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RESEARCH TREND ON HEALTHCARE (HOSPITAL FINANCIAL) FAILURE AND ACTIVITY-BASED COSTING METHODS: A BIBLIOMETRIC ANALYSIS

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Abstract

Hospital financial failure means bankrupt in economic point-of-view. While from the patient care perspective, it can compromise healthcare delivery and deliver possible harm due to substandard services. Leveraging digitalization and information technology can significantly enhance financial management, improve efficiency, and ultimately support sustainable healthcare services. This bibliometric analysis through Scopus database. Retrieved articles were examined based on annual publication numbers, contributing countries, subject areas, authors, and cited documents. Visual analysis was done using VOSviewer to provided insights into word co-occurrence in clusters and R Studio's Bibliometrix package was employed to identify the most contributing countries and the most cited publications. The analysis on total 429 articles revealed that healthcare and activity-based costing is an emerging trend, with a growing number of publications each year. The United States emerged as the leading country in this research area, though other nations also contributed significantly. Medicine was identified as the most common subject area. VOSviewer analysis identified seven clusters related to the topic. Activity-based costing has evolved to accurately assess product costs in changing business landscapes, particularly in healthcare, where it helps optimize profits. The findings indicate a growing awareness of the importance of financial management in sustaining healthcare services globally. However, the study's reliance on a single database and lack of a comprehensive systematic review limit its scope, potentially excluding relevant research from other sources.

Keywords: *Healthcare; Financial; Activity-Based Costing; Bibliometric*

1. Introduction

Financial failure is defined as the inability of a company to pay its financial obligations as they fall due. Apart from that, financial failure can also mean entering the bankruptcy process. Financial failure is a problem characterized by the company's failure to pay creditors and shareholders or bankruptcy, which causes the company's operations to stop. Predicting financial failure can prevent a company from going bankrupt and avoid significant losses for shareholders, creditors, managers, and other interests (Ozler, Isikcelik, Durur, & Gunaltay, 2022).

Hospitals have a primary focus on managing or serving human health problems. However, for continuity of service, the financial condition of health facilities must be appropriate. Hospitals account for 40% overall healthcare costs, in which the care in hospital setting is the biggest contributor to these costs.(Dubas-Jakóbczyk et al., 2022) Hospital financial is an important part of healthcare, as one's financial condition in healthcare setting might compromise some aspects of patient care. For example, hospital that is facing financial failure will try to minimize spending on patient care (intravenous fluid, drugs) and causes suboptimal care. In extreme case such as cardiopulmonary resuscitation, epinephrine, a mandatory drug in this setting may not be given in

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optimal dosage that leads to death (Akinleye, McNutt, Lazariu, & McLaughlin, 2019).
Hospitals also face financial issues such as medical and surgical care evolution, insurance coverage, and corporate operating expenses. In general, these aspects make the hospital's net profit margin smaller. Hospitals are also faced with the need to provide consistently high-quality medical services. Between 2011 and 2019, data shows more hospitals closed than opened. Of the 69 hospitals that closed during 2018 and 2019 in Indonesia, most said financial reasons were the leading cause of closure. In the face of financial problems, companies often reduce their workforce, eliminate services (e.g., specialized care), and cut funding for medical investment or service development. If the hospital's efforts are unsuccessful in halting the downward trend in financial performance, bankruptcy is likely. Therefore, financial analysis is needed so that companies can take preventive action in unfavorable situations. Hence, analysis of financial failure in health institutions is deemed necessary (Enumah & Chang, 2021; Landry & Landry, 2009).

Digitalization and information technology continue to develop, making human life easier and faster. Digitalization can be associated with automation and integration of digital technology in business processes, thereby providing faster and better services. One area of digital transformation that has an important role is financial management. In improving hospital finances, technological developments can increase operational efficiency by automating financial processes and real-time access to financial data to make decision-making faster and more accurate (Stoyancheva & Angelova, 2021).

2. Method

Bibliometric analysis is a branch of library and information science which deals with quantitative analysis of data. This method relies on data from journals, titles, authors, addresses, abstracts, and published literature references using databases (Manoj Kumar L, George, & P S, 2023). A bibliometric analysis was used in a three-step method to achieve the research objectives, using the Arksey and O'Malley methodology that summarizes and addresses significant study subjects. This approach summarizes and addresses the significant study subjects, thus highlighting research needs without sacrificing robustness and quality evaluation. The research method also obtains data from database (Arskey & O'Malley, 2005). In the case of our research, we used Scopus data, which conveniently classified the sought topic. Another program, VOSviewer was also used as an analysis tool for mapping topics and constructing bibliometric maps. This software was developed by Leiden University in the Netherlands to realize the mining of literature authors, journals, countries, and other informations through the means of bibliometrics (Luo, Wu, Niu, & Huang, 2022; van Eck & Waltman, 2017). We used another software called R Studio (version 4.3.1.) to analyze the data using the Bibliometrix Package (Aria & Cuccurullo, 2017). The use of bibliometrics is aimed to show the knowledge structure, evolution, and trends in the research field seeked. This can provide a spatial representation, using mapping to understand the physical proximity and relative position, to understand relationships between disciplines, fields, papers, or authors (Luo et al., 2022).

Using the following keywords, the Scopus database located 568 documents. The search strategy used was: (TITLE-ABS-KEY ("Hospital") AND TITLE-ABS-KEY ("Activity Based Costing" OR "Activity-Based Costing")) AND PUBYEAR > 1999 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")). A limit of year of article publication was set on 2000—2024, thus limiting the number of articles into 521. We used this time frame since the establishment of electronic medical record and digitalization of healthcare have only reached their global application since the beginning of new millennium. An article type filter was also added to limit the search into 457 documents. We excluded articles with languages aside from English, thus presenting 429 articles to be included in analysis. The flowchart of search strategy can be seen at **Figure 1.** The articles were presented as RIS in the Scopus database to aid cluster analysis and citations.

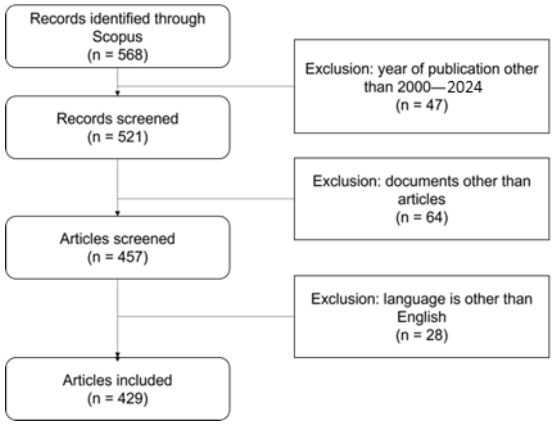

Figure 1. *Search strategy*

3. Result and Discussion

Based on the article search results in the Scopus database, the number of articles increased over time, with a decrease in the years 2017—2018 and 2022 (Figure 2). As we conducted a bibliometric analysis, in depth review on the methodology and results are beyond the scope of this study. Most articles are produced in United States (950 articles), followed by Italy (293), Brazil (171), Canada (157), Australia (123), Netherlands (115), Iran (87), United Kingdom (87), Malaysia (75), and Spain (52) (Figure 3). Among the countries producing the articles, it can be seen that most of the articles were produced in North America, in comparison to other continents (Figure 2). However, some countries in the Asian continents (Iran and Malaysia) have appeared to produce some publications regarding the matter, thus showing that researches surrounding hospital and activity-based costing also starting to become a trend in Asia continent.

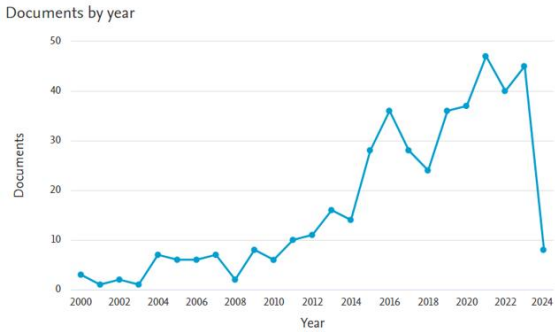

Figure 2. *Publication trend on hospital and activity-based costing, adopted from the Scopus database*

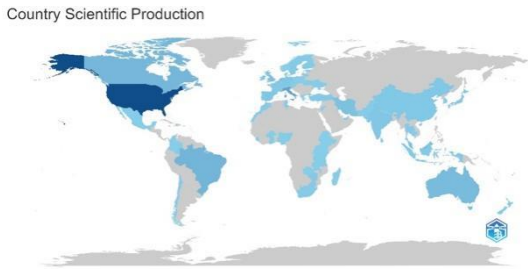

Figure 3. *Geography distribution by document, adopted from Bibliometric analysis*

Figure 4 shows the disciplines of which the subject was published in, which shows 373 (65.2%) of articles were produced in a medicinal discipline, followed by 28(4.9%) in nursing discipline; 23 (4.0%) in business, management, and accounting discipline; 19 (3.3%) in health profession discipline; 18 (3.1%) in biochemistry, genetics, and molecular biology discipline; 17 (3.0%) in economics, econometrics, and finance discipline; 17 (3.0%) in pharmacology, toxicology, and pharmaceutics discipline; 15 (2.6%) in social sciences discipline; 15 (2.6%) in multidisciplinary approach; 10 (1.7%) in engineering approach; and 38

(6.5%) in other disciplines. While indeed most of the articles produced were in the disciplines included in hospital, healthcare, and its management aspects, there exists engineering and other subjects that seem to not correlate to the issue.

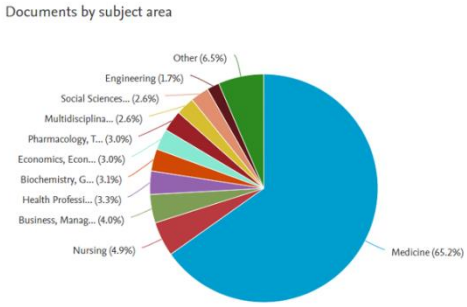

Figure 4. *The document by subject area, adopted from Scopus database*

Figure 5 provided informations regarding the affiliations of documents which were published. Harvard Business School and Harvard Medical School were the top two affiliations in which the documents were published. Both schools were a part of Harvard University which located in United States of America. They were followed by Rothman Institute which was also located in United States of America. Among the top affiliations, New England Baptist Hospital, Thomas Jefferson University, and David Geffen School of Medicine at UCLA also were located in United States of America. Brazil has also been a top affiliated country, with affiliations such as Universidade Federal do Rio Grande do Sul, Pontifícia Universidade Católica do Rio de Janeiro, and Hospital de Clinicas de Porto Alegre. Another country which was top affiliated with the documents were Australia with the top affiliation being University of Melbourne.

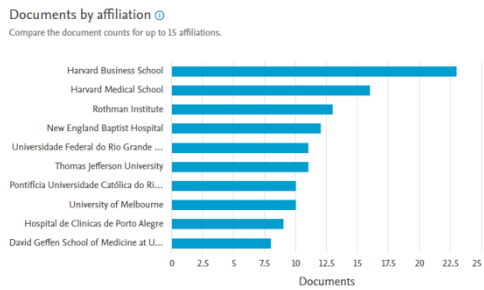

Figure 5. *Affiliations with the most publications, adopted from Scopus database*

VOSviewer analysis translates the provided Scopus data, reads the themes through the content, and provide clusters of the articles provided. As such, a total of 6 clusters were obtained. The clusters, which included cluster 1 of 112 items, cluster 2 of 94 items, cluster 3 of 62 items, cluster 4 of 56 items, cluster 5 of 31 items, and cluster 6 of 17 items. The formation of these clusters is crucial in providing information of regarding topics. Figure 7 shows the network visualization of the healthcare and activity-based relationship in the articles provided. Aside from that, Figure 8 shows the trend over the years of the topics related in the clusters. Another co-occurence analysis was done and provided 7 clusters instead. The clusters included were cluster 1 of 115 items, cluster 2 of 67 items, cluster 3 of 65 items, cluster 4 of 51 items, cluster 5 of 42 items, cluster 6 of 37 items, and cluster 7 of 21 items. Figure 9 shows destiny visualization regarding the subjects of main study over the years. Over all topics, healthcare cost and healthcare delivery seems to be the main topics included in the studies.

Of all 7 clusters, there are some keywords with the most weight of the analysis. In cluster 1, the keywords are health care, cost, hospital cost, costs and cost analysis, healthcare costs, hospital costs, cost control, time factors, and activity-based costing. In cluster 2, the keywords are cost-benefit analysis, cost effectiveness analysis, treatment outcome, economic evaluation, outcome assessment, drug cost, clinical outcome, and cost of illness. In cluster 3, the keywords are major clinical study, retrospective study, length of stay, patient care, hospital patient, hospital discharge, cohort analysis, health care utilization, and

hospital readmission. In cluster 4, the keywords are economics, health care delivery, organization and management, health care quality, delivery of health care, health care system, health care planning, models economic, emergency ward, and emergency service. In cluster 5, the keywords are comparative study, prospective study, health care personnel, time driven activity based costing, prospective studies, time, health insurance, nuclear magnetic resonance imaging, observational study, and radiotherapy. In cluster 6, the keywords are retrospective studies, hospitalization, hospital admission, clinical trial, adolescent, intensive care unit, emergency health service, health care policy, epidemiology, infant, and newborn. In cluster 7, the keywords are priority journal, procedures, total quality management, quality improvement, cost savings, postoperative complication, value, risk factor, postoperative complications, and cancer surgery.

Of all keywords, the most keywords used in the publications are health care cost (395 occurences; cluster 1), economics (385 occurences; cluster 4), cost benefit analysis (374 occurences; cluster 2), cost (366 occurences; cluster 1), major clinical study (366 occurences; cluster 3), hospital cost (356 occurences; cluster 1), priority journal (354 occurences; cluster 7), health care costs (346 occurences; cluster 1), costs and cost analysis (337 occurences; cluster 1), and retrospective study (337 occurences; cluster 3).

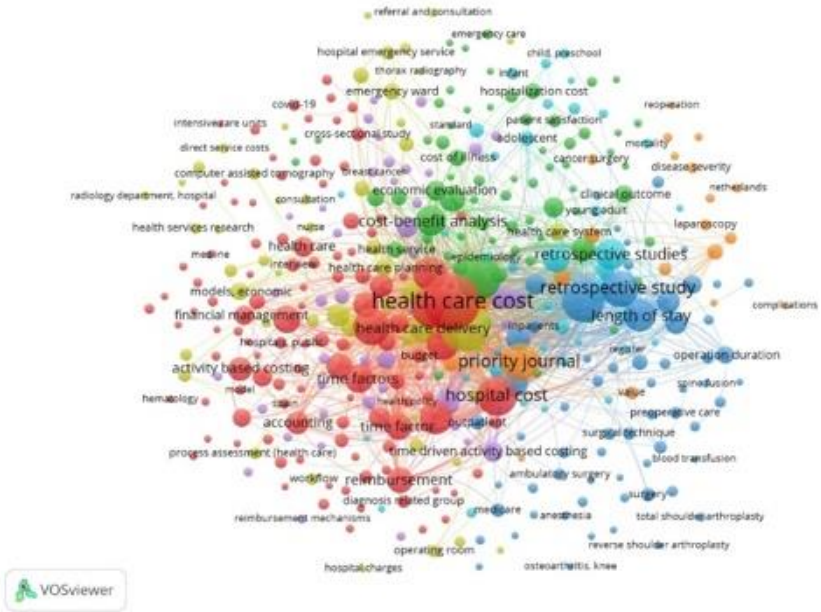

Figure 6. *Network visualization of healthcare and activity-based costing*

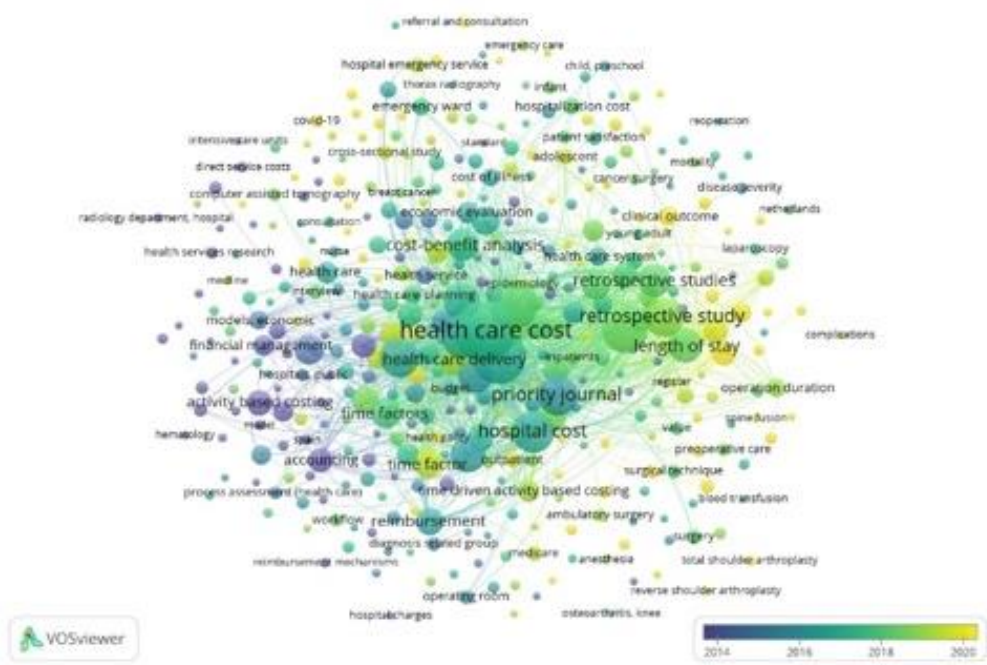

Figure 7. *Visualization of such trends over the years regarding healthcare and activity-based costing*

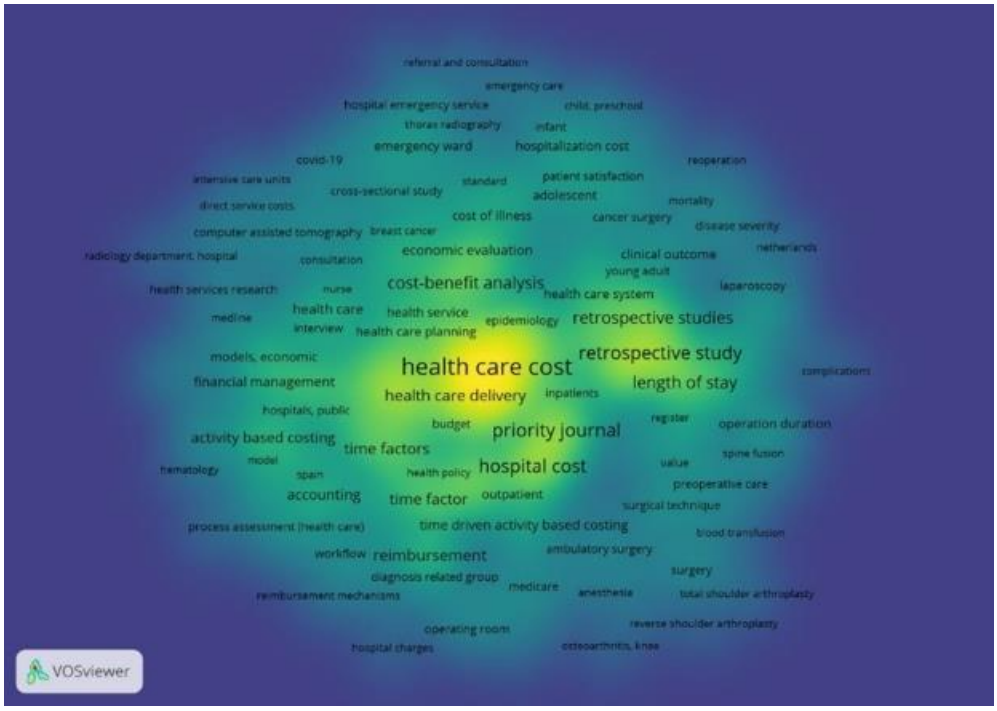

Figure 8. *Destiny visualization of healthcare and activity-based costing*

Table 1 provided details about articles which are most cited regarding the topic of healthcare and activity-based costing from all journals. The table provides the total citations of such articles and total citations per year.

Document Title	Author and year	Sources	Total Citations (TC)	TC per Year
Activity-based costs of blood transfusions in surgical patients at four hospitals	Shander A, Hoffman A, Ozawa S, Theusinger OM, Gombotz H, Spahn DR (2010)	Transfusion 50(4):753-65	595	39.67
Time-driven activity-based costing in health care: A systematic review of the literature	Keel G, Savage C, Rafiq M, Mazzocato P (2017)	Health Policy 121(7):753-63	234	29.25
Cost-effectiveness of accelerated perioperative care and rehabilitation after total hip and knee arthroplasty	Larsen K, Hansen TB, Thomsen PB, Christiansen T, Soballe K (2009)	J Bone Joint Surg Am. 91(4):761-72	177	11.06
Equivalence of two healthcare costing methods: bottom-up and top-down	Chapko MK, Liu CF, Perkins M, Li YF, Fortney JC, Maciejewski ML (2009)	Health Econ 18(10):1188-201	168	10.50
Time-driven Activity-based Costing More Accurately Reflects Costs in Arthroplasty Surgery	Akhavan S, Ward L, Bozic KJ (2016)	Clin Orthop Relat Res 474(1):8-15	154	17.11
Time-driven activity-based costing in an outpatient clinic environment: development, relevance and managerial impact	Demeere N, Stouthuysen K, Roodhoft F (2009)	Health Policy 92(2-3):296-304	125	7.81
Utilizing time-driven activity-based costing to understand the short- and long-term costs of treating localized, low-risk prostate cancer	Laviana AA, Ilg AM, Veruttipong D, Tan HJ, Burke MA, Niedzwiecki DR, et al (2016)	Cancer 122(3):447-55	123	13.67
Hospital costs of nosocomial multi-drug resistant Pseudomonas aeruginosa acquisition	Morales E, Cots F, Sala M, Comas M, Belvis F, Riu M, et al (2012)	BMC Health Serv Res 23:12:122	107	8.23
Administrative Costs Associated With Physician Billing and Insurance-Related Activities at an Academic Health Care System	Tseng P, Kaplan RS, Richman BD, Shah MA, Schulman KA (2018)	JAMA 319(7):691-7	89	12.71
Hospital costs of complications after esophagectomy for cancer	Goense L, van Dijk WA, Govaert JA, van Rossum PSN, Ruurda JP, van Hillegersberg R (2017)	Eur J Surg Oncol 43(4):696-702	80	10.00

Activity-based costing is a method born due to the business changing environment, aimed to obtain a more accurate cost of products. This method has been used for more than 30 years, and is focused on measuring the cost and performance of activities based on three basic premises. The premises are that products require activities, activities consume resources, and resources cost money. In a healthcare sense, the method helps healthcare managers understand where to take actions to drive the profits from a healthcare service. However, this method has its own drawbacks, in which that the method might be challenging to understand due to the difficulty on obtaining the definition of "activities". This method has also been found to be adapted unsuccessfully due to implementation problems (Jalalabadi, Milewicz, Shah, Hollier, & Reece, 2018; Niñerola, Hernández-Lara, & Sánchez-Rebull, 2021).

The use of Scopus database provided a bibliometric analysis of 429 academic publications regarding the trend of healthcare and activity-based costing. Of which, most of the publications were published from North America, notably the United States of America. An analysis using the Bibliometrix package confirmed the finding, which confirms that scholars coming from the USA were dominating the issue of healthcare and activity-based costing. This was confirmed as the most dominant affiliations that published the articles also came from the United States of America.

European countries such as Italy, the Netherlands, and United Kingdom have also been the top contributor to the publications of the topic. The findings also suggest an increase of trends in the publications, albeit with decreases in certain years. The finding that some countries in Asia such as Iran and Malaysia which have provided numerous publications also showed that the topic is still an emerging trend in Asian countries. Outside the regions said before, other countries such as Brazil and Australia have also provided numerous publications regarding healthcare and activity-based costing. These findings can be concluded as the topic being an emerging trend worldwide.

Notably, there are 7 clusters of topics relevant to healthcare and activity-based costing, with the most prolific author being Kaplan RS who provided 13 articles. Aside from that, the study most used as a reference for the topic is titled "Activity-based costs of blood transfusions in surgical patients at four hospitals" written by Shander A, Hoffman A, Ozawa S, Theusinger OM, Gombotz H, Spahn DR (2010). The study was done to determine the cost of blood in a surgical population using an activity-based costing. The study provided information that the activity-based costing confirms the underestimation of blood costs. This study confirmed that the costs per unit of blood exceeded the reported from previous studies (Shander et al., 2010).

Recently, it has been found that the growing complexity of hospital activities and the rising significance of cost management for both hospital administrators and governments have underscored the need to understand these shifts and assess their impact on pricing. Traditional costing approaches, particularly those used in healthcare settings, are insufficient for this task as they fix prices irrespective of contextual hospital conditions. Consequently, adopting suitable and efficient costing methods has become imperative. This is where activity-based costing comes along to determine cost structures (Rajabi & Dabiri, 2012). The VOSviewer analysis has provided a mapping of the trends related to healthcare and activity-based analysis. Of all the 7 clusters provided, it can be concluded that certain topics related to the subjects such as healthcare cost, healthcare delivery, hospital cost, cost-benefit analysis, and the activities of which the healthcare is provided (intensive care units, hospital emergency service, computed assisted tomography, etc.). The mapping also provided how the topics are related to each other and accounts to the relations of the activity-based costing.

Financial failure is an indisputable outcome of bad hospital financial management. Hospital in general account for 40% over all healthcare costs, in which the care in hospital setting is the biggest contributor to these costs (Dubas-Jakóbczyk et al., 2022). In the United States of America, the occurrence of hospital bankruptcy as a result of financial failure became an "all-too-common" occurrence with the number increased by 305% in 2010. The most important factors of hospital resilience against financial failure are that the hospital finds a solution to each problems, the facilities' level of net revenue, and the amount of accounts received through the healthcare (Beauvais, Ramamonjiarivelo, Betancourt, Cruz, & Fulton, 2023).

Of all the factors above, it has become an importance to understand the values of the care received by patients to comprehend and overcome the financial failures that might occur in hospital management. As such, costing methods like activity-based costing, which provided information regarding the costs of an activity which was influenced by the cost of resources, is created to understand the problems arising from hospital and healthcare and their effects on finances (Jalalabadi et al., 2018; Niñerola et al., 2021). Over the past 10 years, the five years prior (2014—2019) seem to have focused on financial management, health

service, certain healthcare service costs, and accounting. However, the recent years (2019—2024) showed trends in a more holistic approach regarding the overall service and the cost it influenced. This also shows that while the trend of healthcare and activity-based costing is still emerging, the topic seems to have certainly became more of a comprehensive approach on the effects of certain healthcare services and the costs of their activities.

This study provides information regarding the topic of healthcare and activity-based costing, which aids to the information of further studies regarding the topic. However, this study also has limitations. One of which is of the nature of the study which did not provide a comprehensive systematic review regarding the studies included, which might provide further information regarding the topic. The database included in the study was also limited to one database, therefore not comprehensive as articles in other databases might seem to be excluded from the study.

4. Conclusion and Suggestion

This review concludes that research on healthcare and activity-based costing has increased over the last two decades, which started as activity-to-activity researches to more comprehensive and holistic researches. The studies regarding the topic was dominated by countries in North America, but globally the trend is emerging and has become an interest worldwide. The study has its limitations of the non-systematic review nature and the use of one database as the source of analytical material. However, this limitations do not restrict generalizability of the findings of this review since Scopus gives the most articles coverage compare to other databases and the number of retrieved studies is adequate. Further study on specific topic, especially review on the impact of accommodating digital financial management as a part of financial analysis to hospital financial status is needed.

5. Acknowledgments

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