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Smart Healthcare Logistics Against Covid-19 Pandemic

Covid-19 Pandemisine Karşı Akıllı Sağlık Lojistiği

Özlem KOÇTAŞ ÇOTUR [1]

[1] Assist Prof. Dr.; İzmir Kavram Vocational School, Department of Logistics, İzmir, Turkey

ABSTRACT

The unexpected Covid-19 pandemic has now become the most significant burden and impediment to healthcare systems around the world. To ease the pressure on the healthcare industry by delivering high-quality services to all types of patients, more powerful technologies are clearly needed than ever before. Smart healthcare uses digital technologies in order to improve the quality of life by lowering health risks and enhancing the well-being of people. By using a systematic literature review method, the current study presents smart logistics technologies used in the fight against Covid-19 in the healthcare industry to provide a holistic perspective. Given this context, this study seeks to present an up-to-date review of the topic of smart healthcare logistics against the Covid-19 pandemic. The findings of the study have revealed that some technological innovation practices have been implemented in the logistics of health services. The use of them appears to have improved both transportation and ease of access. Besides, the Covid-19 pandemic has made healthcare logistics take advantage of smart technologies for public health.

Key Words: Smart Healthcare Logistics, Covid-19 Pandemic, Healthcare

ÖZET

Beklenmedik Covid-19 pandemisi, artık Dünya genelinde sağlık sistemlerinin sürdürülmesinde en önemli yük ve engel haline gelmiştir. Her tür hastaya yüksek kaliteli hizmetler sunarak sağlık endüstrisi üzerindeki baskıyı hafifletmek için, her zamankinden daha güçlü teknolojilere açıkça ihtiyaç duyulmaktadır. Akıllı sağlık hizmetleri, sağlık risklerini azaltarak ve insanların refahını artırarak yaşam kalitesini iyileştirmek için dijital teknolojileri kullanır. Bu çalışma, sistematik alanyazın taraması yöntemini kullanarak, sağlık endüstrisinde Covid-19 ile mücadelede kullanılan akıllı lojistik teknolojilerine ilişkin bütünsel bir bakış açısı sunmaktadır. Bu bağlamda, mevcut çalışma, Covid-19 pandemisine karşı akıllı sağlık lojistiği konusunun güncel bir incelemesini sunmayı amaçlamaktadır. Çalışmanın bulguları sağlık lojistiğinde bazı teknolojik yenilikçi uygulamaların harekete geçtiğini ortaya koymuştur. Bunların kullanımı hem ulaşımda hem de kolay erişimde etkili olmuş görünmektedir. Ayrıca Covid-19 pandemisi sağlık lojistiğinin halk sağlığı için akıllı teknolojilerden faydalanmasını sağlamıştır.

Anahtar Kelimeler: Akıllı Sağlık Lojistiği, Covid-19 Pandemisi, Sağlık

1. INTRODUCTION

Healthcare is a vital part of everyday life. The ageing population and the chronic diseases are heavy pressure on healthcare systems, with a high demand for everything from hospital beds to healthcare personnel (Baker, Xiang and Atkinson, 2017). Unfortunately, the unexpected Covid-19 pandemic has now become the most significant burden and impediment to healthcare systems around the world. Because the pandemic creates ambiguities in the behavior of individuals regarding struggle (Aydoğan and Kutlu, 2021). To ease the pressure on the healthcare industry by delivering high-quality services to all types of patients, more powerful technologies are clearly needed than ever before. Smart healthcare technologies may be one of the best solutions to these problems. In reality, the healthcare industry, like all other industries, has been impacted by the digitalization revolution for a while (Pramanik et al., 2019). With the outbreak of Covid-19, this need has become more urgent than ever, and the use of smart services in healthcare is on the rise.

The healthcare industry is one of the largest and fastest growing industries in the world. The cost of healthcare services is rising as a result of rising demand, demographic changes, and new medical procedures. Many countries strive to develop health systems that are high-quality, efficient, effective, affordable, and accessible (Koçtaş Çotur, 2021). The basic function of the healthcare industry is to deliver medical services to people. There are various supporting tasks that must be considered to achieve this goal. Although the majority of them are not apparent to the patient, they have a huge effect on how patients perceive care during their hospital visits. A significant number of these tasks fall under the category of hospital logistics (Jawab et al., 2018).

Satisfying the needs of patient care, the healthcare logistics encompasses fullfiling, organizing, and controlling whole acts through healthcare, from request to fulfillment of the care commitment. It also involves the information flow required for care chain of patient to run properly (Wiger, 2018). Healthcare logistics delivers a comprehensive

range of medical supplies, including surgical control and patient preparation items, surgical and hygiene products, syringes, and blood analysis equipment (Düzgün, 2020).

Despite the fact that healthcare services are especially critical in a pandemic situation, it is clear that effective logistical management in medical health facilities is also important in our fight against the pandemic. Under pandemic conditions, hospitals should benefit more effectively and efficiently from logistic support activities, and smart solutions should be used wherever possible. These solutions should be redesigned to reduce the risk of any person who works at, receives medical care, or visits a hospital, as well as to place the required equipment and medications at right time and place.

Smart healthcare uses digital technologies in order to improve the quality of life by lowering health risks and enhancing the well-being of people. During the Covid-19 pandemic, it became clear that we needed operational excellence in hospital operations (Rathi et al., 2021). Several countries have used smart technologies to respond quickly to the Covid-19. In hospitals, robotics and artificial intelligence have been used to maintain social distance, reduce person-to-person contact, track viral spread, and provide sanitation (Zhao et al., 2021).

Studies on health logistics are still in its early stages (Wiger, 2018). However, the importance of healthcare logistics has increased since the outbreak of the Covid-19 pandemic. Making healthcare logistics smart with the use of technology has been shown to have a significant impact in reducing the negative impact of the pandemic on healthcare workers and patients. Considering the lack of scientific knowledge about the Covid-19 pandemic and its interaction (Koh and McCormack, 2006), the study aims at conducting a systematic literature review (SLR) (Petticrew and Roberts, 2008) about smart logistics technologies used in the fight against Covid-19 in the healthcare industry to provide a holistic perspective.

The rest of the article is organized as follows: the conceptual framework review is presented in Section 2. Section 3 describes methodology of the study which is sytematic literature review technique and its findings. The paper closes with a conclusion.

2.CONCEPTUAL FRAMEWORK

2.1. The Covid-19 Pandemic

In December 2019, SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2), which is resulting in the Covid-19 disease, was first confirmed to be affecting human life in China. The novel coronavirus has been found to be extremely contagious and has spread exponentially across the world in just a few months (Mohan and Nambiar, 2020). Because of the virus's global transmission and magnitude, the World Health Organization (WHO) has announced the Covid-19 outbreak as a global pandemic on March 11, 2020 (WHO, 2020). Since then, the Covid-19 pandemic has spread to over 215 countries across the world, affecting almost every aspect of our everyday lives. As one of history's most devastating events, the Covid-19 pandemic has caused more than 5,7 million fatalities until today (WHO, 2022). Several actions have been recommended by WHO and have been implemented by several governments, such as social and physical distancing, cleaning surfaces, personal hygiene, wearing a face mask in public, self-isolation, travel restrictions, lockdowns, curfews, quarantine, limits on gatherings, restrictions on opening businesses, school and university closures as preventive measures that are vital to limit the spread of the virus (de Bruin et al., 2020; Regmi and Lwin, 2021). Although these measures slow the spread of the virus, they are not permanent solutions, and the strain on the global health system is still being alleviated.

As a result of the supply crisis that began in China in February 2020 and the effects of the pandemic spreading throughout the world, more and more countries closed their borders and curtailed international transportation and travel in attempt to manage the Covid-19 pandemic. The pandemic has exposed vulnerabilities in firms' production systems and supply chains all across the World. Many items and raw materials, particularly pharmaceuticals and crucial medical supplies, has experienced temporary trade restrictions and shortages. As a result of these considerations, manufacturers all over the world have begun to strive toward growing domestic output and employment in their own countries, lowering or even eliminating their reliance on risky sources (Shih, 2020).

Despite the fact that the digital revolution has begun, the Covid-19 pandemic has accelerated global digitalization. Companies, schools, universities, and several government agencies have developed new strategies for working remotely. Although it is possible to perform many health examinations remotely, it is inevitable for patients to go to the hospital when it comes to emergency response, various medical procedures, tests, and imaging techniques such as X-ray, MRI, and tomography. While healthcare institutions perform their duties during the pandemic period, the presence of various patients, visitors, and staff in hospitals, whether they catch Covid-19 or not, requires much more attention in terms of hygiene and mutual contact than before.

Since those who have to be in hospitals for any reason put themselves at risk, these people should be protected. Therefore, human involvement should be minimized by increasing the use of technology in every possible situation. In this regard, smart technologies should be utilized to the maximum extent both during diagnosis, care, and treatment and when conducting support functions such as logistics in hospitals.

2.2. Smart Healthcare Logistics

In a nutshell, smart healthcare takes a holistic approach to any medical condition, diagnosis, and even avoidance (Yin et al., 2018). Tian et al. (2019) defined smart healthcare as "a health service system that uses technology such as wearable devices, IoT, and mobile internet to dynamically access information, connect people, materials and institutions related to healthcare, and then actively manages and responds to medical ecosystem needs in an intelligent manner".

Smart healthcare entails not only the use of innovative products and technologies for diagnosis and treatment, but also a larger exchange of information across parties, a more active role for patients during treatment (Ippocrate AS, 2020).

Data science is being used in smart healthcare to assist doctors and physicians in making better healthcare decisions and facilitating resource allocation. Participants of smart healthcare are healthcare personnel such as doctors, nurses and laboratory staff, patients, hospitals and other care organizations and research institutions (Tian et al., 2019).

Demirkan (2013) presents a system framework to conceive data-driven, mobile, and cloud-enabled smart healthcare systems. They can help to provide cost-effective and high-quality care.

One of the most critical aspects of Smart Healthcare is that it allows doctors to help patients at home, where they can be constantly monitored using a variety of Internet-connected devices. This decreases the need for institutionalization and hospitalization, which benefits the disabled and elderly in particular. It also has the ability to dramatically reduce healthcare costs while also advancing patients' quality of life (Yin et al., 2018).

Healthcare logistics is a special area of logistics that ensures the design, planning and execution of the most effective and efficient procurement, purchasing, storage and inventory management required for healthcare institutions to fulfill their functions. According to Jawab, Frichi and Boutahari, (2018) from healthcare provider to patient, hospital logistics entails the management of patient, product, and material flows, as well as the associated data, to ensure quality and safety at a given level of performance and productivity. Procurement, transport, production and distribution are the four main dimensions of hospital logistics (Jawab, et al., 2018).

2.3. Technologies for Smart Healthcare Logistics

One of the most appealing application areas of smart technologies is healthcare. In the healthcare industry, several smart technologies have been in use for a while. Within the scope of this study, smart technologies that can be used to prevent Covid-19 transmission during logistics activities in hospitals were selected. The following technologies will be discussed further: internet of things, radio frequency identification, artificial intelligence and machine learning, smart storage, automated guided vehicles and robots.

2.3.1 Internet of Things

The Internet of Things (IoT) is a rapidly expanding ecosystem. It communicates with hardware, computing devices, physical objects, software, and people through a network. They all let interact, communicate, collect, and share data. From Radio Frequency Identification (RFID) and Wireless Sensor Network (WSN) technologies to more sophisticated integration with cloud computing, Internet services, cyber–physical networks, and interconnections between hardware and software devices. A typical IoT system consists of sensors, communication interfaces, advanced algorithms, and cloud interfaces (Farahani et al., 2018). Connecting different objects and attaching sensors allow devices a degree of digital intelligence, allowing them to exchange real-time data without requiring a person. IoT is widely used in many industries. However, it remains a relatively new field of research for the healthcare industry, and its potential use is still in its infancy. For the healthcare industry, IoT is called the Internet of Medical Things (IoMT), which is defined as a network of medical devices, software applications, and healthcare systems and facilities that are all linked. In the healthcare industry, IoMT is used in a variety of departments for a variety of purposes. In the following lines, some examples related to IoMT usage for logistics purposes in the healthcare industry will be mentioned:

- ✓ Accurate and real time inventory/asset tracking: IoMT healthcare applications can help hospitals find out which items need to be reordered and where assets are kept for reliable inventory monitoring. In particular, tracking and managing high-value devices by using IoT technology eases inventory and cost management.

- ✓ Increasing efficiency: By monitoring and identifying bottlenecks and delays, IoMT may also help healthcare organizations boost their efficiency.
- ✓ Navigation: Patients, visitors, physicians, and other medical/supporting personnel can use the hospital mobile navigation applications to find their way around the facility with the help of suggested safe directions and could avoid areas of high Covid-19 risk when they are navigating.

As a result, by streamlining clinical procedures, information, and work flows, IoMT enhances the organizational efficiency and effectiveness of healthcare organizations (Taylor et al., 2018).

2.3.2. Radio Frequency Identification (RFID)

It is the wireless non-contact use of radio frequency waves to transfer data. RFID technology has been used for tracking and identifying medical devices and assets, pharmaceutical materials, hospital personnel and patients in order to optimize clinical workflow and expenditure at healthcare organizations (Yao et al., 2012; Abugabah et al., 2020). RFID technology has the potential to allow healthcare facilities to quickly contact and track infected patients and healthcare staff, as shown by recent research on the management of infectious disease outbreaks such as Covid-19 (Mehta et al., 2020). RFID bracelet usage for hospital patients is very common for several reasons. These bracelets could also be used for Covid-19 patients. RFID bracelets could detect when a Covid-19 infected patient attempts to leave an unauthorized hospital room or building exit and alert the relevant staff.

2.3.3. Artificial Intelligence and Machine Learning

The artificial intelligence (AI) use in the field of healthcare is increasing and diversifying day by day. AI allows for the prediction of potential patient needs based on behavioral, socioeconomic, and genomic data. AI can also be used in the supply chain to help plan the services and equipment and medication needed to sustain patient care. It can also help ensure product supply where it's required by predicting possible backorders or shortages and preventing overstocking equipment and pharmaceuticals that will expire before they're used (Davenport and Kalakota, 2019). AI could provide benefits for health systems, practitioners, and the public, as the Covid-19 crisis demonstrates, by making current clinical and administrative processes more effective, reliable, and equitable (OECD, 2020).

Using a broad clinical dataset containing 155.689 adult patients, Soltan et al. (2021) used AI methods to improve and validate a rapidly deployable Covid-19 screening model. The model will allow the rapid removal of Covid-19 in-patients who present to the hospital, resulting in improved patient flow. In both every day and clinical settings, machine learning helps us to uncover trends and make healthcare predictions. This extends healthcare's scope from traditional clinical settings to daily scenarios, and from passive data collection to active decision-making (Yin et al., 2018).

The use of AI, particularly machine learning approaches, yields promising outcomes for healthcare logistics issues. They are as appointment scheduling, patient scheduling, and resource utilization. Machine learning approaches, for example, have been effectively created to estimate demand for emergency departments, intensive care units, and ambulances (Reuter-Oppermann and Kühl, 2021).

2.3.4. Smart Storage

The healthcare industry, like other industries, needs smart and flawless storage and retrieval solutions. Smart storage systems allow collecting the correct item and easily distributing it around wards and other hospital locations. The automated storage solutions help hospitals to reduce the inventory of perishable medication, surgical equipment, personnel protective equipment etc. and provide more floor space in their facilities. These types of solutions, when used in conjunction with RFID tags, hand-held devices, and pick-to-light assisted storage and retrieval systems, provide greater control over any medical equipment (Kardex Remstar, n.d.). Scrubs with RFID tags that are dispensed by vending machines help healthcare organizations improve inventory control while also enhancing Covid-19 protection because human intervention is minimized (Wong, 2020).

2.3.5. Automated Guided Vehicles (AGVs) and Robots

Im Jeon and Lee (2016) propose a multi-task allocation algorithm for autonomus robot navigation for hospital logistics to perform heavy mobility work. Instead of delivering just one item at a time, multiple delivery tasks may be allocated to a robot to improve the productivity of using multiple robots. BačÍK et al. (2017) created Pathfinder, an autonomous guided vehicle, has designed for the transportation of materials in hospital settings. Pathfinder has features like autonomous localization, navigation, and mapping that can be used for hospital logistics. With the aid

of 5G technology, robots could navigate hospitals to carry drugs and food, especially to reduce the Covid-19 infection risk of hospital staff.

Being a healthcare worker with a direct interaction with patients is extremely dangerous during Covid-19 pandemic. Medical services have been severely curtailed in order to reduce viral spread and protect both healthcare professionals and patients. In the fight against the pandemic, robots that can physically separate the healthcare practitioner from the patient are a huge help (Zemmar et al., 2020).

3. METHODOLOGY

This study presents a systematic review of smart logistics technologies used in the fight against Covid-19 in the health sector by compiling and synthesizing the existing literature considering the lack of scientific knowledge about pandemics and its interaction (Koh and McCormack, 2006). To reach that aim, the current study runs Systematic Literature Review (SLR) (Petticrew and Roberts, 2008) method (e.g: Aydoğan, 2021). Systematic literature review is a research method that aiming at evaluating, describing and analyzing whole revealed research outputs regarding to a specific topic, a specific research or the latest phenomenon of interest (Perry ve Hammond, 2002). In the light of the datas related to smart logistics technologies that emerged with the Covid-19 pandemic, the considerations that should be evaluated in logistics management have been revealed.

The research consists of scientific researches that can be accessed from the Google Scholar database, scanning the Covid-19 pandemic and smart healthcare logistics cases together. The scan was carried out in January 2022.

In this study, the steps in the systematic literature review (SLR) adapted from Centobelli et al. (2017) were followed. The method consist of two main steps.

1. Selecting studies/articles to be included in the systematic literature review

- ✓ Comprehensive search: This step entails determining keywords, generating search strings, selecting databases to be analyzed (Google Scholar, Scopus etc.), and examining chosen databases using search strings.
- ✓ Article selection for further analysis: This stage entails specifying inclusion/exclusion criteria as well as the selection procedure based on the inclusion/exclusion criteria.

2. Defining selected articles and content analysis

- ✓ Descriptive analysis: To produce an overall mapping of the selected articles, the papers are aggregated based on numerous perspectives.
- ✓ Content Analysis: Articles are examined and analyzed in depth. By analyzing the articles, strengths and weaknesses in the literature are emphasized, research gaps are identified.

3.1. Selecting Articles

The purpose of this step is to ensure that appropriate studies written on smart healthcare logistics are selected, taking into account the effects of the Covid-19 pandemic. In this context, the time interval has been determined as 2020 (when the Covid-19 pandemic has started) to 2022. The following search sequences ("Covid-19" "healthcare logistics" "smart") were screened using the Google Scholar (web search engine for scholarly literature).

A total of 136 studies, including articles, book chapters, and proceedings, were found as a result of the screening.

When the search results were obtained, the following extra filtering criteria were used:

- ✓ The review process included only peer-reviewed journal articles (Gunasekaran et al., 2015). As a result, dissertations, technical reports, conference proceedings and book chapters are excluded.
- ✓ Articles belonging to non-subject areas were excluded (Demartini, 2013). Irrelevant articles were determined by reading the title, abstract, and keywords. If a clear decision could not be taken at this stage, the articles were read in full (Winkelhaus and Grosse, 2020).
- ✓ Articles whose full text could not be accessed are not included.

The goal is here to reach articles that fully address smart healthcare logistics against Covid-19. Studies that were not relevant to the determined topics were deleted and the number of publications was decreased to six after the filtering criteria were implemented.

3.2. Defining Selected Articles and Content Analysis

3.2.1. Descriptive Analysis

In the framework of the Covid-19, this part aims to provide an overview of papers dealing with the subject of smart healthcare logistics. For this objective, two perspectives were considered: paper distribution across journals and paper distribution by methodology. As shown below, Table 1. gives distribution of papers across journals.

Table1: Distribution of Papers Across Journals

Journals	Authors
Internatinonal Journal of Healthcare Management	Kriegel et al. (2021)
Expert Systems	Subramanian et al. (2021)
Drones	Quintanilla Garcia et al. (2021)
Healthcare	Klumpp et al. (2021)
International Journal of Systems Science: Operations &Logistics	Jebbor et al. (2021)
Journal of Software Engineering and Applications	Dossou et al., (2021)

Source: Table 1. is generated by author via findings of related researches

Concerning the research methodology the six study are given below:

- ✓ Quintanilla Garcia et al. (2021) produced three scenarios based on the logistics network model and existing demands in Valencia (Spain). In these circumstances, which include metropolitan regions and controlled airspace, flight experiments have been conducted for the Unmanned aerial vehicle.
- ✓ Dossou, Foreste, and Misumi (2021) created an intelligent software program to help identify waste and dysfunctions in hospital flows. Wasted time for nurses, caregivers, and doctors might be minimized with the help of Industry 4.0 technology, while patient service quality could be improved.
- ✓ Klumpp et al. (2021) published an evaluation and opinion article, in which they investigated nine hospitals in Europe and eleven different cases with possible implications and benefits of hospital AI technologies.
- ✓ The proposed system is modelled and simulated in a virtual hospital, which results in dramatically reduction of assets unavailable in the central pharmacy and in wards (Jebbor et al., 2021).
- ✓ A multi-method approach was used by Kriegel et al. (2021) to identify and prioritize present and future requirements, difficulties for the use of AMR in patient care, including semi-structured literature research, expert interviews, and an online survey.
- ✓ Subramanian et al., (2021) made a compherensive literature review by using secondary data and information.

3.2.2. Content Analysis

This study presents the researches that reveal practices for the use of smart healthcare logistic services that differ with the effect of the pandemic by reviewing the existing literature. The research findings obtained in this context are presented below.

Unmanned aerial vehicle systems (UAS) have been used for the delivery of critical medical supplies in metropolitan areas due to the overload on the health system by the pandemic (Quintanilla Garcia et al. 2021).

According to Dossou et al. (2021), the Covid-19 pandemic has required hospital logistics operations to be redesigned to prevent transmission of the virus to both healthcare staff and patients. Using AI, IoTs, big data to optimize healthcare logistics flows could improve hospital logistics activities during pandemics and improve the health of both patients and healthcare employees.

Klumpp et al. (2021) investigated the use of artificial intelligence (AI) in eleven European hospitals. AI has been used in three major application areas at healthcare facilities: diagnosis, care, and logistics. Three hospitals share their AI implementation experiences in hospital logistics. The aims of three hospitals are listed in the following order: i) material consumption recognition and prognosis; ii) optimizing logistic operations; and iii) integration of internal logistics operations and material consumption optimization. By decreasing patient contact, one institution has employed AI to reduce Covid-19 transmission risks to healthcare providers. The Covid-19 pandemic considertaion has highlighted the challenges that healthcare systems would face in the future, as well as the potential for new pandemics. That has heightened interest in the potential of AI in healthcare as a means of pandemic management and prevention. Recent advances in AI and Machine Learning can help address major issues in reacting to pandemic, such as managing limited healthcare resources, generating individualized treatment regimens, and predicting virus propagation rates.

The pandemic pushes the use of logistics automation in order to make healthcare services smarter and less vulnerable to virus spread. Automation of inventory and replenishment systems in healthcare facilities enables automated dispensing systems in pharmacies and wards. A system is offered to ensure fully automated and integrated asset inventory and replenishment management in hospitals. The system proposed is modelled and simulated in a virtual hospital, which results in a considerable reduction of assets unavailable in the central pharmacy and in wards (Jebbor et al., 2021). Due to the necessity for hygiene and patient group separation during the pandemic, autonomous mobile robotics (AMR) integrated with sensor technology and artificial intelligence are utilized in the transportation of drugs, samples, and other items (Kriegel et al., 2021).

While smart technologies such as artificial intelligence, machine learning, and deep learning are employed in healthcare facilities to manage resources and services, robots and drones help limit the spread of Coronavirus by minimizing interpersonal interaction. (Subramanian et al., 2021). Table 2 presents the smart healthcare logistics practices during pandemic.

Table 2. The Smart Healthcare Logistics Practices During Pandemic

The Practice	Source
Unmanned aerial vehicle systems	Quintanilla Garcia et al. 2021
IoTs, big data	Dossou et al., 2021
Artificial intelligence	Klumpp et al. 2021: Dossou et al., 2021
Automation of inventory and replenishment	Jebbor et al., 2021
Machine learning	Subramanian et al., 2021
Deep learning	Subramanian et al., 2021
Robots	Subramanian et al., 2021

Source: Table 2 is generated by author via findings of related researches.

As can be understood from Table 2. different practices obtained from technological innovations have been used smartly in the logistics of health services. The use of these technological innovation practices in the specified way seems to have made an efficacy both in transportation and easy access to critical health products.

4.CONCLUSION

This study reveals the current researches utilising smart technologies while managing healthcare logistics activities to battle the consequences of Covid-19. Obtained findings are presented to provide a comprehensive overview of the issus covered by the literature on smart logistics applications in healthcare against it.

The smart technologies can facilitate various healthcare logistics operations by bringing people, data, medical tools and applications in mobile together to improve healthcare delivery (Taylor, 2018). A variety of emerging technology breakthroughs, including AI, machine learning, IoT, 5G, big data, robotics, drones, and blockchain have made a difference in contrubition to the fight against pandemic. Undoubtedly that it seems possible to engage these smart technologies to reduce the risk of Covid-19 contamination that may occur in healthcare institutionsi in which the health workers are a critical human resource. So that human interference should be mitigated by using those technological practices. On the other hand healthcare organizations are able to facilitate process management by connecting sensors and devices.

As a result, the smart technologies have been transforming the landscape of the healthcare industry. The healthcare industry has to rely more on smart solutions to protect its staff, provide better care to patients, and reduce the effects of the coronavirus. Advanced smart healtcare logistics provide a desirable health operations, considering the lack of employess, in terms of time, cost and productivity. The smart healthcare logistics make healthcare sector more efficient and automated. Therefore, it has seemed to promet to the process optimization in healthcare logistics. The Covid-19 pandemic has made healtcare sector make advantage of smart technologies for public health.

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