

Bridging Supply Chain Concept in Healthcare Services A Systematic Review and Future Challenge

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Abstract. Health services, over time, experience changes and developments by promoting many stakeholders to support excellent service, the use of technology has been implemented in various health services ranging from hospitals, clinics, to community health centers. This study tries to find a bridge between supply chain management concepts in health services, and what its future challenge, aided with two research questions (1) the trends of healthcare supply chain and (2) future research avenues that less-explore. This study uses a literature study base, and Emerald Insight platform was chosen as the platform to be reached for the relevant journals, limited to the peer-reviewed academic articles published in English after 2005. Close with DI (Density Index) score as a main frame for induce future research theme in healthcare supply chain. This study concluded that research development in the healthcare supply chain area is still ongoing and will be possible to develop, as long as health services continue to operate and strive to improve their performance. Five themes consisting of 22 different topics were found, (1) framework development, (2) case study iteration, (3) technology aided, (4) healthcare derivative of service, and (5) method in term of supply chain and operation. Most of the healthcare supply chain studies followed grounded theory and qualitative survey methods. This study thus proposes five main future healthcare supply chain research points (1) framework modelling, (2) using healthcare organization as a sample case, (3) RFID influence, (4) pharmaceutical supply chain, and (5) VMI approach.

Keywords: *Supply Chain, Supply Chain Management, Healthcare, Systematic Literature Review*

1. INTRODUCTION

In recent decades, the healthcare system has been the subject of several technological and operational changes [1]. Hospitals are struggling to increase their efficiency and effectiveness, and are under pressure to cut costs and maintain budget containment, but the literature lacks a comprehensive framework for measuring effectiveness throughout the entire healthcare chain [2]. Measuring organizational effectiveness (OE) across a healthcare chain is a complicated phenomenon, and it requires a holistic system approach. Previous studies have focused on a single tier of the healthcare supply chain. For example, a 2017 research focused on operations [3], a 2009 research focused on measured OE through patient satisfaction [4], a 2003 research focused on concentrated on management style [5], and a 2001 research focused on service quality [6].

Health services, over time, experience changes and developments. Health services are currently increasingly complex by promoting many stakeholders to support excellent service, the use of technology has been implemented in various health services ranging from hospitals, clinics, to community health centers. The use of digital technology in a number of health services is evidence of this transition [7]. This novel technology will affect the logistics, supply chains,

manufacturing and transportation industries. Therefore, the future of every industry will be opened on innovation and technology. Every industry is going through a rapid transformation that appeared with the fourth industrial revolution [8]. Changes are rapidly taking place in all business environments and industries. Supply chains can no longer be repositioned overnight to buy, make, move, or sell the right items in the right quantities and the right places [9] as today's marketplace is dominated by intense competition, cost pressures, short-term market demand, and volatile patterns of demand [10].

The supply chain concept was basically born in a manufacturing environment, but the recent trend is trying to extend it to a service environment. Since the first time the concept of supply chain has been tried in various environments of business organizations, however, services remain a challenge for this concept to be implemented. For whom who not familiar with supply chain management concept, Mentzer in 2001 had already written its definition as a systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole [11].

This study tries to find a bridge between supply chain management concepts in health services, and what it future challenge. Scientific publications related to supply chain research related to health services are still limited, so a review research is needed to help describe the extent to which the supply chain concept can be applied in health services. Considering this, 2 research questions were asked as study material for discussion.

Q1 : What are the trends of healthcare supply chain (HcSC) studies ?

Q2 : What are the less-explored healthcare supply chain (HcSC) themes in the extant literature as a basis for future research avenues ?

This paper is organized as follows. This first section introduces the study's background and objectives, as well as the study questions. The second section describes this systematic review's methodology, including the sourcing and retrieval of the articles, the tabulation and analysis methods and the findings' interpretations and display. Detailed discussions of the findings and proposed future research points are explained in the third and fourth sections, while the last section presents this study's concluding remarks [12].

2. THEORETICAL BACKGROUND

The supply chain of the healthcare industry is different from the manufacturing sector in terms of the level of customization of services provided, the degree of participation of a partner or consumer and the uncertainty underlying the basic process [25].

The main goal of healthcare supply chain (HcSC) is to provide medicines and equipment on time [13]. In this context, several stakeholders are involved. Complying with their functions, stakeholders in healthcare supply chain (HcSC) are categorized into three main groups: producers (suppliers, such as pharmaceutical companies), purchasers (such as pharmaceutical wholesalers) and provider customers (such as hospitals) [13]. The producers deliver products, whether directly to the patient or through a distributor [14]. However, this value chain process does not seem effective and efficient enough for healthcare organizations at both operational and strategic levels [15]. The main problem of the current healthcare supply chain (HcSC) is the lack of integration between different levels of the supply chain, which prevents the supply chain from acting as a coherent system [14].

As healthcare supply chain (HcSC) requires improvements in both operational and strategic levels, as well as increased integrity between different supply chain levels. For instance, one area of improvement could be the pharmaceutical supply chain. Pharmaceutical product delivery is one of the most critical parts of SCM in healthcare, accounting for 25-30 per cent of hospitals' operational costs [16]. Thus, controlling this process is an essential element for assuring that both service and cost objectives are being fulfilled [14].

Study conducted in 2003 and 2004 tried to reveal the structure in the healthcare supply chain. This research emphasizes on how the flow of the healthcare supply chain from upstream to downstream, so that this research is the forerunner to the development of the concept of healthcare supply chain in the future. In healthcare flow runs like in manufacturing, it's just that the difference lies in the end users, who are dominated by business organizations engaged in health services (hospitals and clinics). Figure 1 will further show this flow.

Research development in the field of healthcare supply chain is still insufficient and developing, considering the supply chain concept, which is not yet familiar in health service business organizations (puskesmas, clinics, and hospitals). In 2015, a research conducted in Surabaya, Indonesia, attempted to implement the concept of healthcare supply chain in pharmaceutical health centers in Surabaya with a focus on mapping the distribution process [28]. The results of this study indicate that there are 4 issues in the supply chain process for pharmaceutical preparations (drugs and medical supplies), namely (1) availability of stock of pharmaceutical preparations in the Health Pharmacy Warehouse, (2) the ability to supply pharmaceutical preparations in the Health Pharmacy Warehouse, (3) Accuracy of planning pharmaceutical preparations. (medicine and health supplies) Puskesmas, (4) Deficit of Puskesmas pharmaceutical preparations.

In 2018, a study in India attempted to reveal how health services should be ready to implement the supply chain concept [25]. Based on this research, there are 4 main factors that need to be prepared by management in health services as a framework if the supply chain concept is to be implemented, namely Internal Lean Practice (ILP), Top Management Commitment (TCM), Inventory visibility (IV), and Supplier. Integration (SI). The development of these four factors cannot be separated from the integrated relationship between Supply Chain Practices (SCP), Healthcare Supply Chain Performance (HSCP), and

Healthcare Organizational Performance (HOP). Figure 2, further demonstrates this relationship.

3. METHODOLOGY

This study uses a literature study base. Literature reviews are a substantial principle in any research field [17], allowing researchers to discover research gaps and investigate fruitful results [18]. A key element of any literature review is the research synthesis process. "Research synthesis" is a general expression aiming at "bringing together of a body of

research on a particular topic" [19]. The purpose of research synthesis is usually to explain analyses and to achieve clear findings on the evidence of various studies, applying it to make decisions about the efficacy of healthcare interventions [19]. The systematic literature review methodology presented was adopted for this study; the three major stages of this approach are as follows: planning the literature review process, conducting the review, and reporting the results [20].

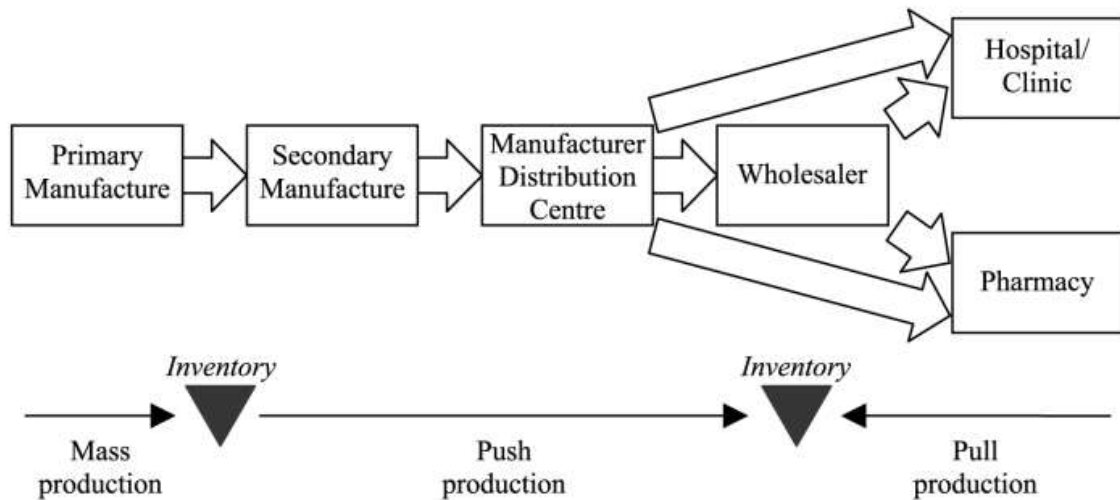


FIGURE 1. Early framework of healthcare supply chain, adopted from [26, 27]

3.1 Literature review process

For the first stage of the approach, a review protocol was developed by applying the conceptualization of topic methodology [21]. This methodology consists of four phases :

- Database search selection should enable the researchers to access a broad number of academic papers [18].
- Keyword search combinations should be selected carefully. Proper keyword selection eases the next steps of qualitative analysis.
- Journal search should aim to guarantee the quality of research; therefore, the researchers should select the appropriate group of academic journals [22]
- Backward search is the process of reviewing promising cited papers in articles retrieved through the keyword search, and forward search is the process of reviewing notable papers that cited the retrieved articles [21] (Figure 3)

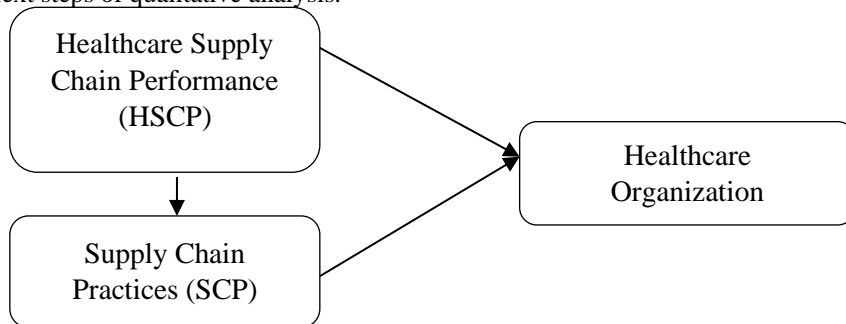


FIGURE 2. Healthcare supply chain conceptual, adopted from [25]

The resulting search contained 3.901 documents. This study was limited to the peer-reviewed academic articles published in English after 2005. Therefore, all non-peer-reviewed journal articles and articles written in languages other than English were removed from the article pool [23]. Due to access to the website using free access, only 1,000 articles can be viewed and reviewed, while the rest cannot be accessed. In addition, additional restrictions are made on the journals obtained, by taking into account the following:

1. Exclude journals based on literature reviews, systematic reviews, and meta data analysis.
2. Issued a journal that discusses healthcare, without being accompanied by an element of the supply chain management concept.
3. Issued a journal that discusses the supply chain management concept without being accompanied by elements of healthcare, or health service or health care.
4. Issue a journal that discusses hospital performance.

Based on these additional restrictions, the number of journals to be analyzed is 95. The distribution by year of the 95 journals to be analyzed is described in Figure 4. This figure explains that the trend of scientific research in the healthcare supply chain field has begun to be looked at and developed after 2015. This shows that There is a paradigm shift from actors in the field of health services that maintaining and improving the performance of health services requires an approach other than health, which in this case is the field of supply chain science.

The journals were published in 26 countries all over the world. The geographic distribution of articles is shown in Figure 5. India is the country that is most active in conducting and publishing articles related to healthcare supply chain (14 articles), followed by USA (13 articles). It is of concern here that the Indonesian state rarely does and publishes

articles in the field of healthcare supply chain, which will be a potential for writers in Indonesia to be able to contribute their scientific thinking.

The limitation in this study is that the journal platform used only uses 1 platform, namely Emerald Insight, while there are still other platforms that can be used to enrich relevant journals such as (1) Scopus (www.scopus.com), (2) Elsevier (www.sciencedirect.com), (3) Taylor & Francis (<http://www.taylorandfrancis.com>), (4) Springer (<https://www.springer.com/gp>) (5) IEEE (<https://ieeexplore.ieee.org/>) and (6) Google Scholar [8].

3.2 Publisher-wise distribution of research paper

The emerald insight platform is selected from various platforms that can be used to get scientific journals on the theme of healthcare supply chain. Emerald was chosen because he has depth in terms of explaining and expressing the intent of the journal he publishes. The use of language that is easy to understand and does not use high terms and vocabulary makes literature review analysis easier, so this research focuses more on using the Emerald Insight platform. Table 1 will further provide an overview of the journal publisher's name of each article used in the analysis of this study.

Based on the data presentation in table 1, it shows the dominance of articles published through Supply Chain Management - an International Journal (8 articles), International Journal of Pharmaceutical and Healthcare Marketing (7 articles), International Journal of Health care Quality Assurance (7 articles), International Journal of Lean Six Sigma (6 articles), and International Journal of Logistic Management (6 articles). The selection of journals from the article above shows its dominance in journals with the theme of supply chain, this indicates that the healthcare supply chain is still seen as an integrated part of the supply chain field, which is a form of development of this field.

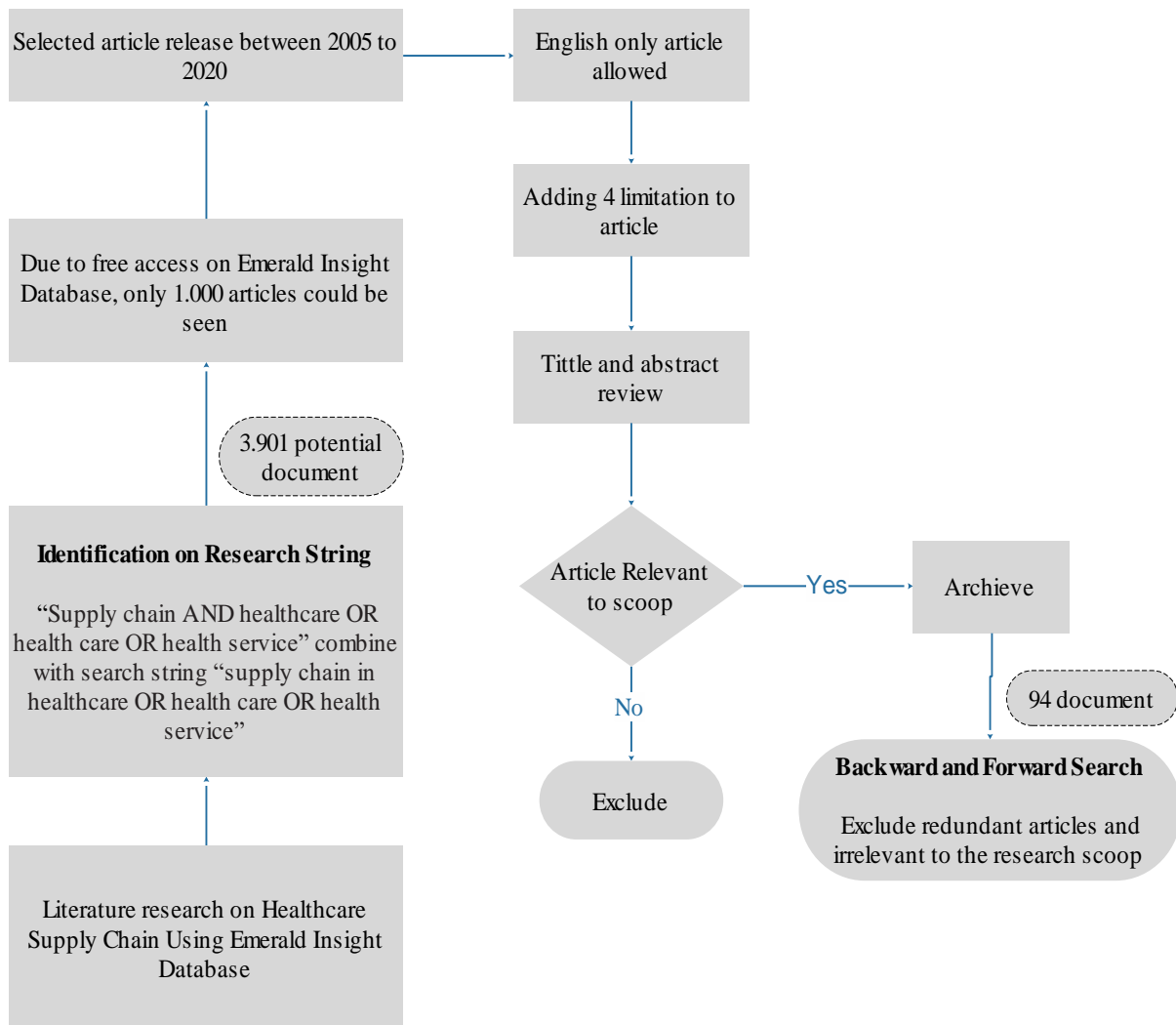


FIGURE 3. Planning to literature review process, adopted from [23]

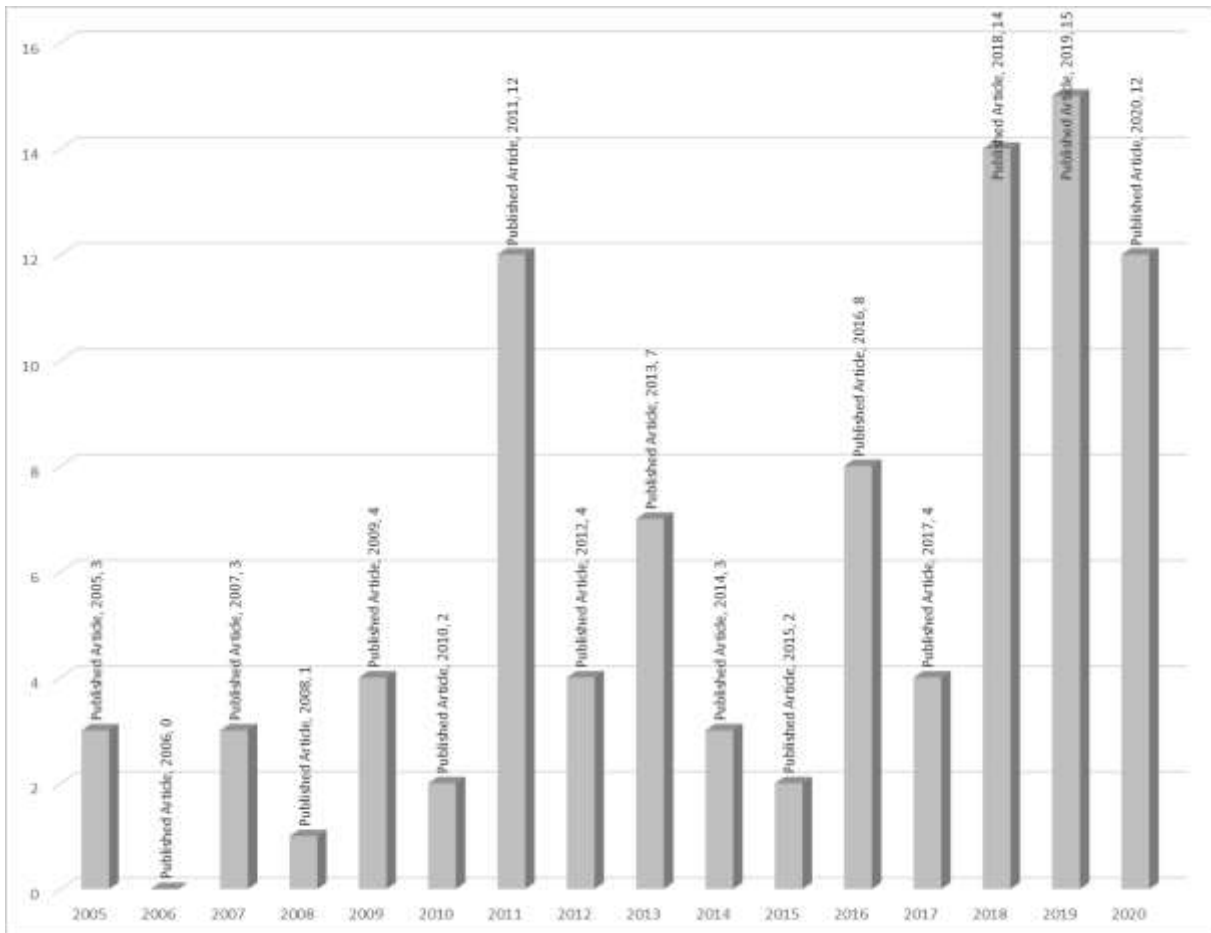


FIGURE 4. Distribution of journal being used by year

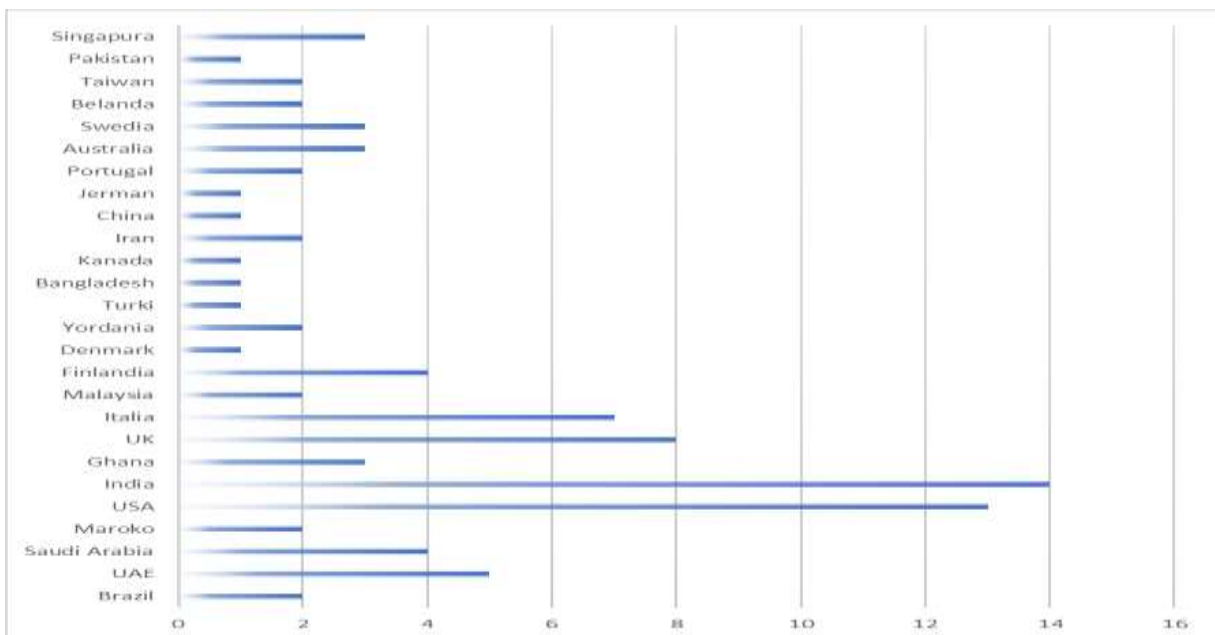


FIGURE 5. Article geographic distribution

4. RESULT

4.1 Trend in healthcare supply chain research

The trend shows the futures pattern of several articles on the theme of healthcare supply chain. Since its minor appearance in 2003, world researchers have looked at the potential to include the supply chain concept in healthcare [26]. Some of the reasons why the concept seeks to be coupled with health services as mentioned in several scientific articles are to (1) improve and maintain health care performance [1, 2]; (2) integration and coordination of supply, demand and relationships [29 , 30]; and (3) delivery speed of service [26 , 28].

Trends in methodology and trends at the data level show how far research in the healthcare supply

chain has been carried out [12, 23]. In this study, trends will discuss 2 main points, namely (1) methodological trends and (2) data level trends [12]. Methodology trends emphasize a descriptive description of the methodology used in articles in the healthcare supply chain. This methodology will at the same time determine the direction of future research, whether this article in the healthcare supply chain will be carried out in a field based on studies, applications, or trials (see figure 6). The data level trend shows the extent to which data is collected by researchers in the healthcare supply chain sector which will later be used for analysis and drawing conclusions. The data level here will be divided into (1) single data level, (2) double data level, and (3) multiple data level (see figure 7).

TABLE 1. An overview of the journal publisher's name

Name of Article Publisher	Quantity
Benchmarking – an international journal	5
International Journal of Lean Six Sigma	6
International Journal of Productivity and Performance Management	5
Journal of Modelling in Management	4
International Journal of Pharmaceutical and Healthcare Marketing	7
Journal of Health Organization and Management	2
Supply Chain Management – an International Journal	8
Journal of Accounting in Emerging Economics	1
International Journal of Logistic Management	6
Sustainability Accounting, Management, and Policy Journal	1
Journal of Global Operation and Strategic Sourcing	1
The TQM Journal	3
International Journal of Quality & Reliability Management	2
Journal of Health Organization and Management	2
Business Process Management Journal	3
Industrial Management and Data System	3
Journal of Business and Industrial Marketing	2
Leadership in Health Service	5
International Journal of Health care Quality Assurance	7
Record Management Journal	1
International Journal of Operation & Production Management	2
Management Research Review	2
Journal of Manufacturing Technology Management	1
Operation Research for Healthcare	1
Strategic Outsourcing : an International Journal	4
Journal of Humanitarian Logistic and Supply Chain Management	1
Disaster Prevention and Management	1
International Journal of Disaster Resilience in Built Environment	1
International Journal of Physical Distribution & Logistic Management	3
Organization Development Journal	1
Asia Pacific Journal of Innovation and Entrepreneurship	1

Single data level shows the data used in the study amounted to one type. This type indicates the data is taken from one location or one entity. So that the depth of the analysis and the conclusions produced are at the surface level that is focused on seeing an

outline of how the supply chain concept is applied in health services. Double data level shows that there are two types of data used in the study. This type indicates the data is taken from two locations or two entities. Comparisons and case studies involving two

locations and entities are the depth of analysis and the conclusions generated from this type of data, researchers at this level of data try to reveal in a comparative way so that they can take lessons from the results of the comparison. Multiple data levels indicate the data used in the study amounted to more than two types. This type indicates the data is taken from more than two locations and entities. A more complex study that not only emphasizes comparisons, but looks for loopholes to try to link the concept of supply chain to healthcare.

Based on the results in Figure 6, information is obtained that from 2017 to 2020, the methodological trend used by researchers in the healthcare supply chain sector is a survey method. This method emphasizes on asking a number of questions to which sources with a large number of sources (generally homogeneous information source) who are able to provide information related to the concept

of supply chain in health services [12, 14, 25]. This fact shows that there needs to be sources from various perspectives to try to find a common thread between the supply chain concept and health services.

Furthermore, in 2013 - 2016, the methodology trend used by researchers in the healthcare supply chain sector was a conceptual method. This method emphasizes the use of a framework developed independently by researchers where this framework is still based on existing theoretical studies. Creating, correcting, or updating the healthcare supply chain framework is the goal of this research, so that the results obtained will be the forerunner for further researchers to develop this research so that later the whole supply chain concept can be applied in health services.

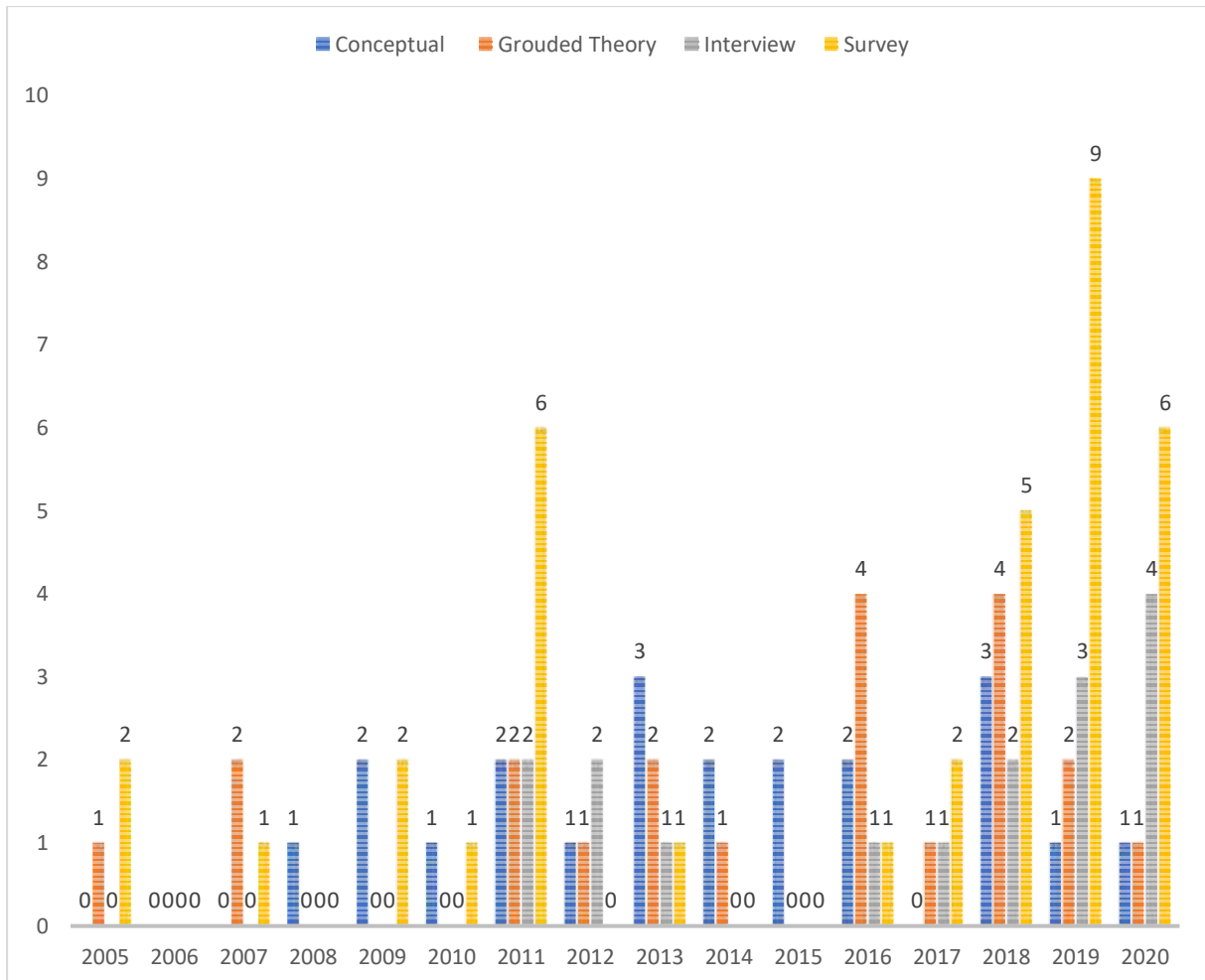


FIGURE 6. Trend research methodology in healthcare supply chain between 2005-2020

Few studies use grounded theory methodology. This methodology emphasizes the use of methods in the field of supply chain management that are completely or partially applicable to health services. Various basic theories in supply chain concepts such as JIT (Just-in-time), VMI (Vendor Manage Inventory), Lean concept, and six-sigma. Some examples of these theories are more likely to be confirmatory, because basically the theory is intended for a manufacturing environment, so that if the research is successful or not, it is not the main point, but rather leads to the extent to which the health service sector adapts to the use of this theory [31 , 32].

Based on the results in Figure 7, research in the healthcare supply chain sector is dominated by using a single data level. The use of a single data level shows that the research model in the healthcare supply chain is limited to finding out how the supply chain concept can be applied in health services. The use of literature in the form of books or articles dominates research in this field, few use the form of implementation (multiple data level 26%) which

further deepens how the supply chain concept can be applied in health services. A small proportion (double data level 12%) tried to make comparisons either using literature comparison media or comparisons within the organization. In the future, health research can be directed into the form of multiple data levels, where the level of complexity in it is getting bigger but can take a bigger perspective.

4.2 Theme in healthcare supply chain research

Based on the deeper content analysis of the 94 collected articles, 5 research themes and their detailed topics related to Healthcare Supply Chain (HcSC) emerged as follows :

1. Framework development
2. Case study literation
3. Technology aided
4. Healthcare derivate of service
5. Method in term of Supply Chain and Operation

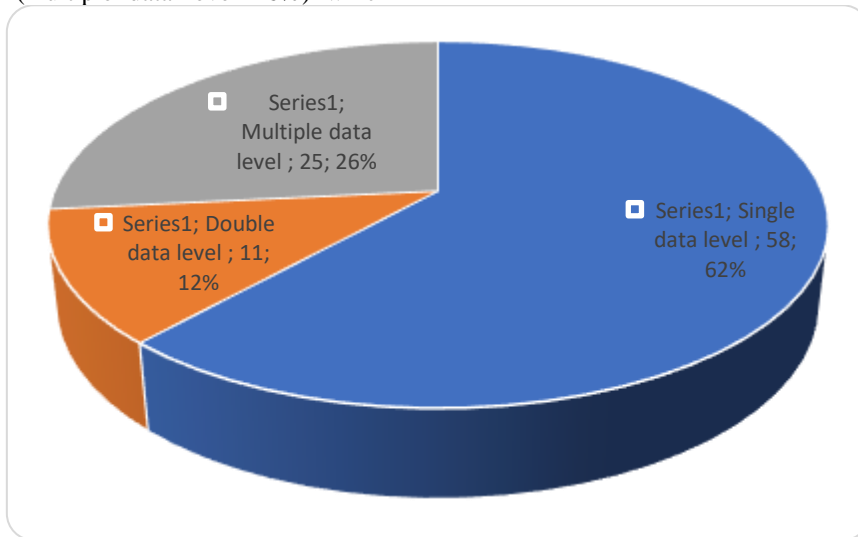


FIGURE 7. Research data level

The framework development describes a journal that specifically discusses how the supply chain concept should be applied in health services by developing, discovering, and synthesizing a framework. The case study literation explains about journals that specifically discuss phenomena in the field of health services which are then analyzed and learned in order to make the supply chain concept successful. Technology aided describes a journal that specifically discusses the uses of technology in health services aimed at enabling the level of

implementation of the supply chain concept in it. Healthcare derivate service explains about journals that specifically discuss parts in the field of health services that are more specifically linked to the supply chain concept, this shows that the smaller the scoop of health services associated with the supply chain concept, the higher the success rate will be. The method in terms of Supply Chain and Operation describes a journal that specifically discusses parts of the concept of supply chain and operations that are partially linked to health

services, this shows that the scope is getting smaller from the concept of supply chain and operations that are connected to health services. the success will be even higher. Table 2 will explain this trend in more depth.

Table 2 describes the Density Index which states DI, refers to the average number of specific topics discussed within a particular theme. The score of DI is calculated by a number of articles divided by a number of topics [12]. For example, the DI of “framework development” is 6,14 (from 43 articles divided by 7 topics). It means the average number of discussions on the theme “framework development” is around six times. The higher the DI leads to the more numbers of the “specific” topics have been undertaken. As a result, this implies the discussion on that particular theme should focus on digging the issue deeper instead of adding a new variation.

The value of DI relatively, shows the closeness between the theme type and the main theme. This value will show how varied the articles published on the main theme are. the meaning is that this value will show the relative level of research themes in healthcare supply chain with its main theme. Suppose that the “explanatory approach” theme which is part of the “framework development” theme category has a relatively value of 1,57. This value shows that healthcare supply chain researchers using this theme as a reference for their research are 1,57 times more than other themes in the theme category "framework development". With this value, it will enrich the understanding for future writers in the healthcare supply chain to develop scientific research in this field.

TABLE 2. Research theme on healthcare supply chain, adopted from [23]

Research Themes	Number of Papers	DI Score (Main)	DI Score (Relatively)
Framework Development	43	6,14	
Explanatory approach	11		1,57
Framework modelling	21		3,00
Data driven approach	4		0,57
Mix method study	1		0,14
Survey study	3		0,43
Experiment study	1		0,14
Quantitative study	2		0,29
Case Study Literature	16	5,33	
Using healthcare organization as a sample case	8		2,67
Expert opinion from healthcare institution	3		1,00
Site study	5		1,66
Technology Aided	6	3,00	
IT influences for MD	1		0,50
RFID Influences	5		2,50
Healthcare Derivate of Service	16	3,20	
Vaccine supply chain	1		0,20
Drug supply chain	6		1,20
Pharmaceutical supply chain	7		1,40
Patient safety	1		0,20
Clinic	1		0,20
Method in Term of Supply Chain and Operations	13	2,60	
VMI approach	4		0,80
TQM approach	2		0,40
Lean Six Sigma Approach	2		0,40
Lean Approach	4		0,80
Reverse Supply Chain Approach	1		0,20

Supply chain research in the realm of health services is dominated by the theme of “frameworks development”, which means that most researchers prefer to use a framework as a basis for seeing the relationship between supply chain concepts and health services. In 2015-2020 health services associated with the concept of supply chain are more inclined in this direction [20, 23, 24]. In the end, this is understandable because playing the framework will speed up finding the common thread between the two. Until now, researchers from various countries are still trying to find this relationship so that in the future the supply chain concept can be fully implemented in the health service sector. Framework is closely related to modeling, where modeling here is closely related to click and match. The large number of modeling used to reveal the relationship between health services and the supply chain concept will produce many frameworks.

While supply chain research in the realm of minority health services is on the theme of “method in terms of supply chain and operation”, which means that researchers in the healthcare supply chain are still trying to find a common thread between this supply chain concept in health services. It is widely known that the supply chain concept is a concept that was born in manufacturing, and the level of difficulty in implementing this concept in services is quite difficult. Taking the example of the “lean approach” in the field of supply chain and operations, where if the lean application in manufacturing covers 7 kinds of waste, then this health service does not fully cover the 7 wastes, there are several things that need to be removed and modified so that this waste can enter health services. [23]. Because of this difficulty level, few researchers took this theme, even though researchers who worked on this sub-theme were still classified as varied when compared to other themes in a field.

4.3 Future research avenues that less-explore in theme of healthcare supply chain

Research development in the healthcare supply chain is still ongoing and will be possible to develop, as long as health services continue to operate and strive to improve their performance. In Figure 8, it has been shown how broad the themes in the healthcare supply chain can be explored by researchers in the healthcare supply chain field. In the table, it is known that the theme of “frameworks development” has been the theme most used by

researchers in the healthcare supply chain field during the last 15 years. Even so, as a healthcare supply chain researcher, he provides an overview of future research themes so that it is hoped that this trend in the healthcare supply chain will not fade and continue to writhe with innovations and findings.

This study will try to provide this description, by playing the DI value relatively found in table 2, to discuss future research in the field of healthcare supply chain. Referring to the theme of “development frameworks” by looking at the relative DI value in each sub-theme, it is known that the future development of healthcare supply chain research in this theme is to focus on the sub-theme of “framework modeling” (see table 2). The term framework is a very popular term used in a vague way, and thus it does not have a clear-cut definition. A conceptual framework is defined as “a visual or written product, one that “explains, either graphically or in narrative form, the main things to be studied and the key factors, concepts, or variables and the presumed relationships among them” [33]. Further, researchers have developed LSC frameworks to fulfill the requirements of the manufacturing industry [34]. In 2011 [35] an article published to develop a framework to investigate the innovation of supply chain in the health-care sector to improve organizational performance. The data were collected from 243 clinics in South Korea (large hospitals, more than 100 beds), and the hypotheses were examined using structural equation modelling. The results showed that there was a positive relationship between the innovation of supply chain factors and organizational performance. The design of supply chain innovation has a considerable effect on the choice of collaboration with improved supply chain efficiency, suppliers and enhancement of quality management practices. However, the research was limited to the hospital’s size.

Referring to the theme “case study literacy” by looking at the relative DI value in each sub-theme, it is known that the future development for healthcare supply chain research on this theme is to focus on the sub-theme “Using healthcare organization as a sample case” (see table 2). A case study is a qualitative research approach used to understand an issue or problem by using a case [36]. The case study research method is appropriate when the form of the research question is “how” because it allows for the gathering of better knowledge and a deep understanding of a complex problem since it considers social processes and knowledge regarding managerial complexity as they occur in practice

[36]. Generally, research with the theme of a case study will combine 2 things, namely literature and the selection of a location (health service institution) which will be used as a location for data collection and analysis [36]. This model will produce a triangulation that is close to real (adjusted to the location where the data is collected and analyzed),

considering that the data taken is real data on conditions at that location. The theme of this research will better describe the location where the data was collected, so that the results will be difficult to generalize, but the concepts and ideas of thought can be used to help develop other research.

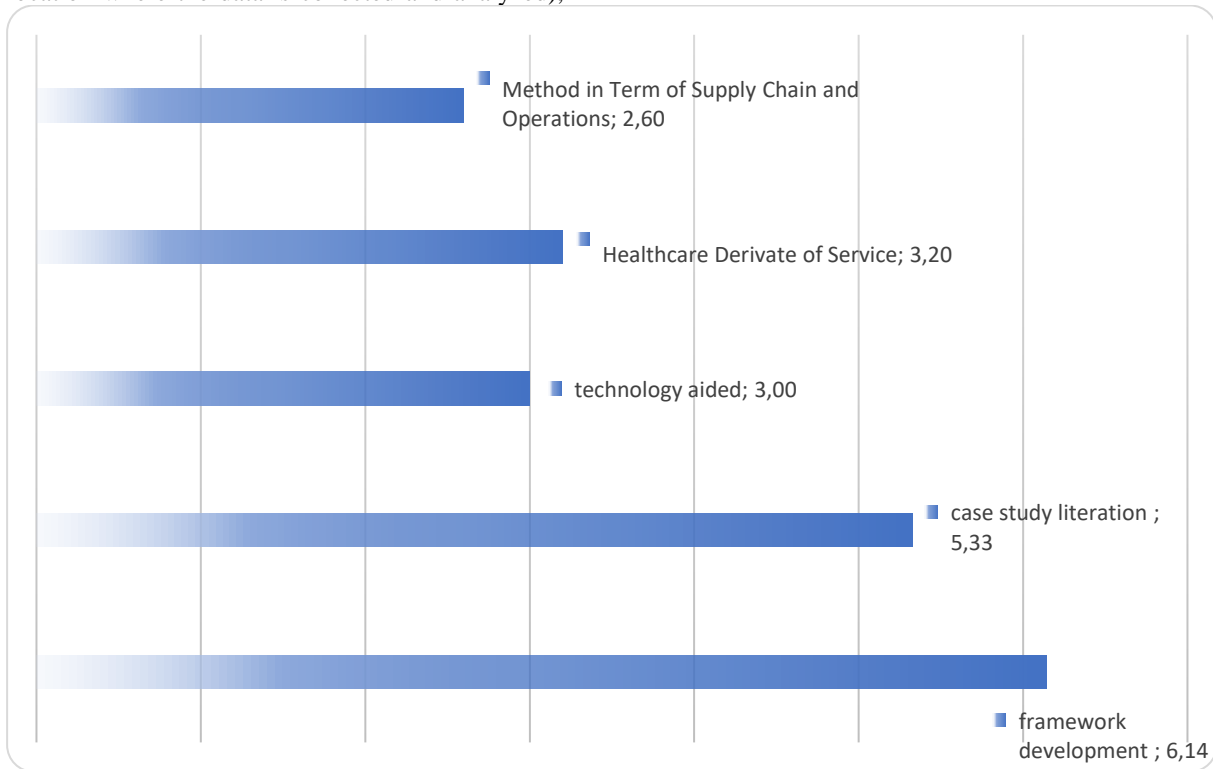


FIGURE 8. The DI value of research theme of healthcare supply chain

Referring to the theme of "technology aided" by looking at the relative DI value in each sub-theme, it is known that the future development of healthcare supply chain research in this theme is to focus on the sub-theme of "RFID influence" (see table 2). The technology aided theme puts forward the active use of some of the latest technology and information systems to be applied in health services. The aim, of course, is to help accelerate the implementation of the supply chain concept in healthcare [37]. Radio Frequency Identification (RFID) is a technology that has been used extensively in manufacturing and retail industries over the past several years and has gained popularity in hospitals. Hospitals can use RFID systems to manage inventory, track equipment and supplies, manage patients and staff, and reduce medication-related errors [38]. Although research exists on RFID adoption in healthcare, relatively little attention has been paid to assess the status of RFID adoption as well as understand the benefits

and concerns regarding RFID implementation in hospitals [37]. Researchers have developed several analytical and empirical models such as the Diffusion of Innovation model, the Technology Acceptance Model, the Technology Organization Environment model to guide empirical research on organizational-level IT adoption. One framework that is commonly used and widely accepted in understanding the adoption of any technology is the Technology-Organization-Environment (TOE) model. The TOE framework identifies three factors that may affect the decision to adopt a new technology: (1) technology factors; (2) organizational factors; and (3) environmental factors [37].

Referring to the theme "Healthcare Derivate of Service" by looking at the relative DI value in each sub-theme, it is known that the future development of healthcare supply chain research on this theme is to focus on the sub-theme "Pharmaceutical Supply

Chain" (see table 2). Pharmaceutical supply chain is a topic of discussion that often dominates in the healthcare supply chain field for further research, this is because pharmaceuticals have varied unit items and characteristics that are continuously required in all health service lines [39]. The pharmaceutical industry is defined as a system of procedures, operations and organizations involved in the discovery, development and production of drugs and medications. The pharmaceutical supply chain represents the path through which essential pharmaceutical products are distributed to the end-users with the right quality, at the right place and at the right time [40]. The pharmaceutical supply chain pharmaceutical supply chain is very complicated and greatly responsible for ensuring that the appropriate drug is delivered to the right people at the right time and in the right situation to fight against sickness and sufferings. This is a highly sensitive supply chain in which everything less than 100 per cent customer service level is unacceptable, as it directly influences health and safety [39]. However, it is a great challenge to ensure 100 per cent of product availability at an optimum cost unless supply chain processes are streamlined toward customer requirements and demands [41]. A typical pharmaceutical supply chain consists of the following members (1) initial manufacturing, (2) secondary manufacturing, (3) market warehouse/distribution centers, (4) wholesalers, retails/ hospitals and (5) patients [27]. Among pharmaceutical supply chain components, it has been argued that delivery of medicines has crucial effect on customers' satisfaction [39].

Referring to the theme "Method in Term of Supply Chain and Operations" by looking at the relative DI value in each sub-theme, it is known that the future development for healthcare supply chain research on this theme is to focus on the sub-theme "VMI approach" (see table 2). According to the Council of Supply Chain Management Professionals (CSCMP), Vendor Managed Inventory (VMI) is defined as "The practice of retailers making suppliers responsible for determining order size and timing, usually based on receipt of retail point of sale (POS) inventory data [42]. Its goal is to increase retail inventory turns and reduce stock outs. It may or may not involve consignment of inventory (supplier ownership of the inventory located at the customer)" [43]. Healthcare systems have, traditionally, paid little attention to inventory management. In fact, this concern occurs, in this sector, as result of budget pressures or, in a more positive perspective, continuous improvement

programs. It is common to find high levels of safety stocks in several points of healthcare units due to poorly implemented inventory management practices and personal judgement in determining safety stock levels in silo-structured organisations [42]. A research in 2007 [44] identified four methods for supplies distribution in healthcare setting: "direct delivery to medical department for use; direct delivery to medical department's storage for later use; direct delivery to central warehouses and then delivery to medical department for use; and direct delivery to central warehouse and then delivery to departments' storages". The best way to look for enablers and barriers to any project implementation is to follow the root causes for benefits and risks. The reported case shows that some benefits of VMI are still hindered by healthcare sector strong implementation barriers [42]. Despite some unawareness of VMI benefits in healthcare, it can present a waste reduction solution not only in costs but in the quality of care for freeing clinical professionals to clinical tasks, among other savings. The multiple benefits are better explored, as in any relationship building, by investing in partnership creation and overcoming the idiosyncratic barriers of healthcare sector [42].

5. CONCLUSION

Research development in the healthcare supply chain field will still and continue to grow in line with the attention of health service management to provide quality and quality services. Management of the supply chain concept in health services can spread into 5 main themes, namely (1) modeling framework, (2) using healthcare organization as a sample case, (3) RFID influence, (4) pharmaceutical supply chain, and (5) VMI concept. approach. The five themes provide an overview of how health services can be bridged by supply chain concepts in order to improve service performance, as well as the quality of health services. It is possible that in the coming year there will be research with additional themes outside of the above themes, as a form of healthcare supply chain development. There are still many themes and areas of research for healthcare supply chain that will encourage the development of the supply chain concept in healthcare services.

This research has provided various perspectives on how the supply chain concept is applied in health services, by prioritizing sources (published articles) published from reputable international journals, so that it will provide an overview for healthcare supply chain activists to continue to find ideas and gaps.

may be used to combine supply chain concepts with healthcare.

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