ISRG Journal of Arts, Humanities and Social Sciences (ISRGJAHSS)

ISRG PUBLISHERS
Abbreviated Key Title: ISRG J Arts Humanit Soc Sci
ISSN 2583-7672 (Online)
Journal homepage: https://isrgpublishers.com/isrgjahss
Volume -1 Issue-V (September - October) 2023
Frequency: Bimonthly

Activity-Based Costing in hospital: A Systematic Review (2013–2023)

Nguyen Thi Thu Le[1],*, Hoang Khanh Van[2] , Dinh Thi Chien[3]

[1,2,3] University of Labour and Social Affairs, Hanoi, Vietnam

| **Received:** 03.10.2023 | **Accepted:** 07.10.2023 | **Published:** 09.10.2023

***Corresponding author:** Nguyen Thi Thu Le
University of Labour and Social Affairs, Hanoi, Vietnam

Abstract

The aim of this study is to systematize previous research on activity-based costing (ABC) in hospitals. Research data was collected and analyzed from the PubMed database using VOSviewer 1.16.19 software, with 62 articles for the keywords "activity-based costing" and "hospital" filtered in abstract form. The study statistically analyzed the year of publication and the number of publishers with multiple articles related to activity-based costing in hospitals. The study also conducted keyword network analysis and co-author analysis. The research results have contributed to the compilation of a systematic body of literature on activity-based costing in hospitals. These findings pave the way for future research directions.

Keywords: *activity-based costing, hospitals, Vosviewer.*

1. Introduction

The healthcare industry plays a crucial role in our service sector, given its significant impact on safeguarding and enhancing human life. Hospitals, however, often grapple with the challenge of balancing their limited resources and costs to meet the demand for their services. One of the key tasks for hospital managers is to develop cost information that aids in decision-making and appropriate service pricing. They are tasked with delivering community-needed healthcare services of acceptable quality at the lowest possible cost, which requires accurate information on the actual cost of these services. Many hospitals, even those with modern cost accounting systems, struggle to accurately calculate the direct and indirect costs of medical services. This highlights the need for reliable pricing systems. There are two main approaches to cost determination in accounting systems: the traditional costing system and the activity-based costing system. The ABC method was designed to address the shortcomings of the traditional costing system by allocating a suitable cost driver to each activity and calculating the cost price based on that activity. Unlike the traditional system, which allocates some costs incurred in departments using a few cost drivers per capita, ABC assigns resource costs to cost objects like products, services, or customers based on performed activities. Furthermore, ABC is a two-step process, as it first assigns total costs to activities and then to services.

Javid, M., Hadian, M., Ghaderi, H., Ghaffari, S., & Salehi, M.(2016) conducted a study on how the activity-based costing method can be used to calculate unit costs in a hospital. They used data from Kashani Hospital's accounting records from 2013, including reports and other sources from the end of 2012. To implement the ABC method, they divided the hospital into different cost centers and identified five cost categories: wages, equipment, space, materials, and overheads. They then defined activity centers. The ABC method was carried out in two stages. First, they allocated the total costs of each cost center to activities using relevant cost factors. Then they divided the costs of these activities among cost objects using cost drivers. After determining the cost of each object, they calculated the cost of medical services and compared it with those obtained from TCS. Kashani Hospital had 81 doctors, 306 nurses, and 328 beds, with an average occupancy rate of 67.4% in 2012. They calculated the unit cost of medical services, the daily cost of an occupied bed, and the cost per outpatient service. The total unit costs calculated by ABC and TCS were $187.95 and $137.70, respectively, showing that the ABC method resulted in a higher unit cost of $50.34. The ABC method provided more precise information on major cost components. By using ABC, hospital managers gained a valuable accounting system that gave them a clear understanding of their department's organizational costs.

DOI: 10.5281/zenodo.8420271

Rajabi and Dabiri (2012) explored the use of the activity-based costing method to determine the cost of hospital and treatment services. They carried out their research at Shahid Faghihi Hospital, where they first divided the hospital units into three main sections: administration, diagnosis, and hospitalization. Next, they identified activity centers using an activity analysis method. The costs of administrative activity centers were then distributed into diagnostic and operational departments based on the cost driver. Finally, they calculated the cost of medical services by considering how much each service used resources from the activity centers. They found that the cost price derived from the ABC method was significantly different from that obtained using the tariff method. They also noted a high number of indirect costs in the hospital, suggesting that resources were not being used efficiently. When compared with the ABC method, they found that the tariff method did not accurately calculate the cost of treatment services. While ABC calculates the cost price using appropriate mechanisms, the tariff method relies on a fixed price. Furthermore, ABC provides valuable information about the quantity and mix of cost-priced services.

Phong N. D.(2021) conducted a study on the factors influencing the application of activity-based costing systems in hospitals across Ho Chi Minh City. The goal was to measure the impact of these factors on the use of activity-based costing in these hospitals. Drawing from theory and previous research, Phong proposed a model consisting of six independent variables and one dependent variable. The study combined qualitative and quantitative research methods, with qualitative results helping to construct a scale for the 25 observed variables in the model. For the quantitative part, primary data was collected from 250 individuals working in Ho Chi Minh City hospitals via a survey, with 220 valid responses received. The data was then analyzed using Cronbach's alpha reliability test, exploratory factor analysis (EFA), and multivariate regression analysis with the help of SPSS 20.0 software. The findings revealed that all six factors influenced the application of ABC in Ho Chi Minh City hospitals, with their impact decreasing in this order: (1) competition, (2) training and education, (3) support and involvement of senior management, (4) quality of IT systems, (5) importance of cost information, and (6) scale. Based on these findings, Phong suggested implications for relevant parties to promote the use of ABC in Ho Chi Minh City hospitals for sustainable development.

The article clarifies the following research questions, including Q1: How many articles about ABC have been published in the hospital from 2013 to 2023? And which magazines have the most publications? Q2: What themes are the used keywords grouped into?

To answer the above questions, the study reviewed 62 articles published between 2013 and 2023. The research was conducted through a bibliometric analysis, which greatly contributes to the research community. Through this analysis, valuable information can be gathered about a topic. By reflecting on what has been done and what needs to be researched in the future, the article aims to supplement more literature on various methods and contexts to support researchers on ABC. The research is divided into sections: defining conceptual foundations, application methods, research results, and concluding remarks.

2. Theoretical Basis

Activity-Based Costing

Garrison et al (2010) suggested that the activity-based costing method is a cost approach designed to provide managers with cost information for strategic decision-making and other decisions that could potentially impact productivity. The ABC method is based on the fundamental principle that products consume activities, activities consume resources, and ABC determines the cost of activities and then allocates these costs to products based on a cause-and-effect relationship. If the full costing method is built to provide data for external financial reporting, then the activity-based costing method is built for decision-making purposes. Therefore, according to Garrison and his team, the full costing method differs from the ABC method in three ways: Both production and non-production costs are allocated to products but only based on a cause-and-effect relationship; some costs are not included in product costs; many overhead costs are used, each of which is allocated to products and other cost allocation objects using their own activity measurement methods.

Drury (2004) suggested that the activity-based method, which measures all the resources an organization needs to produce a product and calculates the average long-term product cost, is more accurate than the full-cost method. Therefore, it's a good idea to use costs from the ABC method for long-term pricing decisions and the variable cost method to determine incremental costs for short-term pricing decisions.

Cooper and Kaplan (1988) emphasized that most pricing and other decisions impact a company's long-term capacity, and these decisions should be based on long-term coverage costs, not short-term ones. In reality, many recent studies in management accounting have focused on designing cost accounting methods where product costs are more accurately determined. Many researchers have advised businesses to use activity-based costing (ABC) to provide product cost information for decision-making. Shim and Sudit (1995) explained the reasons for continuing to use full-cost pricing. According to them, implementing the ABC method can rationalize the allocation of fixed costs and make these costs appear variable or semi-variable. Additionally, the ABC method enhances the determination of fixed costs for a specific product and leads to better cost allocation. They concluded: The ABC method provides more accurate product cost estimates, which is the basis for determining prices based on full costs. Implementing the ABC method tends to provide information for widespread use of full-cost pricing in practice.

So, ABC streamlines the allocation of fixed costs, providing more accurate product cost information for pricing decisions. Using ABC, we can overcome the inherent limitations of full-cost pricing methods.

Activity-Based Costing in Hospitals

In recent times, the rise in complex activities and the significance of cost-price in hospitals have become crucial for managers and governments. Understanding these changes and assessing their impact on cost is vital. Traditional costing methods, particularly those used in hospitals, often fall short of meeting these needs. These methods set the cost of services based on a fixed rate, ignoring the varying conditions within hospitals (Rajabi A., 2005). Hence, it's essential to use effective costing methods. That's where

DOI: 10.5281/zenodo.8420271

"activity-based costing" comes into play for calculating the cost. ABC is a modern costing method gaining popularity worldwide. It takes into account complexity, diversity, and unique features when calculating the cost. A standout feature of this method is its ability to pinpoint exact costs and provide non-financial information to enhance performance and efficiency (Marvin E. et al., 2005). Plus, using the ABC method can help identify and reduce unused capacity resources within an organization.

The ABC method has seen remarkable growth and success in the industry, and since the early 1990s, it's been making waves in other sectors too, particularly in healthcare centers and hospitals. Kaplan was instrumental in developing this method (Cooper R, Kaplan RS, 1992). With the introduction of ABC, the precision of cost calculations in health systems became so crucial for hospital managers, doctors, investors, and governments that over 20% of hospitals in America and Canada were using this method by the 1990s (Aryeh S., 2008).

3. Research Method

The approach of Systematic Literature Review (SLR) by Tranfield et al. (2003) is used in this investigation. Liberati et al. (2009) first developed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which Page et al. (2021) modified, served as the basis for the study's sample selection. The three processes that comprise the PRISMA process diagram are identification, screening, and inclusion in the research.

The first thing the writers did was choose a database from which to compile articles for their study. The online database PubMed is widely used for summaries and reference materials on biomedical and life science subjects, which is why they selected it. This is a very scientific database for data collecting since the study was centered on the use of ABC in hospitals. "ABC" and "hospital" were the keywords used to gather the data on September 22, 2023. Between each of the search terms was the boolean operator AND. From 2013 to 2023, they discovered 62 results in total from PubMed.

In order to remove inappropriate materials using technological and content-based filters, the author team screened the material in a second stage. Articles like encyclopedias, book chapters, editorials, brief communications, mini-reviews, and short communications were excluded from the technical screening process. Regarding content filtering, papers that included search terms but had unrelated information were first screened out. All 62 outcomes satisfied the filtering requirements for inclusion in the research, according to the data obtained after filtering.

Following two stages, the quantity of documents still present is examined using the systematic literature review (SLR) approach and entered into the VosViewer program for co-citation and keyword analysis. Charts and tables are used to display the SLR analysis findings. An eye-catching format will be used to present the bibliometric analysis's findings. Based on these evaluations, the report defines and identifies popular research paths as well as makes recommendations for future research directions.

4. Results

* **Publication year statistics**

From 2013 to 2023, a total of 62 articles on ABC were indexed in PubMed from hospitals, averaging 6.2 publications per year. The lowest number of articles was in 2013 and 2020, with just one each. The highest number of publications was 16 in 2016. The yearly publication statistics show that researchers are increasingly interested in using ABC in hospitals.

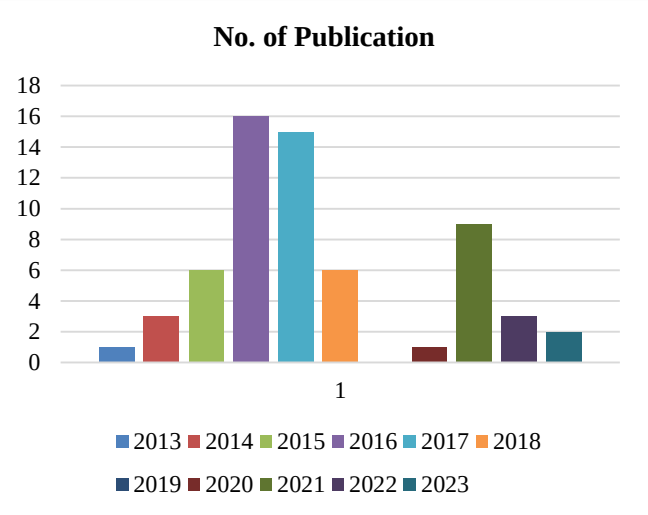

Figure 1. Chart of the number of studies over the years

*** Journal publication statistics**

The list of published magazines is directly extracted from the database, including those that have published on the topic of hospital balance scorecards two or more times, as shown in Figure 2. The magazine publication statistics reveal that many magazines have published two or more articles on this topic, with four magazines—BMC Health Serv Res, Healthc Financ Manage, Gac Sanit, and Int J Environ Res Public Health—having published four articles each.

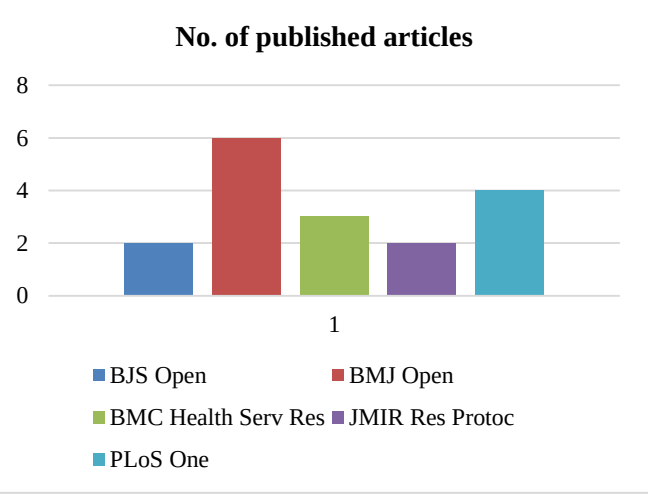

Figure 2. Chart of magazine publication quantities

*** Keyword analysis results**

In the keyword analysis section, we've carefully selected keywords that appear five times or more. These keywords are evaluated by the software based on their frequency and overall link strength. The results of the keyword analysis can be exported as an image file. Here's what the keyword analysis results look like:

DOI: 10.5281/zenodo.8420271

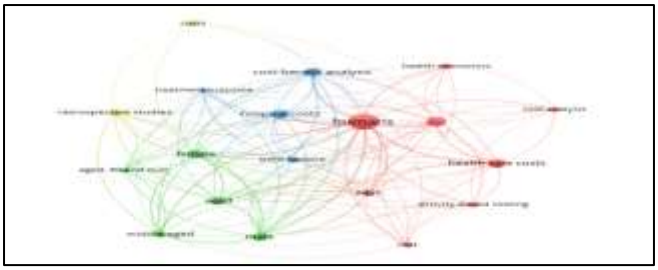

Figure 3. Keyword networks

Only 19 terms—out of 403—met the requirement of occurring at least five times. "Activity-based cost" was mentioned five times, "hospital cost" fifteen times, and "humans" forty-three times, which was the most common term. Keep in mind that two terms are more strongly associated when the line linking them is thicker and the bigger the circle, indicating a more frequent presence. Similar terms are clustered together, with a different color designating each group. You can see that the keywords are grouped into four categories by looking at the picture. With a total of 146 link strengths, Group 1 is represented by red connections that are focused upon "humans," totaling 18 linkages. The blue connections in Group 2 are grouped around "hospital cost," totaling 16 links and 58 link strength. Green connections, totaling 16 links and 76 link strength, centered around the word "female" signify Group 3. Yellow connections with a total link strength of 39, focused around the term "retrospective study," reflect Group 4. The findings indicate that there is still a need for further study on activity-based costs in hospitals, with four research paths and 19 common keywords (Figure 3). This might serve as a foundation for choices on future research paths to close gaps in the literature or conduct in-depth analysis.

*** Co-occurrence author keywords**

18 of the 161 keywords occur twice or more. We'll determine the overall strength of each of these 18 keywords' relationships with other keywords. The terms that have the strongest overall connections will be chosen. You can see that the keywords are grouped into six categories by looking at the picture. Group 1 is denoted by red links, with a total of 4 connections and a total link strength of 4, with the main term being "activity-based cost." With eight links and a total link strength of eight, Group 2 is represented by blue links, with the term "cost analysis" serving as its focal point. Group 3 is denoted by dark blue links, the main keyword of which is "health economics," with three connections and a total link strength of three. Group 4 is composed of yellow links, with four links for the main keyword "costs" and a total link strength of five. Group 5 is characterized by green links, with "time-driven ABC" serving as the primary keyword. There are four links in Group 5 overall, for a link strength of four. With four connections and a total link strength of four, Group 6 is represented by green links, with the term "economic analysis" serving as its focalpoint.

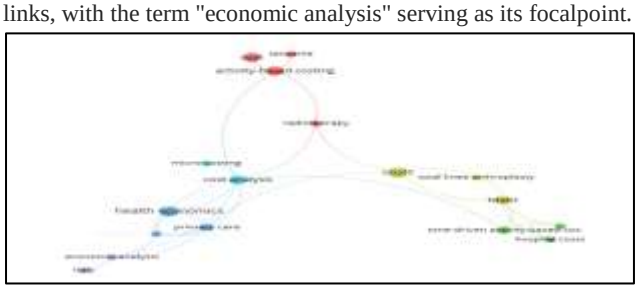

Figure 4: Author Keyword Networks

*** Co-author Analysis**An examination of co-author connections between individual writers and organizations was done in this study to better understand the trend of cooperation in research using balanced scorecards in hospitals. Benoit et al. (2018) state that the analysis's findings contribute to our knowledge of research cooperation and assist in identifying key researchers. A network diagram of the co-authors is shown in Figure 5. A collaborative connection between two writers is represented as a link between two nodes, with the thickness of the link signifying the degree of cooperation. The trio of co-authors Jeffrey Braithwaite, Virginia Mumford, and Johana Westbrook are the closest. They comprise a core group that has over many years produced a large number of publications.

Figure 5. Co-authorship analysis by author units

The statistics show that 259 organizations have authors who have published papers related to activity-based costing in hospitals. Through co-authorship analysis, with the unit of analysis being the organizations, for each of these 259 organizations, the total strength of co-authorship links with other organizations has been calculated. Consequently, the organizations with the greatest total link strength have been selected and are displayed in Figure 6.

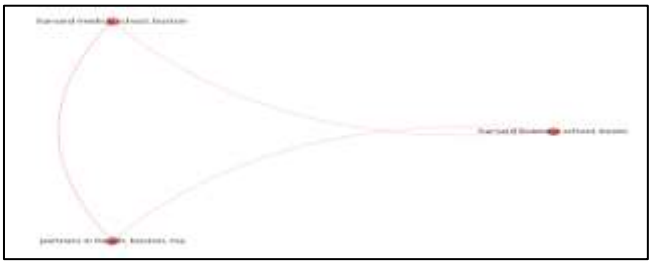

Figure 6. Co-authorship analysis by units of organizations

5. Conclusion

In this research, we evaluated international papers from 2013 to 2023 that were indexed in the PubMed database on hospital activities based on cost. Our goal was to provide comprehensive data on co-author networks, keyword networks, publishing journals, and publication numbers. Utilizing various data analytics and visualization software, we used bibliometric techniques to identify research patterns in hospital cost-based initiatives.

References

1. Aryeh S, Axel H, Sherr O, Hans G, Donat R. Activity-based costs of blood transfusions in surgical patients at four hospitals. *Transfusion journal*. 2008;50(4):753–765Rajabi, A., & Dabiri, A. (2012). Applying activity based costing (ABC) method to calculate cost price in hospital and remedy services. *Iranian journal of public health*, *41*(4), 100.
2. Baratti D, Scivales A, Balestra M. R, Ponzi P, Di Stasi F, Kusamura S, Deraco M. Cost analysis of the combined

DOI: 10.5281/zenodo.8420271

procedure of cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (HIPEC) *European Journal of Surgical Oncology.* 2010;36(5):463–469
3. Cooper, R. and Kaplan, R. S. (1988) "How cost accounting distorts product costs", Management Accounting, (USA), April, pp. 20-27
4. Cooper R, Kaplan RS. ABC Measuring the Cost of Resource Usage. *Accounting Horizons.* 1992;34:2–13
5. Drury, C. (2004) "Management and cost accounting", 6th edition,London, Thomson
6. Garrision RH, Noreen EW, Brewer PC (2010), Cost Accounting: A Managerial Emphasis, Thirteenth Edition, New York, NY: McGraw Hill/Irwin, 2010
7. Javid, M., Hadian, M., Ghaderi, H., Ghaffari, S., & Salehi, M. (2016). Application of the activity-based costing method for unit-cost calculation in a hospital. *Global journal of health science*, *8*(1), 165.
8. Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., ... & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Annals of internal medicine*, *151*(4), W-65
9. Marvin E, Gioconda Q, Rhonda M, Ignacio U. Building an activity-based costing hospital model using quality function deployment and benchmarking. *Benchmarking: An International Journal.* 2005;12:310–329
10. Meyer J. W, Feingold M. G. Integrating financial modeling and patient care reengineering. *Healthcare Financial Management.* 1995;49(2):32–40
11. Page, M.J., Moher, D., Bossuyt, P.M., Boutron, I., Hoffmann, TC, Mulrow, C.D., ... & McKenzie, J.E. (2021). PRISMA 2020 explanation and elaboration: updated guidance and examples for reporting systematic reviews. *bmj , 372*
12. Rajabi A. Applying ABC System for Calculating Cost Price of Hospital Services Case Study: Shahid Faghihi Hospital of Shiraz. *National Project Ministry of Health and Medical Education.* 20052005 (Persian)
13. Ross T. K. Analyzing health care operations using ABC. *Journal of Health Care Finance.* 2004;30(3):1–20.
14. Phong, N. D. (2021). Factors affecting the application of activity-based costing systems studied in hospitals in Ho Chi Minh City.
15. Shim, E. and Sudit, E. (1995) "How manufactures price products", Management Accounting (UK), February, pp. 37-39. Shim, E. and Sudit, E. (1995) "How manufactures price products", Management Accounting (UK), February, pp. 37-39

DOI: 10.5281/zenodo.8420271