

## Article

# Hospital Costing Methods: Four Decades of Literature Review

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**Abstract:** This study aims to identify and classify the costing methods used in hospitals in recent decades and to analyze the research carried out in this area, to identify and characterize the main lines of research and the research paradigms used. To this end, a systematic literature review was carried out, mapping 1067 articles collected from the ISI Web of Science and Scopus databases. The articles were selected by two independent researchers. To ensure the quality of the SLR, AMSTAR 2 was used as well as matrices for quantitative studies, and for qualitative articles. Additionally, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) systematic review process was followed to systematize the article selection process. Of the 1067 articles screened, 172 articles met the inclusion criteria. The results point to a growing interest among researchers and a predominance of the positive paradigm, albeit with an increase in interpretative research. There is a growing production of descriptive analyses of hospital processes and the costing of pathologies, with a predominance of the ABC method and analyses of costs and reimbursements for diagnosis-related groups. As a contribution, a conceptual model is proposed that aims to help the performance of hospital institutions, as well as a proposal for a future agenda based on this model.

**Keywords:** cost accounting; management accounting; costing systems; hospital costs



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## 1. Introduction

Healthcare costs now represent a significant proportion of gross domestic product (GDP) in most countries. After the pressure from the recent pandemic crisis, the healthcare sector is facing significant challenges as a result of market demands, competition, and regulation, which are pressuring hospitals to change the way they operate and make decisions. The need to improve the performance of hospitals is evident, but at the same time, there is the possibility of visualizing an epistemological disquiet in the face of the different currents shared in the social sciences, especially in management, where they find great scope for development. The rapid evolution of technological equipment and therapeutic options and the high prices of medical materials, among other factors, create an environment in which it is not only advantageous but necessary to conduct cost studies in hospital institutions (Zheng et al. 2018).

On the other hand, there is a need to create a coherent body of knowledge in the field. Here, it is necessary to take into account the influence of paradigms on the construction of the meaning of reality and the ability to communicate that same reality from an objective or subjective standpoint on the part of the researcher. In this sense, the maturing of management research has aroused growing interest because of its contribution to the construction of structured and coherent knowledge. The importance of understanding epistemological issues related to research and knowledge production in management has led researchers to delve deeper into the subject (Burrell and Morgan 1979; Baxter and Chua 2003; Kakkuri-Knuuttila et al. 2008).

The hospital environment presents both opportunities and challenges for researchers and illustrates how hospitals' choices of costing methods are guided by the institutional envi-

ronment in which they operate. Incorporating the diversity of this institutional environment into research can help researchers make better predictions about costing systems combined with governance models for better performance analyses (Cardinaels and Soderstrom 2013).

In this way, strategic cost management becomes an excellent alternative to be used by organizations to guide decision making and is traditionally seen as the process of assessing the financial impact of management decisions (Marques and Carvalho 2020). Cost accounting can provide relevant information for hospital management through its tools for inventory valuation (absorption costing), control (standard costing), decision making (variable costing, activity-based costing), reimbursement for surgical procedures (diagnosis-related groups (DRGs)), and management artefacts in the area of strategic management (cost-effectiveness analysis, quality costs, statistical analyses) (Vogl et al. 2012; Chapman et al. 2014; Russell et al. 2016).

In this context, the aim is to explore the research carried out into the costing methods used in hospital organizations in recent decades by analyzing the articles published over 42 years, listing the main costing systems and the characteristics of strategic cost management identified in the literature and characterizing the predominant research paradigms, using a protocol adapted from Tranfield et al. (2003) and Massaro et al. (2016). The paradigm shift in healthcare management is creating constant social, political, and economic pressure to deliver high-quality, efficient services at the lowest cost. In addition to complexity, the larger size of hospitals means there are numerous costs to be known. It is necessary to know the cost of surgical procedures, the cost of introducing new drugs or new technologies, and the true cost of hospitalizations or emergency room visits in order to better negotiate with health insurance plans (private hospitals) or government reimbursements (public hospitals). Therefore, there is a need to fill this gap by identifying both the costing methodologies that hospitals are using and where and for what purpose they are being used. The multiparadigmatic endeavor in the field of management accounting is not new, requiring researchers to be careful and take positions about the conceptions of science and knowledge involved (Burrell and Morgan 1979; Morgan 2007). The path proposed for this journey passes through the conceptions of epistemology recognized in the field of science in general and management in particular, presenting the most emblematic characteristics involved in cost accounting, these points being highly relevant for the decision-making process of hospital administrators (Abernethy et al. 2006; Chapman et al. 2016).

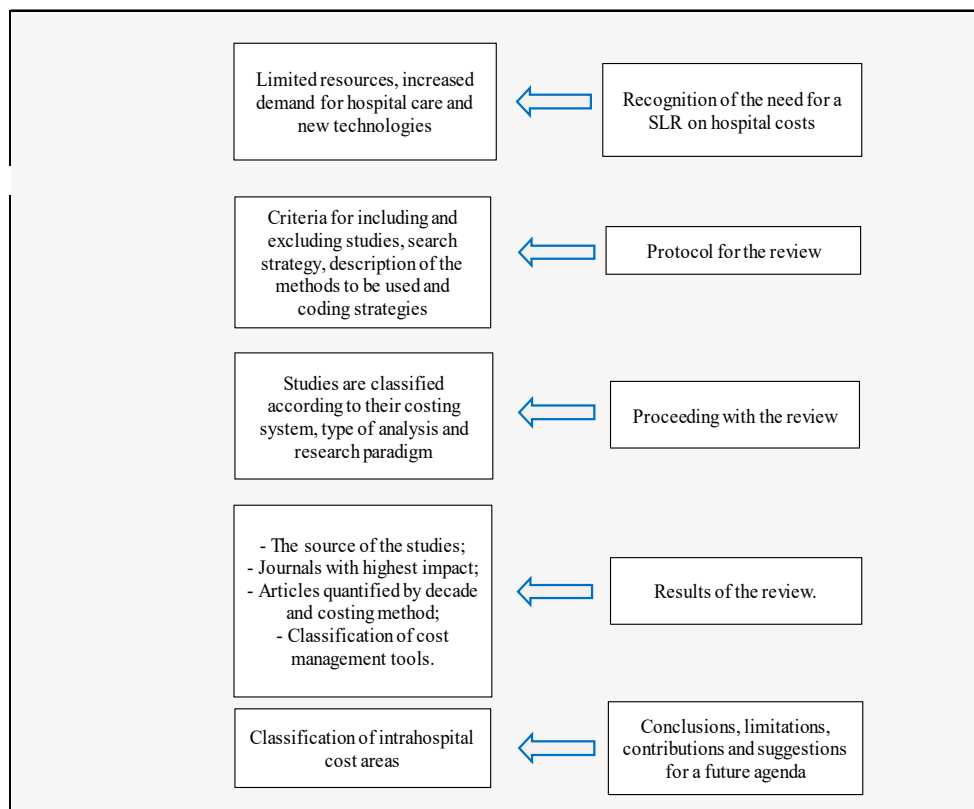
The article contributes to the literature by proposing a model that combines different types of costing in the search for better financial performance of hospital institutions without compromising the quality of services provided to patients (Eldenburg and Krishnan 2006; Labro and Stice-Lawrence 2020). Furthermore, the present study contributes to the identification of possible costs at different levels of the hospital, such as at the level of sectoral processes (laundry service, nutrition service), surgical procedures (appendectomy, cardiac surgery), and introduction of new drug therapies, and for diagnostic and/or therapeutic support exams, in addition to including the costs of processes performed by the multidisciplinary team (doctors, nurses). Analyzing the findings presented here leads to a proposal for a future agenda to guide further research into costing methods in hospital institutions and contribute to better institutional performance.

The remainder of this paper is structured as follows; Following this introduction, Section 2 describes the methodology used to conduct the review. Section 3 presents and discusses the findings. Finally, Section 4 presents the main conclusions, limitations of the study, and an agenda for future research.

## 2. Methodology

In terms of methodology, a systematic literature review (SLR) was used to identify the main costing methods used in hospitals over 42 years, and the selection of trends in studies of hospital costing systems included the review of key articles using guidelines and strategies to increase the specificity of the search. SLRs help us determine what we know about a topic, such as the costing methods used in hospitals. They also help us determine what needs to

be studied (Owens 2021). A SLR involves adopting scientific strategies to reduce bias and to collect, critically appraise, and synthesize all relevant studies that address a specific topic (Cook et al. 1997). Thus, the selection of studies, carried out by two independent researchers, involved the screening of the identified titles and abstracts according to the defined inclusion and exclusion criteria, such as belonging to the “hospital” sector. The review process is shown in Figure 1 and follows the guidelines of Tranfield et al. (2003).



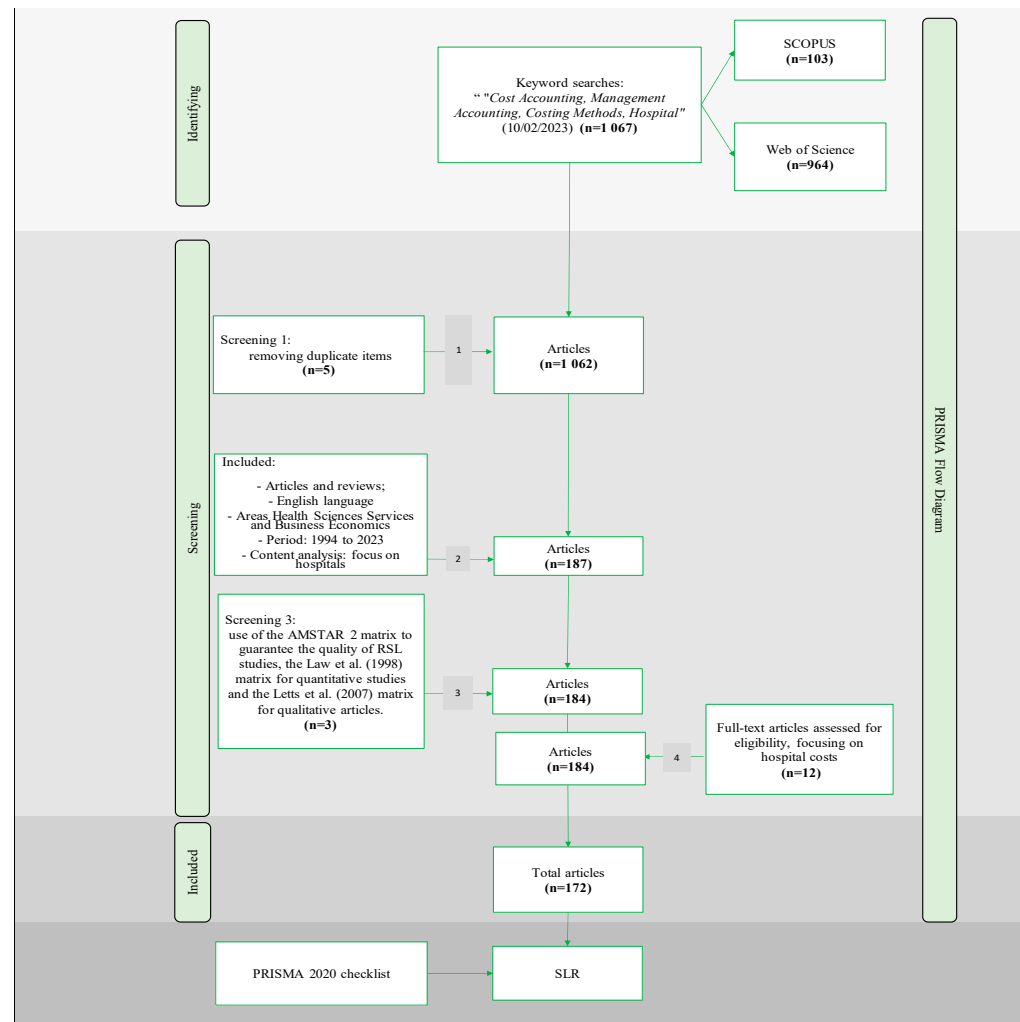
**Figure 1.** Protocol used for SLR (adapted from Tranfield et al. 2003).

According to Tranfield et al. (2003), presenting the search strategy ensures that it can be replicated and makes it possible to detail the ideas that guide the researchers in developing the SLR (Massaro et al. 2016). In this context, it is essential to draw up a protocol identifying the starting question of the review, which methods will be used, which types of studies will be located, which media will be used, and the format of the structure used to analyze the studies (Petticrew and Roberts 2008). The process followed is shown in Figure 1.

To identify relevant studies, we systematically searched two major databases: Scopus and ISI Web of Science databases. In line with previous literature, our study, like most of the bibliometric studies in the fields of business, management, and accounting (e.g., Castriotta et al. 2019; Ferreira 2018; Kroon et al. 2021; Kroon and Alves 2023a, 2023b; Nayak et al. 2022; Rojas-Lamoren et al. 2022; Uyar et al. 2020), analyzes articles written in English and published in peer-reviewed international journals indexed in the Scopus and Web of Science (WOS) databases. These databases produce the highest-quality publications and are considered the most reliable source of knowledge in various scientific fields (Caputo et al. 2021; Guz and Rushchitsky 2009). They are used to ensure the homogeneity of the sample and the reliability of the study’s results (Ferreira 2018; Nayak et al. 2022).

Within the set of options for choosing articles on hospital costing, the keywords “cost accounting”, “management accounting”, “costing systems”, and “hospital costs” were used in the “article title”, “abstract”, “keywords” field, with the addition of the search

expression “and”. A total of 964 articles were obtained from the ISI Web of Science and 103 from the Scopus database (Figure 2). The limitations imposed refer to studies in the form of articles and literature reviews, written in English. Additionally, 5 articles were eliminated as duplicates in both databases. Finally, and regarding the period of searching, the first identified studies were considered.



**Figure 2.** PRISMA flowchart of the study selection process (adapted from [Page et al. 2021](#); [Law et al. 1998](#); [Letts et al. 2007](#)).

“There are number of checklists available to guide the systematic review process that range from a few steps to many; the best choice is often guided by level of expertise and the need for detailed instruction” ([Owens 2021](#), p. 69). A Measurement Tool to Assess Systematic Reviews (AMSTAR 2) was used to ensure the methodological quality of systematic reviews. For quantitative studies, the matrix of [Law et al. \(1998\)](#) was utilized, and for qualitative articles, the matrix of [Letts et al. \(2007\)](#) was used. The assessment matrices aim to qualitatively analyze each article included in this systematic review. Using a grid, created in Excel, the selected articles were divided into qualitative, quantitative, and systematic review categories and submitted to 17 questions (“yes” or “no”), among them, objective was clearly defined, whether the relevant literature was analyzed, whether the design was appropriate to the research question, whether the method was described in detail, among others. Three studies were excluded because they did not meet the required quality standards, and 12 were excluded because they did not have a focus on hospital

costs (see Figure 2). A total of 172 studies focusing on hospital costs were included in this SLR after content analysis of the 184 full articles.

Systematic reviews should be reported in a comprehensive and transparent manner, and to achieve a transparent systematization, this paper follows the method outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (Liberati et al. 2009; Page et al. 2021). The PRISMA flowchart that illustrates the steps in this systematic literature review is shown in Figure 2.

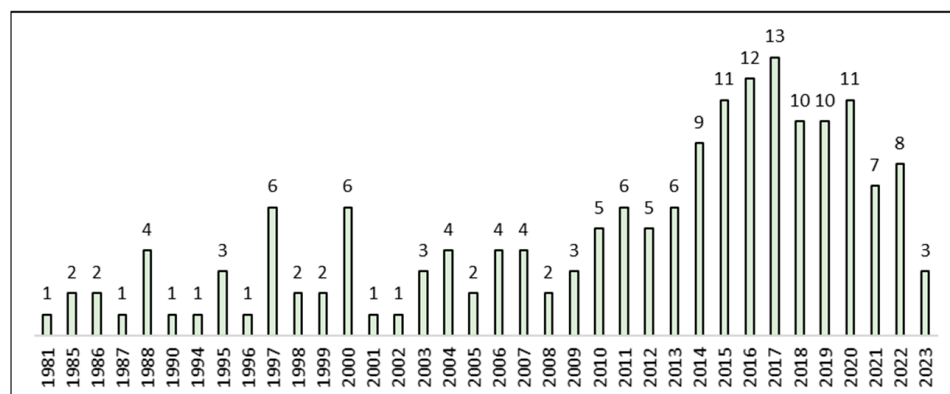
The starting point for this review was to understand how research into hospital costing systems has evolved over the last four decades and the types of analyses referred to, as well as identify the research paradigm followed (Burrell and Morgan 1979).

### 3. Results and Discussion

This section provides the answer to our research question “What is the current status of empirical research on hospital costing methods?” by encompassing the spread of publications in different journals and articles, contexts and research methods, and theoretical paradigms.

#### 3.1. Status of Empirical Research

Figure 3 provides an overview of the evolution of the studies over the last decades, based on the articles selected from the Scopus and ISI Web of Science databases (172 articles), with the number of articles shown by year of publication. It can be seen that more than half (58.13%) of the 42-year articles were published in the last 10 years. This leads us to conclude that the topic is pertinent, relevant, and up-to-date.



**Figure 3.** Evolution of scientific production over the last 42 years (172 articles).

Of the 172 articles included in this study between 1981 and 2023, it can be seen (Table 1) that countries such as South Africa, Austria, Brazil, Chile, South Korea, Denmark, Ghana, Greece, Malaysia, Norway, New Zealand, the Netherlands, Peru, Serbia, and Turkey present 1 study per country and that 15 articles are the result of joint research (Austria, Italy, Portugal, Sweden, Belgium, France, Spain, and Switzerland; the Netherlands and Belgium; Austria and New Zealand; England and Germany; Canada and Spain; South Korea and Thailand; Italy and Croatia). The remaining countries are analyzed in Table 1, taking a 42-year timeline. In individual terms, the scientific output of the USA stands out (27 articles), while the scientific output of all the European Union countries is also noteworthy.

**Table 1.** Geographical distribution of the scientific publications analyzed.

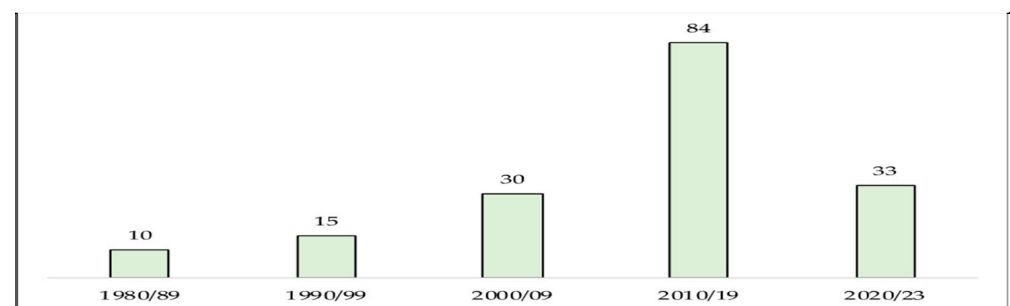
Countries	Studies (n = 172)
EUA	27
England	14
France	12
Germany, Italy—11 studies per country	22
Australia, Japan—9 studies per country	18
Spain, Canada—8 studies per country	16
China, Finland, Iran, Poland, Portugal, Czech Republic, Vietnam, Belgium—4 studies per country	32
Austria, Brazil, Chile, Denmark, Ghana, Greece, Malaysia, Norway, New Zealand, Netherlands, Peru, Serbia, South Africa, Thailand, Turkey, South Korea—1 study per country	16
Joint studies (Austria, Italy, Portugal, Sweden, Belgium, France, Spain, Switzerland; Holland, Belgium; Austria, New Zealand; England, Germany; Canada, Spain; South Korea, Thailand; Italy, Croatia)	15

As for the journals with the highest impact factors among the articles selected, it can be seen that most of the journals are in the health area (Table 2).

**Table 2.** Journals with the highest impact factors.

Journal	Impact Factor (2018)	Number of Articles
Annals of Oncology	13.93	1
International Journal of Radiation Oncology Biology Physics	5.55	1
Value in Health	5.49	3
Heart	5.42	1
JMIR Mhealth and Uhealth	4.54	1
Clinical Orthopaedics and Related Research	4.09	1
Health Technology Assessment	4.06	1
Surgery	3.57	1
Pharmacoeconomics	3.24	3
Journal of Medical Systems	2.83	2
Management Science	2.83	1

Figure 4 analyzes scientific output by decade, showing a clear increase in scientific output in this area. In 2010–2019, scientific production more than doubled compared with the previous decade.

**Figure 4.** Number of articles per decade.

### 3.2. Content Analysis and Development of Hospital Costing Methods

Following [Liberati et al. \(2009\)](#) guidelines, and based on the content analysis of the articles collected, a survey of the costing methods, procedures, and analyses carried out was made. The distribution of costing methods and analyses identified in the literature is shown in Table 3. Complexity in hospital management takes into account (i) the size of the hospital (number of beds), which is considered small (capacity of 50 beds or fewer), medium (51 to 150 beds), and large (151 to 500 beds); (ii) the type of care, general or specialized; and (iii) the complexity of patient care, which can be considered low complexity (general clinical care), medium complexity (intensive care, surgical and anesthetic care, and maternal and child care), and high complexity (in addition to the requirements contained in medium complexity, it also covers radiotherapy, chemotherapy, and/or chronic kidney care). Studies show that the greater the complexity and size of the hospital, the greater the tendency for organizations to control their spending ([Choi 2017](#); [Zhang and Augenbroe 2018](#)). In this context, each hospital organization chooses the best way to analyze its costs with a view to improving competitiveness (private hospitals) and better allocation of resources. There is no consensus on the best format for such controls. The literature indicates that the greater the complexity or size of the hospital, the greater the tendency to use more in-depth financial analysis or more accurate costing methods, such as the ABC method ([Thomson et al. 2019](#)) and cost and effectiveness analysis ([Lunney et al. 2019](#)). It is important to note that cost systems are commonly confused with costing methods, but the difference is that cost systems accumulate cost information and costing methods calculate the cost of products or services, which characterize the types (for example, the cost of a particular surgery, the cost of a daily hospital stay, performance analysis of a sector such as the emergency service). It is therefore possible to carry out cost analysis using various costing methods and different types of business analysis. Studies show that there is no consensus on which costing method is most efficient. It is common for the same organization to use a costing method in conjunction with another type of analysis, such as calculating the cost of a hospitalization after the use of a certain drug in conjunction with an analysis of the cost-effectiveness of the drug in the patient's recovery.

**Table 3.** Evolution of costing methods and types of analyses by decade.

Costing Methods and Analyses	1980–1989	1990–1999	2000–2009	2010–2019	2020–2023
Descriptive analysis	0	0	10	28	12
Activity-based costing (ABC)	0	4	4	13	9
Management models, methods, and tools	1	3	4	11	4
Costs of diagnosis-related groups (DRGs)	1	1	3	8	8
Standard cost	4	4	0	4	0
ABC costing and other methods	0	0	2	5	0
Cost-effectiveness analyses	0	1	1	4	0
Miscellaneous mixed costs	0	2	2	2	0
Departmental costs	2	0	1	0	0
Average cost	0	0	0	2	0
Variable cost	0	0	0	2	0
DRG costs and other methods	2	0	0	0	0
Econometrics	0	0	2	0	0
Microcosting	0	0	0	1	0
Statistical analysis; marginal cost	0	0	0	2	0
Systematic literature review	0	0	1	2	0



It is important to note that the absorption costing method is recommended by the public tax system and is the most widely used in the public health context. In this study, costing prevails in private hospital institutions, which explains why this method is not included in Table 3. The same is true of the RKW and TDABC costing methods. Both are advanced costing methods that usually require a well-parameterized computerized system to be used in the hospital context. The fact that they were not used in this study indicates that there is little investment in more robust systems or that managers may be unfamiliar with the methods.

The issue of hospital costs is relevant given the importance of these institutions in the social and economic spheres, as well as for their management and managers. In the hospital context, which has high costs, scarce resources, and pressure for quality and good services, knowing the cost information is essential for efficient management (Cinquini et al. 2009), as well as for improving hospital transparency (Mercier and Naro 2014). Controlling costs in healthcare is a challenge (Neriz et al. 2014) due to the complexity of its products and services (Mercier and Naro 2014) and the variety of human, financial, material, and technological resources, making efficient cost management essential. Faced with this complexity, cost accounting can provide relevant information for hospital management through its tools for inventory valuation (absorption costing), control (standard costing), decision making (variable costing, activity-based costing), and managerial artefacts in the field of strategic management (target costing, cost determinants, competitor cost analysis, cost-effectiveness analysis, ABC/ABM, quality costs), but bearing in mind that the use of costing methods is not mutually exclusive, and sometimes a combination of methods is used in the same institution.

Analyzing the evolution of costing systems over time, we can see that in the 1980s, standard costing was used to forecast and control costs, sometimes based on models used in industry. It focused on evaluating performance and analyzing variances in hospital activities (Rinaldo et al. 1981; Bennett 1985). Various processes have been studied to analyze the costs of diagnostic tests (Tarbit 1986; Gray et al. 1987; Bretland 1988), the influence of nursing staff in containing costs (Rosenbaum et al. 1988), and the emerging need to obtain more precise costs to guide the technical and administrative decisions of the hospital institution (De Mars Martin and Boyer 1985).

Standard costing is a planned measure that is used for comparisons with real or historical costs (those incurred and recorded by the accounting department) to identify variances, which are analyzed and corrected to keep operational performance within predetermined guidelines (Martins 2000).

Absorption costing, on the other hand, is characterized by the appropriation of all internal operating cycle costs to the final cost bearers. According to Horngren et al. (2000), in absorption costing, all costs, both variable and fixed, are considered inventory costs. The main advantage lies in the fact that absorption costing is accepted for the preparation of financial statements for external use and for obtaining long-term solutions, where absorption costing information is normally indicated. As for RKW, the main characteristic of this method is the division of the organization into cost centers. Costs are allocated to the centers using distribution bases and then passed on to the products by work units. The most widely observed application of the costing method is in decisions involving sales prices, where the main advantage is the fact that the entire cost of producing, managing, and selling is allocated to the products (Hartmann 2013).

Standard costing continued to be used in the 1990s, providing an appropriate set of accounting information, focused on the medical professional (Eldenburger 1994) or sometimes on critical care services, identifying the intensive use of resources in the provision of healthcare (Mahon et al. 1997) or the costs of unused beds (Sopariwala 1997). Knowledge of financial and operational costs in the health sector has increased the need to make better use of resources. In this context, the first research was carried out on the use of activity-based costing to enable organizations to restructure their practices internally and purify costs by type of pathology (Kempeneers et al. 1995; Eastaugh 1998), always seeking to improve the method for use in hospitals (Ryan 1997) and in the purchase of medical supplies (Zeller et al. 1999). Management



models, methods, and tools have also been introduced to verify cost-effectiveness and to analyze the efficiency of resource use and process costs (Edbrooke et al. 1995; Powe et al. 1996; Trenchard and Dixon 1997a, 1997b).

Descriptive analysis is a set of analytical techniques used to summarize all the data collected in a given investigation. These analyses are organized, providing reports that present reliable information to support decision making. This tool has been mainly used since the 2000s and is beginning to be used more frequently in work aimed at developing effective approaches to identifying clusters of people at higher risk of future high use of health services (Reuben et al. 2002), establishing the cost per day of hospitalization (Boonen et al. 2004), to understand the elements that make up the costs of hospitalizations for specific pathologies (Orrick et al. 2004; Riewpaiboon et al. 2007; Prescott et al. 2007; Weaver et al. 2009), to analyze the cost-effectiveness of using certain drugs over others (Jakovljevic et al. 2008; Lynch et al. 2009) or the use of environments and spaces, such as operating theaters (Stahl et al. 2006). The ABC method continues to be used in this third decade as a tool for calculating the costs of diagnostic services (Glick et al. 2000; Laurila et al. 2000) to identify the services that are generating the most revenue and those that are operating at a loss (Emmett and Forget 2005; Cao et al. 2006a, 2006b). Combinations of ABC with other methods are also beginning to emerge.

In this decade, the diagnosis-related groups (DRGs) system began to gain importance. It seeks to relate the types of patients treated by the hospital with the resources consumed during the hospitalization period, creating categories of patients that are similar in their clinical characteristics and their resource consumption (Noronha et al. 1991). Studies from this perspective have been carried out in this period to determine the direct costs associated with the treatment of pathologies (Rigby and Litt 2000; Levy et al. 2003) and the specific relative costs of a wide variety of health policy and planning applications (Ghaffari et al. 2009). Furthermore, it becomes relevant to incorporate hospital costing into its institutional context in the health area. In many countries, hospital costing is linked to DRGs. The costing data feed into the DRG systems (Busse et al. 2008; Vogl et al. 2012; Chapman et al. 2014) to define DRG tariffs for reimbursement of hospital care. In the DRG system, there are usually government guidelines that prescribe how to cost and, therefore, the costing method to be used (Chapman et al. 2014).

Other hospital costing systems are often a mixture of different methods, which makes it difficult to categorize a costing method/system into ABC or traditional costing, for example (Chapman et al. 2016). Studies using specific types of costing rather than mixed costing were identified in this study.

Descriptive analyses to better understand resource use in hospital processes have predominated from 2010 to date (Chung et al. 2010; Ghate et al. 2011; Raven et al. 2011; Zulman et al. 2014; Corral et al. 2015; Joret et al. 2016; Lee et al. 2016; Bertoni et al. 2017; Plantier et al. 2017; Jackson et al. 2018; Loizzo et al. 2018; Mori and Nyabakari 2023; Saraswathula et al. 2023) for the costs of pathologies and palliative care. Management tools, methods, and models are also used to estimate and analyze the unit cost of providing clinical services (Monnickendam and de Asmundis 2018), improving the performance of efficiency standards (Rego et al. 2010), for the strategic and operational planning and management of key hospital resources (Harper et al. 2010), for the cost of pathologies and the influence of doctors and nurses on cost control (Hongoro and Dinat 2011; Nakagawa et al. 2011; Myint et al. 2011; Crane et al. 2013; Ektare et al. 2015; Kim et al. 2018), and for comparisons between drug therapies (Maniadakis et al. 2017).

Among the costing methods presented in the literature, and which have already been the subject of empirical studies carried out in hospital institutions, the following stand out: activity-based costing (ABC), time-driven ABC, and Reichskuratorium für Wirtschaftlichkeit (RKW), emphasizing that no costing method is capable of meeting all the information needs of managers, so they cannot be considered mutually exclusive, but rather complementary. Product/service costing systems based on a single indirect cost allocation criterion tend not to reflect the costs associated with products and services in

highly complex environments. In this way, decisions on prices, product mix, and production processes were based on incomplete information, which was usually only detected too late, often due to successive negative results and the company's loss of competitiveness (Cooper and Kaplan 1988a, 1988b). It was in this context that the concept of activity-based costing (ABC) emerged, presented and strongly publicized by Cooper and Kaplan (1991).

Kaplan and Anderson (2004), without abandoning the ABC concept, developed a simpler approach that circumvents some of its limitations, such as slowness, inflexibility, and costly implementation and maintenance. This method was called time-driven activity-based costing (TDABC) by its creators. According to the authors, this system is easier to implement and more flexible, which makes it simpler to maintain, as well as providing other benefits to organizations, such as making it easier to consider very complex activities and measuring unused capacity. The creators of TDABC also mention that this new methodology requires less research and implementation time than traditional ABC because it replaces transactional cost drivers, which measure the number of times an activity is carried out, with duration cost drivers, which estimate the time needed to complete a task (Kaplan and Anderson 2004). In conventional ABC, time drivers are only used after the costs have already been assigned to each activity (Kaplan and Anderson 2007). The major distinction between the use of time drivers in TDABC and conventional ABC is that TDABC does not require the first phase of distributing costs by activities (which is responsible for a significant part of the difficulties and inflexibility in conventional ABC), and resource costs are first estimated and then the time used in each activity to obtain each product is used to assign the costs to the products (Kaplan and Anderson 2007). The objectives for which TDABC can be used are varied, particularly in terms of improving processes, providing an analytical basis for analyzing the costs of departmental support, and increasing company profits through better analysis (Popesko 2013; Labro and Stice-Lawrence 2020; Koster et al. 2023). The ABC method, alone or in combination with other tools, appears to be dominant over other specific costing methods because it is a powerful tool for supporting the decision-making process of hospital managers, especially in terms of resource allocation and redesigning the new hospital organization. It is used to cost pathologies (Dugel and Tong 2011; Akhavan et al. 2016; Afzali et al. 2017; Cardoso et al. 2023), diagnostic therapies (Atif et al. 2012; Kawamata et al. 2017; Bauer-Nilsen et al. 2018), surgical procedures (Au and Rudmik 2013; Özyapici and Taniş 2017), various hospital processes (Neriz et al. 2014; Popesko et al. 2015; Javid et al. 2016), and costs involving healthcare professionals (Balakrishnan et al. 2015; Zheng et al. 2018). In turn, the DRG system is also highlighted in recent research, being used to determine the value of hospital reimbursements (Vogl 2012), to support regulators in improving cost schemes (Vogl 2013), and to identify treatment approaches for various pathologies (Merollini et al. 2013; Eti et al. 2014; Hidalgo-Vega et al. 2014; Russell et al. 2016).

### 3.3. Research Paradigms and Tools for Hospital Cost Management

In the search for a paradigmatic classification of research in organizational studies, many authors have used the criterion of a methodological approach for this purpose, where qualitative research would be classified as interpretivist and research with a quantitative approach would be positivist or functionalist, although interpretivist research can use quantitative methods in a complementary or auxiliary way, excluding the possibility of using them as the main method. However, the paradigm situates the researcher's perceptions and choices at an earlier stage in the work, and the methodological stage can vary enormously within the same paradigm. Even given the important connection between paradigm and method, a variety of methods, such as case studies and interviews, can appear from both a positivist and interpretivist perspective, depending solely on the researcher's position about the phenomenon being studied (Vergara 2005).

However, within the functionalist paradigm, many investigations with a quantitative approach have been associated with a positivist position of doing science. Quantitative research in organizational studies may or may not be positivist, depending on the compo-

nents that are present in the conduct of the research. Particular features of positivism, such as objectivity, generalization, and distance from the researcher are hardly practicable in this field of study, despite the methodological care taken by researchers. In this way, we can see elements for two different possibilities in the classification of paradigmatic positions: some quantitative research can be classified as interpretivist given its subjectivity, joint construction of the reality being researched, and the involvement of the researcher with the object of study; other more functionalist research loses its positivist characteristics because of the missing elements and inhabits the interface between functionalism and interpretivism. This approach is compatible with [Burrell and Morgan's \(1979\)](#) proposal, given their conception of a continuum between the paradigms listed by the authors. [Hopper and Powell \(1985\)](#) discuss the dominant scientific method in accounting research, outlining three categories of research normally adopted in accounting: mainstream, interpretive, and critical.

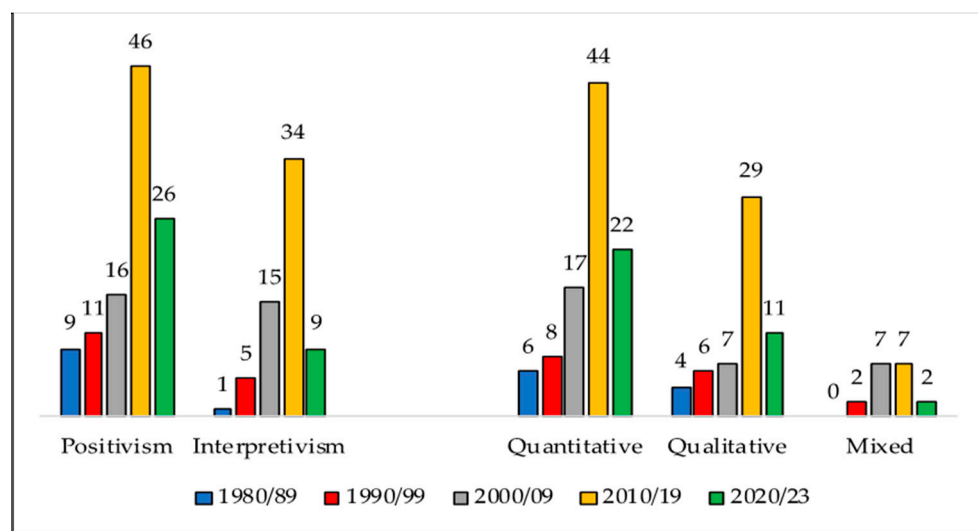
[Burrell and Morgan \(1979\)](#) propose that social theories can be classified according to two sets of principles: the nature of the social sciences and the nature of society. About the nature of the social sciences, the authors identify ontological, epistemological, human nature, and methodological premises. Two different types of approach are presented: the subjectivist, which emphasizes the importance of the subjective experiences of the subjects in the structure of the social world, and the objectivist, which treats the social world as something external to the individual, and therefore susceptible to being described in terms of universal laws that explain and predict the observed reality. About the nature of society, [Burrell and Morgan \(1979\)](#) set out two other approaches: the sociology of regulation, made up of theories that seek to explain society by emphasizing its cohesion, and the sociology of radical change, which emphasizes the search for explanations for radical changes, for the structural conflicts perceived as peculiar to modern societies. In this context, the two sets of premises form four distinct paradigms in the social sciences: radical humanism, radical structuralism, interpretive, and functionalist (or positivist).

As in other recent studies ([Rodrigues et al. 2021, 2022](#)), the taxonomy of [Hopper and Powell \(1985\)](#) was used to classify the research paradigms used in the empirical studies published.

The research to be carried out is conditioned from the outset by several factors, such as the research question, the resources available, and the way the researcher sees science and the reality that surrounds them. According to [Major \(2017\)](#), positivists see reality as a concrete, objective structure that is external to the researcher and can be reduced to explanatory (independent) and dependent variables through laws that express their relationship. Despite the criticisms levelled at positivist research ([Hopwood 2007](#)), such as the fact that it corresponds to attempts at numerical representation of interpretative concepts, it continues to dominate, accounting for 62.79% of the research carried out in this study, unlike radical studies, which were nowhere to be seen. As for how the data were obtained, quantitative studies prevailed with 56.4%. However, after a slight decline in the 1990s, their relative weight has remained constant, and they currently account for around 45.3% (44/97) of the studies analyzed (see Figure 5).

In terms of paradigm, positive research leads the way, but interpretive research has been growing significantly since the 1990s (Figure 5).

In an attempt to summarize the information gathered on costing methods from the 172 articles analyzed, Table 4 shows the main tools and artefacts observed in hospital cost management. In the hospital context, the studies indicate that the main costing method used is ABC ([Kempeneers et al. 1995](#); [Dugel and Tong 2011](#); [Bayati et al. 2015](#); [Afzali et al. 2017](#); [Bauer-Nilsen et al. 2018](#)) despite the complexity involved in allocating indirect costs. This is followed by mixed costing ([Rinaldo et al. 1981](#); [Orloff et al. 1990](#); [Levy-Piedbois et al. 2000](#); [Bermudez-Tamayo et al. 2014](#)) and standard costing ([Bennett 1985](#); [Mahon et al. 1997](#); [Colin et al. 2010](#); [Cyganska 2017](#); [Tran et al. 2018](#)).



**Figure 5.** The evolution of the research paradigms and approaches by decade.

**Table 4.** Classification of studies in terms of cost management tools.

Elements for	Variables	Number of Articles	Frequency (%)	Total (%)
Measurement methods	Activity-based cost (ABC)	31	18.02	45.93
	Mixed cost	19	11.05	
	Standard cost	16	9.30	
	Variable costing, departmental costing, microcosting	13	7.56	
Costs for decision making and control	Break-even point, contribution margin, management models, methods and tools, cost-effectiveness	23	13.37	13.37
Strategic cost management	Cost-effectiveness, competitor analysis, value chain analysis	46	26.74	38.37
	Diagnosis-related groups analyses	14	8.14	
	Statistical analyses	3	1.74	
	Quality costs	3	1.74	
Others	Systematic literature review	4	2.33	2.33
Total		172	100	100

In the context of costs for decision-making and control purposes, several studies refer to the use of management methods or tools (Tarbit 1986; Powe et al. 1996; Oostenbrink et al. 2003; Harper et al. 2010; Maniadakis et al. 2017; Kim et al. 2018) that are extremely important for better business management, supporting problem solving, increasing revenue, reducing expenses, and innovation.

In strategic cost management, the analyses of the cost-effectiveness of operations have the largest number of studies (Bertapelle et al. 2015; Salas et al. 2016; Espinoza et al. 2017; Mortuaire et al. 2018) and reflect the benefits that come from the right actions performed in the right way, resulting in gains in competitiveness against competitors. A growing body of research analyzing the reimbursement generated by DRG management shows that the classification system, which relates the types of patients treated by a hospital to the resources consumed during their stay, creating categories of patients with similar clinical characteristics and resource consumption, is increasingly being implemented by national

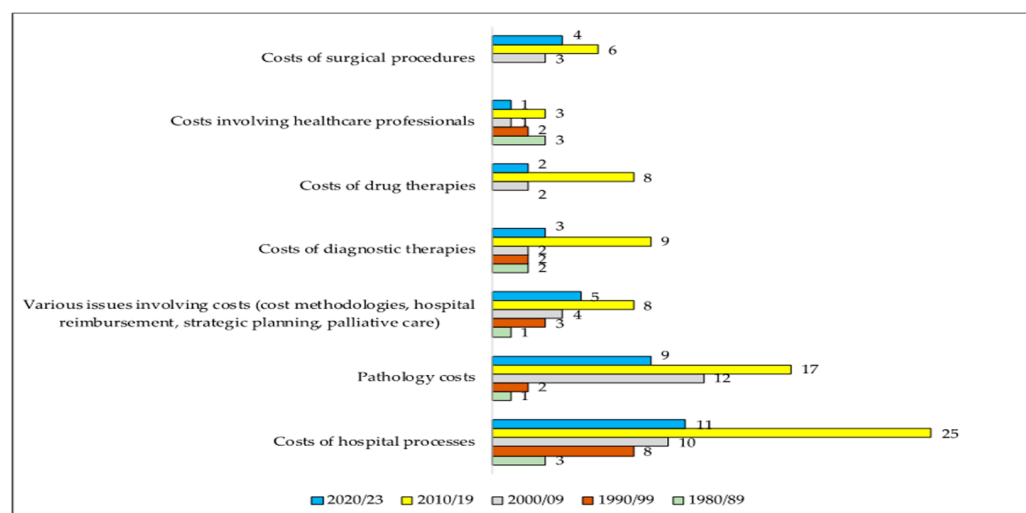
health systems (Ghaffari et al. 2009; Vogl 2013; Eti et al. 2014; Hidalgo-Vega et al. 2014; Russell et al. 2016).

### 3.4. Main Lines of Research and Their Development

The next step is to outline the main lines of research in hospital costing to identify the approaches and contexts for developing a future agenda. Table 5 summarizes the studies analyzed and classified according to the type of hospital costing, while Figure 6 shows the evolution of costing types by decade.

**Table 5.** Classification of the types of in-hospital costs.

Hospital Costs	Number of Articles	Frequency (%)
Costs of hospital processes (examples: laundry, material, and sterilization, nutrition)	57	33.1
Treatment costs for specific pathologies	41	23.8
Miscellaneous issues involving hospital costs (examples: cost methodologies, hospital reimbursement, strategic planning)	21	12.2
Costs of diagnostic therapies (examples: X-ray, ultrasound, tomography, echocardiogram, cardiac catheterization, laboratory tests)	18	10.5
Costs of surgical procedures (examples: gastroplasty, appendectomy, cholecystectomy)	13	7.6
Drug therapy costs	12	7
Costs involving health professionals (examples: doctors, nurses, physiotherapists, speech therapists)	10	5.8
	172	100



**Figure 6.** Evolution of hospital costs.

Categorizing the possible types of in-hospital costing makes it possible to (i) stratify the organization's internal control processes for improvement and decision support purposes; (ii) provide specific costings of patient care by type of pathology or type of diagnostic test or surgery performed, allowing comparison with reimbursement by private health plans and medical insurance schemes; and (iii) provide information on the cost-effectiveness of drug treatments. (iv) Another relevant point concerns the involvement of a multidisciplinary



team and how this can change, positively or negatively, the cost of hospital care during the patient's treatment.

The manager of a healthcare institution needs to have full control of hospital costs, monitoring metrics, data, and concepts that have a direct impact on the budget, such as the amount spent on materials, and the waiting time for patient care or the period of equipment idleness. Beyond the basic control of the inflow and outflow of resources, the manager must analyze different aspects and hospital activities that can influence the final bill. Efficient hospital cost management makes it possible to identify the institution's main bottlenecks, from operational issues to infrastructure and/or flaws in care flows. With data control, it is also possible to recognize areas and operations that can be optimized and strengthened to generate even better results. In this way, costing derived from reliable data analysis is a process that supports managerial and strategic decision making for the organization.

Notably, the majority of research (33.1%) focuses on the internal control of processes carried out in hospitals that focus on the provision of health services, but which require the internal support of different sectors working in a wide range of areas, such as hygiene, nutrition, warehousing, and laundry, contrasting the most varied business segments that have specific needs and interrelate, making the internal processes of such organizations abstruse (Campos and Marques 2011). However, studies analyzing the costs of specific pathologies (23.8%) and indications for surgical procedures (7.6%) have been attracting the interest of researchers, especially when drug treatments, diagnoses, and the use of orthoses, prostheses, and special materials have a significant financial impact and are reflected in patients' quality of life. The application of new technologies (10.5%) and drug therapies (7%) translates into more expensive diagnostic and therapeutic methods, which are increasingly specialized and require evidence-based medicine to be verified for appropriate use. Another topic that has been explored is the involvement of healthcare professionals (5.8%), in influencing the reduction of hospital costs, both by promoting the appropriate use of resources and by obtaining information that makes it possible to know the costs and that helps to raise awareness and organizational commitment. This study also reveals the researchers' concern about coming up with new costing models, methods, and strategies (12.2%) that help integrate hospital management and optimize resources to improve process efficiency.

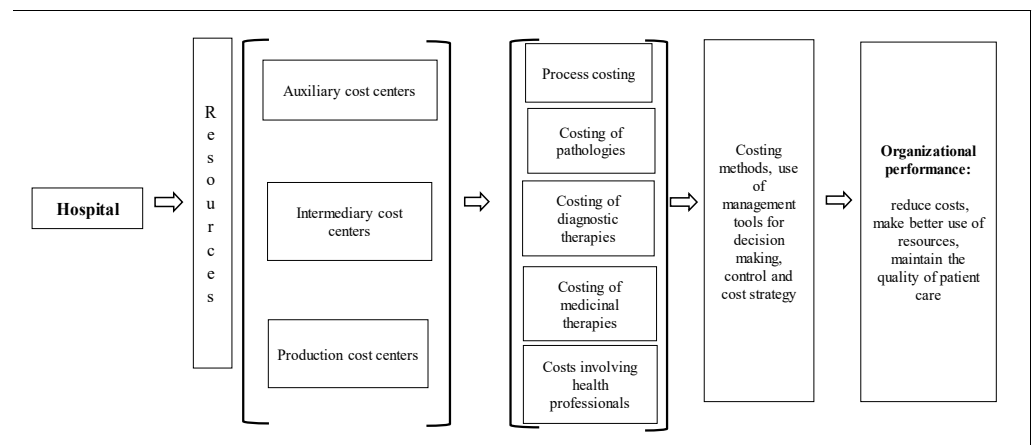
Based on the above, a model is presented, identifying the main types of costing (Figure 7), as a tool for improving the performance of hospital organizations based on the application of grounded theory. The emphasis of grounded theory is on learning from the data and not from an existing theoretical view (Strauss and Corbin 1990). According to Urquhart (2013), grounded theory can be used in positivist, interpretivist, or critical studies. In other words, grounded theory is a method that can be used regardless of the researcher's epistemological stance. The conceptual model (Figure 7) is derived from the qualitative analysis of the content of the studies reviewed in the SLR and reflects the five major themes that researchers have studied over several decades, as shown in Figure 6.

A hospital has a system with very complex processes. It has costs and requirements that involve multiple factors. Adopting intrahospital methods and processes is essential for measuring costs, knowing where they come from and what they are used for, and identifying bottlenecks and waste. Similarly, knowing the costs of implementing new drug therapies (e.g., new cancer drugs) or using new diagnostic therapies (e.g., vascular angiography instead of ultrasound) enables managers to compare costs and benefits, in terms of both investment and quality of patient care.

This model reflects the concern of scholars to understand and help, through research, to improve hospital organizational performance, which, in the global context, is currently under pressure for more efficient management, with greater reduction and control of scarce resources, within the framework of the sociodemographic characteristics of each country, for greater and better use of the health system. According to Cunha and Corrêa (2013), these characteristics include an ageing population, the trend towards growth in gross domestic product (GDP) in developing countries, the universalist constitutional model of



healthcare, and public spending on health, which represents a considerable proportion of the national GDP.



**Figure 7.** Costing model to help hospital organizational performance.

#### 4. Conclusions

As far as we know, this is the first work to simultaneously study the characteristics of hospital costing systems, their evolution, and the epistemological and ontological positioning of the studies analyzed from the point of view of accounting research paradigms. A prevalence of positivist (or functionalist) research was identified in most of the studies analyzed (Hopper and Powell 1985; Hopper 2005), although interpretive research has been gaining relevance over the last two decades. It should also be noted that no radical humanist or structuralist articles were identified (Burrell and Morgan 1979). The role of management accounting research for positivists is therefore to accurately and objectively reflect reality. For interpretivists, this role is seen as providing theoretical and subjective explanations of accounting practices; it is about understanding the context and its influence on practice. Thus, although positive research continues to predominate, there has been a clear growth in interpretive research since the 1990s.

Various tools, such as measurement methods, costs for decision making and control, and other strategic elements for the application and management of costs in hospitals, are recurring themes in the studies and highlight the importance attributed to more efficient and transparent management of these organizations (Wenzel 1987; Ellram 2006). About the technical dimension, there was a predilection for quantitative studies (56.40%) to the detriment of qualitative studies (33.14%) or mixed studies (10.47%). In evolutionary terms, there has been a trend in recent years towards studies that carry out descriptive analyses of hospital processes and costing of various pathologies, with a predominance of the activity-based costing method (ABC) and analyses of costs and reimbursements appropriate to homogeneous diagnosis groups (DRG), confirming the findings of different authors (Chapman et al. 2014; Keel et al. 2020; Fang et al. 2021). In the period analyzed, few studies were identified that focused on systematic literature reviews (Jarlier and Charvet-Protat 2000; Whiting et al. 2015; Alves et al. 2018), and all of them had a narrower scope.

The main costing systems have been identified here, as well as the elements of strategic hospital cost management that are most used and pointed out in the literature, demonstrating the evolution of research in this area, including pointing out the paradigms used. A relevant point of the present study is the identification of possible costs at different organizational levels: (i) costs of sectoral processes (laundry service, nutrition service), (ii) costs of surgical procedures (appendix surgery, heart surgery), (iii) costs of introducing new drug therapies, (iv) funding for diagnostic and/or therapeutic support exams, (v) and costs involving processes carried out by the multidisciplinary team (doctors, nurses). Another contribution of this work is the development of a model that takes into account the various

types of costing identified in hospitals, which can help hospital administrators in their evaluations and decision making. It also points the way to new studies that could provide alternatives for better performance in these institutions.

To this end, a future research agenda based on these types of funding is proposed. It would be relevant, as a contribution to the literature, to carry out these studies with more than one costing method in order to compare and discuss the results obtained: (i) costs of hospital processes (carry out surveys of the processes that have the greatest impact on the direct costs of hospitals and cost them, comparing them with institutions with the same characteristics; undertake cost analyses to identify the advantages and disadvantages of outsourcing hospital services); (ii) costs for specific pathologies (cost per day of hospitalization (surgical and clinical) by type of medical specialty and comparison with national health service (NHS) reimbursement and between countries with similar NHS); (iii) miscellaneous issues involving hospital costs (add new elements, by type of costing, to test the model proposed in this study); (iv) costs of diagnostic therapies (not only reviewing the costs of diagnostic tests, but also linking them to demand by medical specialty and triangulating with performance analysis by unit (radiology, ultrasound, computed tomography, clinical analysis, magnetic resonance imaging, diagnostic hemodynamic)); (v) drug therapy costs (analyze the best alternatives for drug use by type of medical specialty and associated pathologies); (vi) costs involving health professionals (develop studies involving the hospital's multiprofessional team to explore alternatives for better resource allocation); (vii) and costs of surgical procedures (list the operations that have the greatest impact on resource consumption (medical inputs) and continue the costing process, comparing the methods used; procedures with a low financial impact but which are performed frequently should also be costed).

Despite the various advantages and contributions, the study has some limitations that must be taken into account. First, the articles were collected from only two peer-reviewed literature databases (WoS and Scopus), and second, the study focused only on hospital institutions; a study with greater diversity could cover other health institutions, such as health posts, medical clinics, and diagnostic and therapeutic services.

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