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Review article

Benefits of implementing Industry 4.0 technology in health services

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ABSTRACT

The development of Industry 4.0 technology has progressed rapidly across various business sectors, including healthcare. Since the pandemic, the adoption of Industry 4.0 technologies in health services has become increasingly essential for patient care and health reporting systems. The healthcare industry demands efficiency and effectiveness, and today, numerous Industry 4.0 applications are widely utilized to streamline critical business functions in this sector. Numerous studies exploring the implementation of Industry 4.0 in healthcare can be found in academic publications. This research aims to analyze and provide a segmented review of parameters derived from a collection of articles, highlighting the extent to which Industry 4.0 technologies, or Health 4.0 (H4.0), are applied in the healthcare sector. The study employs a Systematic Literature Review (SLR) approach, drawing on research from various journals and conducting a comprehensive literature review of articles sourced from well-known databases related to Industry 4.0 in healthcare. The research identifies key Industry 4.0 technology segments based on data collected from 2019 to 2023. The findings contribute to the body of knowledge in industrial engineering, particularly in operations research and analysis, by demonstrating that the application of H4.0 is widely implemented across various segments in healthcare services. Additionally, this research offers practical insights by providing solutions for implementing Industry 4.0 technologies in healthcare, aligned with the identified segment parameters.

1. Introduction

The era of globalization in the service industry is experiencing very rapid development and people's needs for various areas of life are very urgent. The service industry plays an important role in the future, one of which is health services [1]. Rapid industrial development is also followed by technological developments, including industrial technology 4.0. The development of industrial technology 4.0 in various business sectors is very rapid, including in health services. In general, the term for Health Care 4.0 is applying industrial technology 4.0 in health services, both patient services and health technology.

Medical scales and various health technology applications have implemented Industry 4.0 design principles called Healthcare 4.0 which refers to digitalization and the cloud concept [2]. Completing important business functions in almost all health industries has widely used 4.0 technology applications because it can produce efficient performance. The problem with the current trend is that some health companies still do not use Industry 4.0 technology due to investment problems. But as times change, some health service companies must quickly adapt to Industry 4.0 because of the many benefits.

The health industry is experiencing a treatment crisis due to the COVID-19 pandemic, so it needs to be supported by the application of technology 4.0 to make it easier for medical personnel to treat patients [3]. Developments began with Health Care 1.0 around the 1800s when the critical role of hygiene, sanitation, and the concept of disease transmission began. Then continued with era 2.0 in the early and mid 20th century, with the emergence of various specialties, large hospitals, various types of antibiotics, and the pharmaceutical industry. Then, the world entered the 3.0 era around the 1980s, marked by the widespread use of computers in health services. Various developments in radiology imaging and evidence-based medicine.

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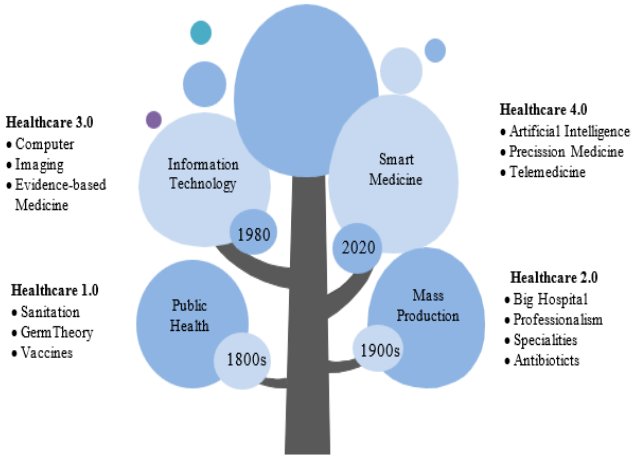

Figure 1. Healthcare revolution trend [4]

The expansion of the use of Industry 4.0, including artificial intelligence, big data, Internet of Things (IoT), telemedicine, and precision medicine, is the transformation of Industry 4.0 in various industries, especially the era of health services 4.0. There are several other practical aspects in the daily use of health services 4.0, such as robots in hospitals or a kind of watch that also measures indicators of human health. The development of Health care from time to time can be seen in Fig. 1.

According to WHO, this development was marked by the launch of the World Health Assembly (WHA) Resolution on digital health in 2018. This digital health resolution brings a new chapter in global health services and is expected to be one of the main ways to achieve the Sustainable Development Goals (SGDs) health goals. This resolution clearly states that digital health will support health systems in all countries, cover aspects of health promotion and disease prevention, and increase access, reach, and quality of health services in various parts of the world. Technology 4.0 has had a major impact on the healthcare industry with technology and innovation improving healthcare services, although human interaction remains important for human health and well-being.

In the next 15-year cycle, the Internet of Things will become a big issue in the pharmaceutical and health management industry based on the Pharma Management Radar survey [5]. Dramatically and spontaneously, the health service industry with H4.0 can increase the agility, efficiency, flexibility, and quality of industrial medicine production, so that many health industries improve themselves in fulfilling [6], [7]. Hospitals around the world have implemented RFID technology that can track medical assets, interact with almost any medical device, pharmaceutical ingredient, and IT equipment, or individual patient reports [8]. The application of the Industry 4.0 concept can develop a structural framework by analyzing dependencies which will help professionals understand and identify symptoms in health services [9].

The provision of health services becomes efficient if implementing a combination of Industry 4.0 technology approaches and lean concepts can result in reduced waiting times and resource allocation [10]. In the health sector, all precision medicine activities and the evolution of smart drugs which are developing rapidly for chronic and non-communicable diseases have implemented Industry 4.0 design principles which are working very well [11]. The characteristics of future industries related to cyber-physical systems (CPS), Internet of Things (IoT), internet of services (IoS), robotics, big data, cloud manufacturing, and augmented reality are included in Industry 4.0 in the health service industry as an umbrella paradigm concept new industry [12].

This research aims to analyze and provide a parameter review segment from a collection of articles that shows how much Industry 4.0 technology is applied in the health sector or Health 4.0 (H4.0). The benefits of this research are the body of industrial engineering knowledge including operations research and analysis which can provide input to other researchers that the application of H4.0 has been widely used according to segment parameters in health services. The practical contribution of this research can provide input regarding solutions for implementing Industry 4.0 in health services according to its segment parameters.

2. Material and method

This type of research uses secondary data, where the data collected is in the form of documentation reports of several scientific works that have been published. This scientific work concerns the existence of Industry 4.0 in health services such as the Internet of Things (IoT), Big Data Analytics (BDA), blockchain, Artificial Intelligence (AI), and cloud computing which have advanced the development of health services. An integrative review is used as a research methodology framework to condense the literature on the observed phenomenon. It will be interesting to synthesize knowledge from selected and systematically analyzed studies.

This research method uses a Systematic Literature Review (SLR) Approach with studies from several journals and involves literature studies of various papers from well-known databases related to technology 4.0 in the health industry. This research framework uses seven steps: (1) literature review with the keyword Healthcare 4.0 in trusted databases for publishers who have officially published their journals. Scientific works taken from publication years 2019 to 2023. (2) determining research objectives totaling 80 articles from various databases. Then screen whether the article is in English and relevant to the parameter segment in health services or not? (3) if something does not match the parameter segment, do not include it in the classification of Industry 4.0 scientific work in health services. (4) identification and filtering of various articles collected into 70 articles, then classifying the articles according to the year of publication, country of the publishing author, publication by publisher, publication by empirical study and publication by Industry 4.0 Technology. (5) evaluate the research

included in the integrative review with 5 finding parameters and create tables and graphs. (6) interpretation of the results of literature studies and (7) suggestions and future research plans related to Healthcare 4.0.

3. Results and discussions

3.1. Article summary

This paper identifies 70 articles in journals related to implementing Industry 4.0 in healthcare. Selected articles will be summarized and analyzed. Articles are summarized based on research and findings. The summary of the articles can be seen in Table 1. Table 1 shows that many articles related to 4.0 technology in healthcare industry are related to smart digital applications consisting of IoT, BDA, blockchain, AI, and cloud computing as many as 42 articles or 60% of the total articles collected. This shows that many healthcare services or hospitals have adopted industry 4.0 technology in their operational activities to accelerate patient responses or data analysis. For more details on the findings obtained from the 70 collected articles, see Table A1 in Appendices.

This paper identifies several attributes in the literature to offer a comprehensive insight into the applications and benefits of Healthcare 4.0. Selected articles will be grouped based on different perspectives. These perspectives include the number of publishers, the number of distributions by country, and the classification based on the type of research. Based on clustering, articles were searched from 2019 to 2023. It can be seen in Fig. 2. In Fig. 2, the year with the most publications was 2020, with 25 articles or 36%, where that year was the condition of the Covid-19 pandemic in all countries. Many researchers have written texts related to the application of Industry 4.0 to the health service industry.

Fig. 3 analyzes the distribution of Industry 4.0 technology publications in health services. India is the country with the most frequently applied Industry 4.0 technology. Healthcare 4.0 is neglected in this case, especially in developed and developing countries. The distribution of publications in India with 16 articles. That means that 23% of the articles were in all identified countries for India. This indicates that the two countries are intensively implementing Industrial Technology 4.0 in Health care. It can be seen in Fig. 3.

Fig. 4 shows that Elsevier is the database with the highest number of contributing articles, totaling 15 (21%). This is because Elsevier is a reputable journal publisher that offers open access and allows researchers to quickly obtain desired articles. This can be seen in Fig. 4.

This paper attempts to identify the methodological design used in each empirical study. Once identified, it was found that the most common methodological design in this research was case studies, with 33 articles (47%), followed by classroom action research with 12 articles and observational studies with 10 articles. Additionally, there were 6 articles using a before-and-after intervention design, 5 descriptive studies, and 4 intervention studies. More details can be seen in Fig. 5.

This phenomenon, which combines cyber technology and automation technology, is conceptualized as the implementation of H4.0, focusing on automation in health services. Applying H4.0 to health services through digitalization reduces the involvement of human workers in the process. The implementation of H4.0 in the health service industry using digital technology is crucial for supporting the sustainability of the healthcare sector [13] (More details can be seen in Fig. 7).

Among Industry 4.0 technologies, the Internet of Things has the most applications, with 29 articles (41%), followed by Artificial Intelligence with 16 articles (23%), Cloud Computing with 14 articles (20%), Additive Manufacturing with 6 articles (9%), and Big Data with 5 articles (7%). In the healthcare industry, these technologies have a significant impact on work quality and service costs. However, their benefits extend beyond healthcare, providing advantages to all levels of society. More details can be seen on Fig. 6.

Table 1.
Parameter review of Industry 4.0 technology in healthcare

No	Parameters	Authors	Number of articles
1	Smart Digital Application	[14], [15], [16], [3], [17], [1], [18], [9], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [10], [33], [34], [35], [36], [37], [38], [39], [40], [41], [42], [43], [44], [45]	36
2	Precision Medicine	[46], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57]	12
3	Telemedicine	[6], [58], [8], [59], [60], [61]	6
4	Business Management	[62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73]	12
5	Review	[4], [74], [12], [75]	4
		Total	70

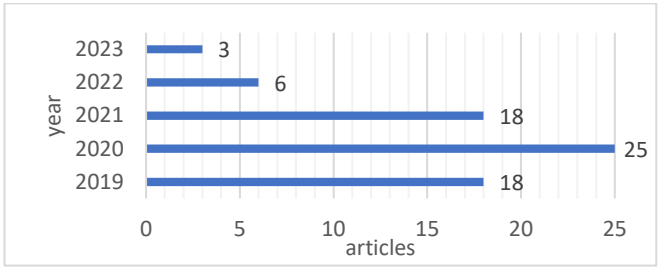

Figure 2. Publication by year

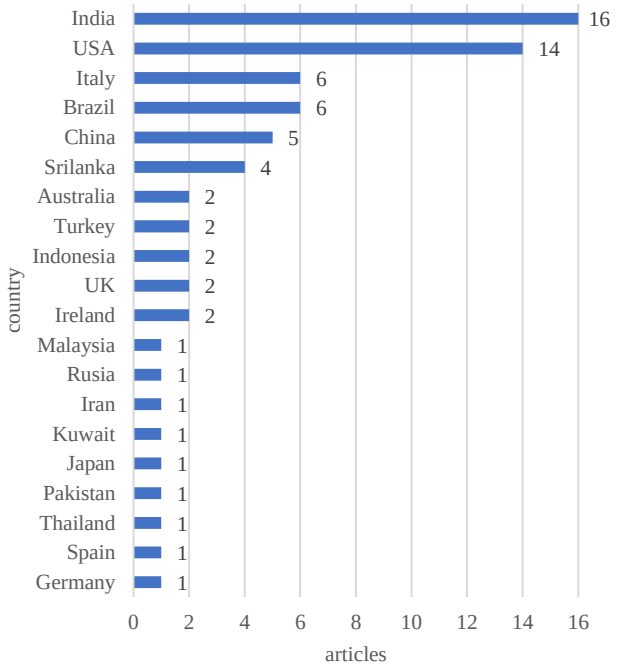

Figure 3. Publication by region

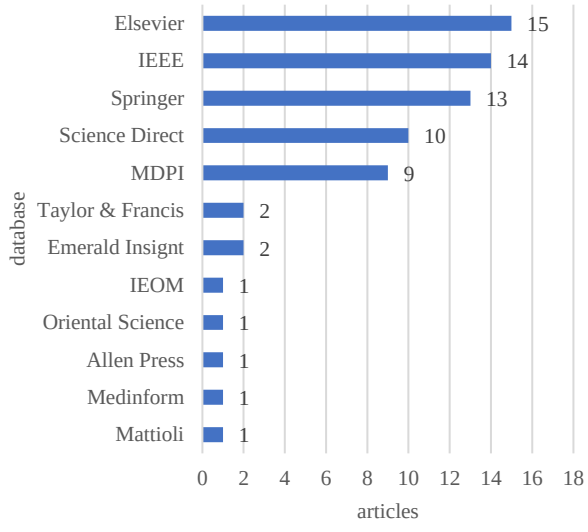

Figure 4. Publication by publisher

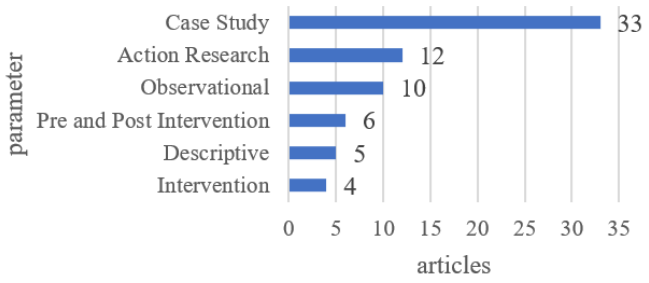

Figure 5. Publication by Empirical Study

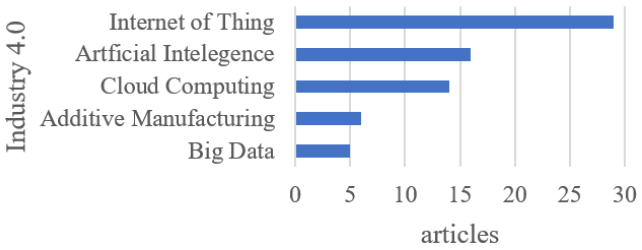

Figure 6. Publication by Industry 4.0 Technology

3.2. *Research gap*

This research presents a systematic literature review on Industry 4.0, particularly in the healthcare sector. The focus is on research summaries from various countries spanning 2019–2023, which have been carefully and conceptually analyzed. In the post-COVID-19 era, researchers worldwide have actively contributed to scientific publications on the benefits of implementing Industry 4.0 in healthcare. The healthcare industry is upgrading and improving its systems and devices by integrating digital technologies such as IoT, big data, blockchain, and cloud applications to enhance services. Other studies on Industry 4.0 explore its application in healthcare but focus on the significance of innovation in AI adoption.

The combination of AI and telemedicine has the potential for exponential growth in the development of H4.0, leading to greater efficiency in healthcare management. Healthcare service reviews, including patient monitoring, healthcare IT, intelligent diagnostic assistance, and information analysis, have facilitated faster service delivery [76]. Additionally, research examining the relationship between AI and Industry 4.0 in healthcare indicates a strong connection between the two. One study analyzed the countries contributing to Industry 4.0 research in healthcare, revealing that China had the highest number of publications, while India emerged as the most collaborative country in this field [77].

3.3. *Benefit implementation Healthcare 4.0*

The benefits for the health industry are those who implement Healthcare 4.0, health industry players will get great benefits and opportunities in the future [46]. Healthcare 4.0's presence can make it easier for patients to access health information via their smartphones. One of them is a digital inhaler for patients with chronic obstructive pulmonary disease that can monitor inhalation data in real-time. Not only that, but many artificial health applications also help health industry players diagnose patients. The IBM Watson Project is a tool capable of supporting individual patient clinical, research, and social data. IBM's sophistication can also estimate a patient's blood sugar level by streaming data from an insulin pump. The advancement of the world of health through digitalization makes nurses must be able to adapt. Nurses need to be more innovative to respond to a fast-changing business.

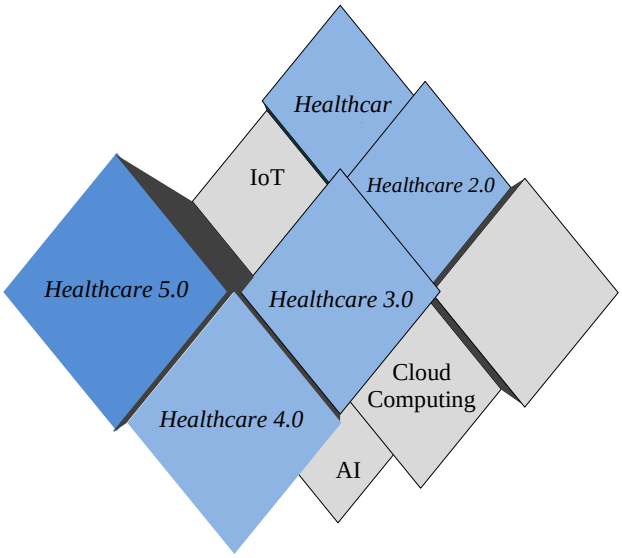

Figure 7. Development for Healthcare 5.0 [5]

Other forms of the 4.0 concept in the Hospital are robots in the treatment ward and patient monitoring technology in the isolation room, telehealth in screening patients in the triage room in the emergency department, electronic medical records, etc. Various latest technologies have also been used to improve the health management information system (HMIS) in a broader concept. The smart supply chain system is utilized to procure drugs and medical devices in various parts of the country. In the COVID-19 situation, procuring health commodities is inclusive and complex, and management's willingness to implement H4.0 is needed because it concerns the service of human life. The availability of a very reliable logistics management system with high precision and supported by the right technology has become an indispensable daily necessity.

3.4. Further study

This paper identifies gaps in the literature study on Health 4.0. These gaps have been grouped and prioritized as the following applications. First is the lack of skills or leadership style required of senior/executive management and middle management to run an organization. Leadership is an essential factor in the success of Health 4.0. The impact will be the subject of future research to determine which leadership characteristics are most conducive to implementing Health 4.0. The leadership style that is often applied is in the manufacturing sector. Different leadership styles may be required in other industrial sectors, especially healthcare. Another gap is the issue of investment in medical equipment. Investment is a major problem facing the healthcare industry. With the investment, procurement costs will be reduced to hurt health services. However, during the Covid-19 pandemic, investment is a necessity. Investment in medical equipment during the COVID-19 pandemic may be part of handling this pandemic itself, but also as an opportunity to deal with economic slowdown conditions that also affect investment.

Based on identification, this paper provides suggestions for future research. Collaboration of 2 components is required, Industry 4.0 and Society 5.0 technology. The expected effect is to provide guidance that makes decisions more accessible, faster, more reliable, and satisfying with such big data controlled in real time. This concept will help to improve services and decisions in health care. More details can be seen on Fig. 7.

4. Conclusions

This study concluded that 70 articles were collected with the analysis and identification discussing the application of industrial technology 4.0 in health services. Based on the identification, Elsevier became the most searched publisher from 2019 to 2023. India is a country that fully contributed to implementing Healthcare 4.0. This indicates that India is intensively improving its infrastructure for health services. Based on methodological design, most case studies were collected. This indicates that the research is based on problems that must be improved.

Industrial Technology 4.0 is essential for health services because it has various positive impacts. Patients can access health information easily. Medical personnel are assisted with super-sophisticated tools that can reduce their workload. Drug procurement becomes more accessible, faster, and more flexible with Smart Supply Chain. The Health Management Information System can control all job reports in health services. The Health Management Information System can control all job reports in health services. For further research, researchers are interested in integrating Industry 4.0 and Society 5.0 because of the relationship between technology and social associations from around the community.

Declaration statement

Iskandar Zulkarnaen: **Conceptualization, Methodology.** Alloysius Vhendy Prasmoro: **Supervision, Project Administration**. Arif Nuryono: **Funding Acquisition, Data curation**. Oki Widhi Nugroho: **Validation, Writing - Original Draft**. Hibarkah Kurnia: **Resources, Validation, Formal Analysis, Editing.**

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article or its supplementary materials.

AI Usage Statement

The authors confirm that no generative AI or AI-assisted tools were used in the creation or writing of this manuscript. All content has been entirely produced, reviewed, and edited by the authors without the assistance of AI technologies.

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Appendices

Table A1.
Existing literature review of industry 4.0 technology in healthcare

No	Authors	Findings
1	[41]	Digital technologies in the healthcare sector include seeking medical knowledge resources, monitoring the quality of patient care, and improving clinical support.
2	[69]	The future of IoT is very bright as the healthcare sector requires a deeper understanding of the factors that lead to the point of active sustainability efforts
3	[56]	Relevant technology in the categories of diagnosis, treatment, consultation, and health monitoring for self-management of chronic conditions is by directly mapping AI functions
4	[60]	Electronic medical record management, biomedical training, remote patient monitoring, pharmaceutical supply chain, health insurance claims, health data analysis, and other potential fields require Blockchain technology to facilitate in the healthcare sector.
5	[42]	Personalized smart healthcare uses PDT by bringing together existing advanced technologies (i.e., DT, blockchain, and AI).
6	[43]	Smart manufacturing and healthcare require DT characteristics, communication technologies, and tools used in the creation of DT models, reference models, standards, and recent work in the healthcare sector.
7	[45]	Paradigma digital twinning sebagai penunjang layanan kesehatan, dan sebagai aplikasi entitas fisik yang sudah diklarifikasi untuk referensi arsitektur digital twin di bidang Kesehatan.
8	[44]	Digital technologies and Industry 4.0 tools offer opportunities for effective healthcare delivery, online education, and Work from Home (WFH) environments.
9	[70]	The new Industry 5.0 features for the health service sector will prepare this sector for a super sophisticated health service system
10	[71]	Future developments in health services 4.0 are a fundamental need and mainstay in building security and privacy in the health care system.
11	[57]	Application of cyber-based health interventions and healthcare technology focus on changing treatment pathways for patients worldwide.
12	[73]	Efforts from the health sector to investigate, and implement, challenges and opportunities of the 4th industrial revolution paradigm in the health sector.
13	[61]	Perception of technology The H4.0 healthcare industry was created through pre-medical diagnosis to lead to improved operational performance in the healthcare sector.
14	[14]	Implementation of systemic integration of I4.0 technology into health service organizations depends on hospital management because digital applications can run from the seriousness of an organization's management.
15	[15]	Provides a causal relationship model among the intertwined drivers of industry 4.0 and circular economy for developing an intelligent healthcare waste disposal system enriched with the benefits of the circular economy.
16	[16]	The application of Industry 4.0 in its expansion can lead to a Society 5.0 context for public health services.
17	[46]	A strong impact on the application of technology 4.0 in health services is the development of real-time care systems, digitalization of non-invasive care, emergency response to medical emergencies, and collaborative patient information data.
18	[47]	Implementing H4.0 in the service industry can help improve quality management during the COVID-19 pandemic, therefore consistency is needed from health service industry players.
19	[72]	Healthcare organizations routinely use the data generated from patient records, insurance companies, research labs, and pharmaceutical manufacturers for disease prevention, diagnosis, and treatment.
20	[62]	The application of Industry 4.0 to health services, especially logistics management, is the most prioritized factor in implementing digitalization in the supply chain of medicines and spare parts for health technology machines.
21	[3]	A series of clouds supporting IoT, BDA, blockchain, AI, and computing are included in the healthcare database 4.0.
22	[48]	The virtualization of new technologies is becoming broader and simpler, the need for monitoring and virtualization of certain parts of the system can be sufficient, so that it is effective in H4.0.
23	[17]	Contribute to narrowing the information gap about Industry 4.0 in the Brazilian health sector.
24	[6]	The application of these technologies can dramatically increase the agility, efficiency, flexibility, and quality of the industrial production of medicines.
25	[39]	The integration of Healthcare Industry 4.0 technologies utilized in the healthcare domain is developing a new path to offer traditional products and services.
26	[59]	The medical data collected at the edge layer was first encrypted using Elliptic Curve Cryptography using Elliptic Curve Diffie Hellman (ECDH).

No	Authors	Findings
27	[67]	Green Human Resources Management (GHRM) is important in health services, especially in HR management which is suitable for organizations, including hospitals that have a significant environmental impact.
28	[68]	Implementation of H4.0 works to ensure minimization of medical supply costs. Apart from that, you can consider the vehicle fleet as well as location, demand, delivery time, and travel time priorities between suppliers and customers.
29	[58]	Detecting and diagnosing the symptoms of COVID-19 can be found in the application of H4.0 technology
30	[1]	Our results allow hospital managers to anticipate potential issues in H4.0 implementation, enabling more proactive efforts to improve performance and deliver high-quality and low-cost care in the fourth industrial revolution era.
31	[63]	Treatment management proposes to provide direct recommendations regarding health knowledge for users so that addicts can recover through rehabilitation.
32	[18]	The superior paradigm of health services 4.0 includes scenarios, advantages, and benefits from implementing H4.0 which are very beneficial for all parties, both hospitals and patients.
33	[8]	The RFID technology can track medical assets, interact with almost any medical device, pharmaceutical ingredient, and IT equipment, or individual patient reports.
34	[9]	The application of the Industry 4.0 concept in the health sector is developing a structural framework by analyzing dependencies that will help professionals understand and identify health service needs.
35	[19]	The survey results show that 82% are employees who have worked for more than 8 years and 98% are management who know awareness of the implementation of H4.0.
36	[20]	Health equipment such as radiography, Computer Tomography (CT), and Magnetic Resonance Imaging (MRI) are regulated and monitored by AI which can analyze the health equipment data.
37	[21]	One application of H4.0 is blockchain in a medical cyber-physical system based on the digitalization of health services.
38	[49]	The Decision Making Unit (DMU) will receive a detection signal of the patient's critical condition outside and inside so that the patient is immediately followed up.
39	[22]	Applications of H4.0 are often found in Internet of Things applications, big data, artificial intelligence, data integration, robotization, virtual reality, and 3D printing.
40	[50]	The development of the H4.0 application began by creating a service-oriented middleware framework as a performance standard for health services.
41	[23]	The Gas value required (indicating block size and expenditure) lies within the current Ethereum network gas limits.
42	[24])	One of the 4.0 technologies in the health sector is employee competency.
43	[25]	Implementation of H4.0 requires agreement and authorization from health service management to gain support from interested parties.
44	[34]	Personalized and participatory health and ICT applications in health care are essential for advances in diagnosis and treatment in the healthcare sector.
45	[37]	Industrial Internet of Things technology has been applied in various industries, especially health services so that company targets for health service satisfaction are achieved.
46	[35]	Technological advancements and the amalgamation of several fields, including Advanced Robotics, Artificial Intelligence (AI), Big Data Analytics, Cyber Security, Cloud Computing, and the Internet of Things (IoT) have brought the world to the cusp of a Fourth Industrial Revolution (FIR).
47	[51]	Treatment abroad has become more affordable, and easily accessible, and health records are available in real-time and safely, even remotely, but the implementation of H4.0 helps customers.
48	[54]	Elderly or infirm people can be treated at home with the application of H4.0-based medical technology.
49	[55]	Hospitals can use the structural equation model to analyze knowledge, attitude, skill, and behavior problems to increase doctors' readiness and strengthen their behavior needs to develop their attitudes and skills.
50	[52]	The results of patient examination reports in the form of diagnostic communication can be measured measurably from wireless biosensors that can be used on a server via the nearest cloudlet hosting on H4.0 health services.
51	[26]	This indicates that contingencies affect both H4.0 technologies adoption and associated barriers, although not homogeneously in terms of effect, and are more prominent in technologies' adoption than in barriers to H4.0 implementation.
52	[64]	Implementing H4.0 in public health services is an important point for every hospital in its sustainability in the field of health information.
53	[75]	Big data changes the storage capacity of a database from one byte to large data needed by hospitals.
54	[27]	In the health services sector, H4.0 is needed so that many great benefits can be gained from health services.
55	[28]	A reasonable and inexpensive solution for healthcare application scenarios is bodyedge in H4.0 implementation.
56	[65]	The application of H4.0 digitalization in the form of healthcare applications that can monitor demand-based drug packaging production reflects feasibility and flexibility
57	[29]	A combination of methods between Health 4.0 and health service system engineering is needed for hospital management to accelerate patient waiting times.
58	[30]	The use of H4.0 in health services is very useful as a control network for hospitals in health service operations that is more relevant and valuable.
59	[31]	Implementation of H4.0 will be ineffective due to a lack of top management support, inadequate maintenance support systems, and lack of employee training.
60	[12]	The challenge in implementing H4.0 in health services is the role of human resources in health care system engineering.
61	[10]	The combination of Industry 4.0 technology approaches and lean concepts can result in an efficient reduction of waiting times and allocation of resources by health service providers.
62	[4]	Health Services 4.0 needs to be further developed in terms of information systems, health environments, and integrated health service management.
63	[33]	The development of digitalization in the service industry has spread to health services with H4.0 with various databases that support hospitals.
64	[53]	There are 19 important medical devices included in H4.0 in the medical or health service sector that can make a significant contribution.

No	Authors	Findings
65	[66]	Search engine index can improve the accuracy of prediction, and the performance of SVM is better than other methods (ARIMA and ANN) when the number of observations is limited.
66	[32]	Optimizing the flow of the drug delivery process to hospitals is one application of H4.0 digitalization in health services.
67	[74]	The solution for managing hospitals that are difficult to control is the application of Industry 4.0 technology which can have a big impact on hospital management performance.
68	[36]	The application of H4.0 is an intelligent scenario scheme for interacting with each other reliably and safely to become an integrated system between human resources and technology.
69	[38]	Equipment and supplies such as computers, communication systems, data storage, and bioactuators constitute Health Cyber-Physical Systems 4.0 (HCPS).
70	[40]	Future professional prospects with the influence of Industry 4.0, especially health services, have an impact on biotechnology, and the preparation of data reports resulting from health service documentation.