressure
Error rate
Error rates
Ethics while decision making
Evaluating results

Evaluation of lvs function
Evidence of a 24 h call rotation
Evidence of audit

Evidence of existence of policy and strategy for continuing professional development
Exams ordered at the ER, per patient
Existance of infection control protocol
Existence of performance reward system
Expected service
Experience of the staff
Explanation of the health status/ medication by the staff
Explanation of the medication
Extent to which doctors answer patient's questions and explain treatment that you could understand
Failure to rescue
Fairness in financial dealings
Familiarity with tools
Family name used

Regularity of reporting
Requierd equipment in the facilities
Respect for dignity of beneficiaries
Respectful personnel
Respectful relationship
Responsive doctors/staff
Restorability
Resuscitation equipment is accessible, complete, organised and functional
Review of progress
Rntcp microscopy center
Room airing
Room lighting
Room security
Room temperature
Safe waiting area
Safety during diagnosis
Safety with the staff
Satisfaction with medical care
Satisfaction with nursing care
Satisfaction with the organization and service
Segregation of waste occurs
Service availability
Serving temperature of food
Severe
Short-term stay beds
Shouting and rough treatment
Shraps destruction carried out
Simplicity of setting na appointment
Simplicity of the procedures
Sincerity, honesty and ethics when providing medical services.
Single-day stay for selected surgeries
Skill of physician
Sometimes doctors make me wonder if their diagnosis is correct
Space for patient baggage

Specialist followed ethical practices
Specialist sympathetic toward patient
Specific diases mortality rate
Specifications provided to customers are followed
Staff absenteeism
Staff accommodation is catered for hospital buildings do not leak
Staff adequacy level
Staff are friendly and polite

Staff are friendly and polite
Staff are friendly and polite to each other
Staff burnout
Staff feel comfortable at work

Fault ratio	Staff handle hospital information confidentially
Faultless assessment of health conditions by doctors	Staff injury
Feedback and communication about errors	Staff needle puncture incidents
Feedback frequency	Staff working overtime
Female doctors	Staff working time and intensity are appropriate
Fibrinolytic therapy for less than 30 minutes	Staff working time and intensity are appropriate
Fibrinolytic therapy received within 30 minutes of hospital arrival	Staffing
First name used	Staffing rate
Flexible payment	Statin at discharge
Folic acid available	Storage of sterile instruments
Follow-up and care of the staff	Strategic quality planning
Food-service time	Stroke education
Frequency of events reported	Sufficiency of documentation
Fun activities to do for the chield	Supervisor expectations and actions promoting patient safety
Fun chield programs	Surgery patients who received appropriate venous thromboembolism prophylaxis from 24 hours before surgery to 24 hours after
Functional adequacy	Surgery patients with perioperative temperature management
Functional completeness	Surgery postponed or canceled
Functioning disciplinary committee	Surgery‡
Given ace inhibitor or arb for left ventricular systolic dysfunction	Surgical theater use
Given aspirin at discharge	Surgical theaters
Given aspirin on arrival	Surveillance of needle stick injury
Given assessment of left ventricular function	Systems failure
Given discharge instructions	Tastefulness of food
Given oxygenation assessment	Teamwork across units
Given pci within 120 minutes of arrival	Teamwork within units
Given pci within 90 minutes of arrival	Telephone center
Given prophylactic antibiotic within 1 hour prior to surgical incision	Telephone facilities in wards
Given smoking cessation advice/counseling	Temporary personnel
Given thrombolytic medication within 30 minutes of arrival	The actions of hospital management show that patient safety is a top priority.
Governance and social responsibility	The data indicate a significant improvement in at least one element of drug safety following intervention by the committee
Guidelines meet requirements	The data indicate a significant improvement in at least one element of safety following intervention by the committee
Handoffs and transitions	The doctor calls me by my name while addressing me.
Health education regarding specific health concerns	The hospital provides patients with services beyond medical treatment.
Health outcomes	The hospital runs various programs for patients to support different societal sections.
Hemodialysis facilities	The loved ones also treated well

High-risk drugs are stored in a location separate from the other drug

Hmis training

Hospital acquired complications (hacs)

Hospital bed coverage

Hospital can give personalized care to staff

Hospital can process the staff's complaints in a timely fashion

Hospital can process the staff's complaints in a timely fashion

Hospital can process the staff's major and unexpected events actively

Hospital can process the staff's major and unexpected events actively

Hospital can satisfy the staff's working needs

Hospital can satisfy the staff's working needs

Hospital departments design makes it easier for the patients to access services

Hospital departments design makes it easier for the patients to access services

Hospital facilities are visually appealing

Hospital financial performance

Hospital has a positive reputation.

Hospital has blood banks

Hospital has everything needed to provide complete medical care

Hospital has patients' best interests at heart

Hospital has tap water

Hospital information system

Hospital is accurate in its billing

Hospital is interested in solving the problems at work

Hospital is interested in solving the problems at work

Hospital is reliable

Hospital is willing to help the staff to solve working problems

Hospital is willing to help the staff to solve working problems

Hospital knows staff's needs

Hospital management provides a work climate that promotes patient safety

Hospital offer adapted to the contemporary trends and needs of patients

Hospital pays attention to staff's interests

Hospital pays attention to staff's needs

Hospital pays attention to training of staff's professional knowledge and skills

Hospital services are correct from the outset

The people i know think it is right that i come here

The personnel give me positive feelings the personnel did not hassle me

The personnel know about all the services offered by the hospital

The quality of the services was maintained throughout

The services were well organized

The waiting lists are reasonable

Their advice was valuable

There is good cooperation among hospital units that need to work together

They knew their job well

Those who provide me medical care sometimes hurry too much when they treat me

Thrombolytic therapy

Time needed for admission after arrival at the er

Time needed for initial clinical examination at the er after arrival

Time needed for selective surgical treatment

Time of the services

Time to give antibiotics

Timeliness

Timeliness of opd consultation

Timeliness of referral transport

Timeliness of reporting

Timely answering of calls

To receive good service required payment of baksheesh (extra payment)

Toilet in patients' rooms

Top management commitment and leadership

Total attention

Trainees with supervisor and are supervised

Trust in the staff

Understanding patients' specific needs

Unfractionated heparin with dosages/platelet count monitoring

Union influence

Unplanned icu readmission rates

Unscheduled readmission to icu

Unsolicited advice

Up to date inventory of pharmacy medication

Hospital staff are always ready to cooperate with me

Hospital staff are characterized by humanity, decency and civility

Hospital staff are committed to providing services at specified times

Hospital staff are familiar with and aware of patients needs

Hospital staff follow adequate hygienic care and procedures (e.g. Wearing gloves).

Hospital staff follow up sick cases constantly

Hospital staff has knowledge to answer questions

Hospital staff has time to answer patients' questions

Hospital staff instils confidence

Hospital staff provides prompt service

Hospital staff respond immediately to patient inquiries and complaints

Hospital staff treat me as a human being and not just a patient

Hospital staff were keen to resolve patient problems and answer their questions

Hospitals having a webpage

Hospitals provide patient friendly policies

Human resource management in the hospital

Human resources utilization

I am able to get medical care wherever i need it

I am satisfied by the pharmacy services of the hospital

I feel confident that i can get the medical care i need without being set back financially

I feel good about the interaction i have with other staff at the hospital

I feel good about the interaction I have with the doctor at the hospital

I feel good about the interaction I have with the nurses at the hospital

I feel relaxed

I felt at ease

I have built a close relationship with some staff at the hospital

I have built a close relationship with the doctor at the hospital

I have built a close relationship with the nurses at the hospital

I have easy access to the medical specialists i need

I have some doubts about the ability of the doctors who treat me

Urban or rural hospital

Usage of laboratory exams

Use of data

Use of electronic medical records

V arious medical programs are provided

Various entertainment programs and social activities are provided

Venous thromboembolism (vte) prophylaxis

Venous thromboembolism prophylaxis

Vermin control

Visibility of staff identity

Waiting time

Waiting time of responses

Waiting time of the services

Warfarin therapy discharge instructions

Warm greeting by the nurse

Warm greeting by the specialist

Water adequate for washing hands

We are actively doing things to improve patient safety

We had patient safety problems in this unit

We have enough staff to handle the workload

We use more agency/temporary staff than is best for patient care

We work in "crisis mode" trying to do too much, too quickly

Weekly clinical audits performed

Welfare benefits promised by the hospital can be realized

Well-designed landscape

When a lot of work needs to be done quickly, we work together as a team to get the work done

When i go for medical care, they are careful to check everything when treating and examining me

When one area in this unit gets really busy, others help out

Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts

Where i got medical care, people have to wait too long for emergency treatment

I have to pay more for my medical care than i can afford

Iatrogenic pneumothorax

Icu lenght of stay

Icu units

Icu venous thromboembolism prophylaxis

Ignorance

Willigness

Willingness to help patients

Work and time allotted for hospital are suitable for patients

Work load norms are observed

Working processes are clear and concise

Table C.2: *List of dimensions based on* the documents accepted by the PRISMA methodology

#	Dimension
1	Accessibility
2	Administrative Procedures
3	Affordability
4	Assurance
5	Clinical care process
6	Clinical quality
7	Communication
8	Effectiveness
9	Efficiency
10	Empathy
11	Experimental quality
12	Facility Readiness / Material Resources
13	Fair financing
14	Financial aspects
15	Formality
16	Functionality
17	General satisfaction
18	Governance
19	Health Financing
20	Health management information system (HMIS)
21	Healthscape
22	Hospital Environment
23	Hospital image
24	Hospital services
25	Hospital-acquired conditions
26	Human resources
27	Information technology
28	Infrastructure
29	Interpersonal manner
30	Infrastructure and facilities
31	Optimal health
32	Outcomes
33	Output quality
34	Patient experience
35	Patient experience
36	Patient-centered
37	Perceived quality
38	Personalization
39	Personnel
40	Process
41	Readmission
42	Relationship
43	Reliability
44	Responsiveness
45	Safety
46	Service delivery
47	Sincerity
48	Tangible
49	Technical quality
50	Time spent with doctors
51	Timeliness
52	Trustworthiness
53	Usability
54	Utilization

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Table C.3: *Economy of each country based on Department of Economic and Social Affairs (2022)*

Country	Economy of the Country
Australia	Developed economy
Bangladesh	Developing economy
Belgium	Developed economy
Czech Republic	Developed economy
France	Developed economy
Ireland	Developed economy
Poland	Developed economy
Spain	Developed economy
Netherlands	Developed economy
India	Developing economy
China	Developing economy
Croatia	Developed economy
Ethiopia	Developing economy
Finland	Developed economy
Sweden	Developed economy
Denmark	Developed economy
Norway	Developed economy
Germany	Developed economy
Ghana	Developing economy
Greece	Developed economy
Iran	Developing economy
Italia	Developed economy
Jordan	Developing economy
South Korea	Developing economy
New Zeland	Developed economy
Pakistan	Developing economy
Saudi Arabia	Developing economy
Singapore	Developing economy
South Africa	Developing economy
Taiwan	Developing economy
Thailand	Developing economy
Turkey	Developing economy
UAE	Developing economy
Uganda	Developing economy
UK	Developed economy
US	Developed economy
Vietnam	Developing economy

Table C.4: *Type of health system of each country*

Country	Type of health system
Australia	Beveridge model
Bangladesh	Out-of-Pocket Model
Belgium	Bismarck model
Czech Republic	Bismarck model
France	Bismarck model
Ireland	Beveridge model
Poland	Bismarck model
Spain	Beveridge model
Netherlands	national health insurance model
India	Out-of-Pocket Model
China	Out-of-Pocket Model
Croatia	Beveridge model
Ethiopia	Out-of-Pocket Model
Finland	Beveridge model
Sweden	Beveridge model
Denmark	Beveridge model
Norway	Beveridge model
Germany	Bismarck model
Ghana	Out-of-Pocket Model
Greece	Out-of-Pocket Model
Iran	Beveridge model
Italia	Beveridge model
Jordan	Beveridge model
South Korea	national health insurance model
New Zeland	Beveridge model
Pakistan	Out-of-Pocket Model
Saudi Arabia	Bismarck model
Singapore	Beveridge model
South Africa	Out-of-Pocket Model
Taiwan	national health insurance model
Thailand	Beveridge model
Turkey	Bismarck model
UAE	Beveridge model
Uganda	Out-of-Pocket Model
UK	Beveridge model
US	private health insurance
Vietnam	Out-of-Pocket Model

Table C.5: *Top 10 dimensions vs years*

Top 10 dimensions / year	2000	2001	2010	2011	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Tangible	1	-	1	1	1	1	1	1	1	1	-	1	1	1
Reliability	1	-	1	1	1	1	1	1	1	1	-	1	1	1
Assurance	1	-	1	1	1	1	1	1	1	1	-	1	1	1
Empathy	1	-	1	1	1	1	1	1	1	1	-	1	1	1
Responsiveness	1	1	1	1	1	1	1	1	1	1	-	1	1	1
Safety	-	-	-	-	1	1	-	-	-	-	1	1	1	1
Patient-centered	-	-	-	-	-	1	-	-	1	-	-	-	-	-
Human resources	-	-	-	-	-	1	1	-	-	-	1	-	-	-
Outcomes	-	-	-	-	-	-	1	-	1	1	1	-	1	1
Process	-	-	-	-	-	-	1	-	-	-	-	-	-	-