

Supply chain performance for Social Sustainability concerning healthcare workers

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Abstract—Long Russia-Ukraine war, never-ending fight against Covid-19, increasing political unrest, and tension between conflicting countries, have shed the light on the vulnerability of the Healthcare Supply Chain (HSC). This needs to be looked into with great importance, to be better prepared to handle any future uncertain situations. Although there is some research focusing on its sustainability, however the research focus on the social dimension involving practitioners in the healthcare setting is still scarce, especially in developing countries. In many developing countries in Asia, Healthcare workers (HCWs) face common social problems such as work compensation, employee engagement, occupational safety, social equality, mental health, and physical work condition. However, they are often neglected or given lesser attention. HCWs are considered to be one of the key stakeholders in the HSC because these individuals deliver the value of medical treatment and health services to the end users - the patients. The development of HSC performance can lead to the highest standards of safety for patients, and medical personnel in a sustainable manner. This study aims to identify the HSC performance measurement for Social Sustainability (SS) on the dimension of healthcare personnel. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) was conducted. The potential factors related to health workers for social sustainability have been identified and enrich the understanding of social sustainability in the dimension of healthcare personnel. The novel of HSC performance for SS is provided to demonstrate the factors that can enhance SS in developing countries' contexts. Moreover, this study contributes to the Meta-analysis by analyzing existing research studies and proposing new future research opportunities in the healthcare supply chain: a sustainable model toward high safety and better quality of life for patients and healthcare workers.

Keywords— Healthcare, Supply Chain Performance, healthcare workers, COVID-19, social sustainability

I. INTRODUCTION

Long Russia-Ukraine war, never-ending fight against Covid-19, increasing political unrest and tension between conflicting countries, have disrupted and are still upsetting the global supply chain since 2020. Healthcare is one of the industries that has been critically impacted. The Healthcare supply chain (HSC) is the essential backbone of the healthcare industry [1]. HSC had never been smooth and stable in the past. Since the dawn of the COVID-19 pandemic, it has further proven that HSC is indeed very

fragile and can be disrupted easily by any crisis. This needs to be looked into with great importance, to be better prepared to handle any future uncertain situations. Although there is some research focusing on supply chain and its sustainability, however the research focus on the social dimension involving practitioners in the healthcare setting is still scarce, especially in developing countries. In the HSC, Healthcare Workers (HCWs) are considered to be one of the key stakeholders because these individuals deliver the value of medical treatment and health services to the end users - the patients.

In developing countries such as Cambodia, the healthcare sector is improving continuously since the end of the Khmer Rouge war in 1979 [2]. The improvements include child mortality reduction, maternal health improvement, decrease in the prevalence of HIV, Malaria, tuberculosis, and other communicable diseases. Moreover, the Cambodian government has made good progress with United Nations for Sustainable Development Goals (SDGs) by 2030. The World Bank addressed that Cambodia is upgraded from a low-income to a low-middle-income country in 2016 due to gross domestic product significantly increasing and the number of people living in poverty having decreased dramatically. Although Cambodia has significantly shown those improvements, however, the outbreak of COVID-19 has affected Cambodia's economy likewise other countries. The pandemic has reflected the vulnerability of HSC in Cambodia. Amid the COVID-19 pandemic, the neonatal care unit in Cambodia faced many challenges such as shortages of professional workforce and difficulty to access polymerase chain reaction (PCR) tests [3]. Similar to the global situation, HCWs in Cambodia also face common social problems, such as work compensation, employee engagement, occupational safety, social equality, mental health, and physical work condition [4], [5], [6]. However, they are often neglected or given lesser attention.

The pandemic has shed light on the vulnerability of HSC performance, especially on the shortages of resources. It has attracted scholars, executives, and policymakers to focus on the HCS factors for social sustainability. It is believed that the development of HSC performance can lead to the highest standards of safety for patients, and medical personnel in a sustainable manner. Therefore, the purpose of this study is to identify the HSC factors for Social Sustainability (SS) in the dimension of healthcare personnel in the context of developing countries.

II. LITERATURE REVIEW

A. Healthcare Supply Chain

Supply Chain in the healthcare setting can be described as a system of interrelated functions for the forward and backward flow of medicine, vaccine, medical supplies, medical equipment, and consumables to satisfy the clinical service provider who provides those services to the end users as patients [7]. Figure 1 illustrates the HSC process. The HSC

is fundamentally related to the flow of information, products and services, quality, and materials [8]. The supply chain in the healthcare industry particularly in hospitals as mentioned by Supreekit et al., (2014) is the process that aims to achieve customers' requirements. Customers as patients who normally receive clinical services such as diagnosis and treatment. The process of HSC is complex and comprised of various stakeholders from upstream to downstream [10].

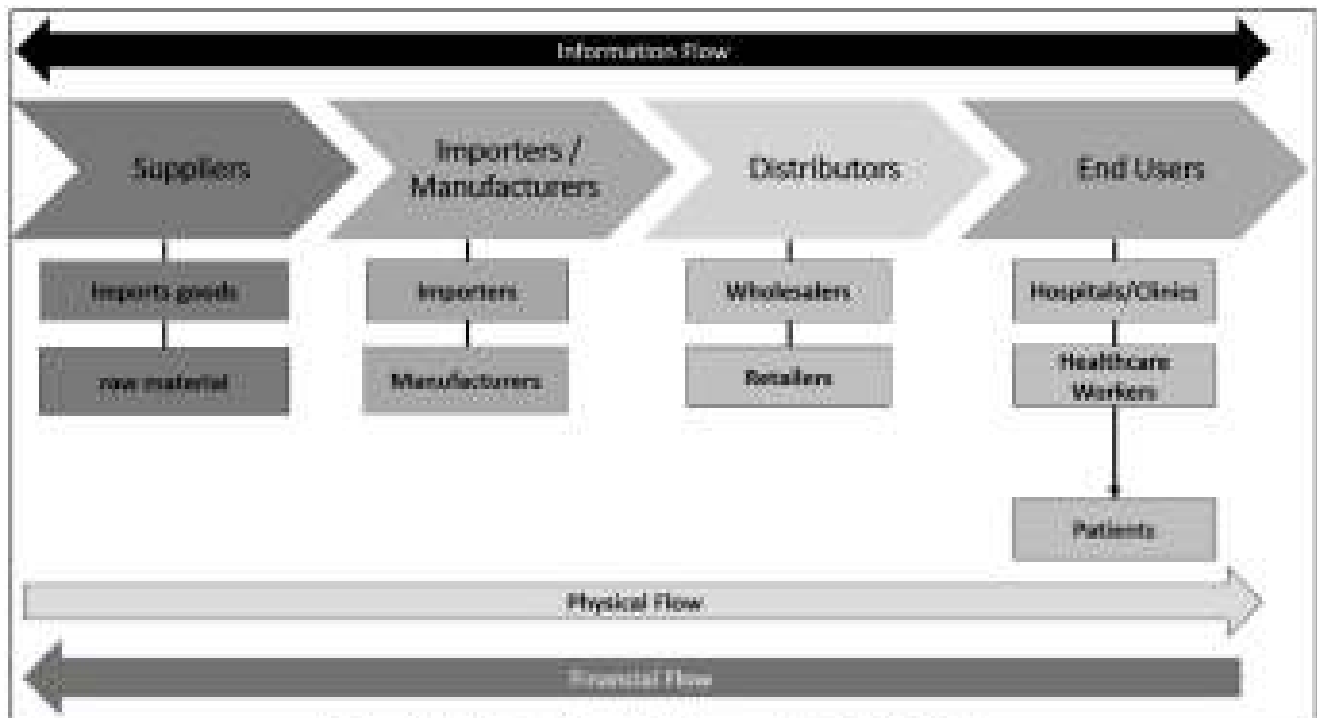


Figure 1: Healthcare Supply Chain process [14], [15], [16]

During the outbreak of COVID-19, HCWs are at the forefront of the pandemic and fight against it to provide the service. They are exposed to hazards that put them at most risk of infection. According to various studies, the pandemic critically impacts the physical and mental health of HCWs [11]. The study addressed that the pandemic causes post-traumatic stress disorder (PTSD) and burnout conditions in HCWs. The situation of COVID-19 among HCWs is a concern in many developing countries. Likewise, In Thailand COVID-19 database from the Department of Disease Control. Coronavirus disease showed that a female HCW infected with SARS-CoV-2 from her workplace was notified [12]. The lack of awareness of COVID-19 infection during work, the scarcity of PPEs during the peak of the outbreak and improper PPE wearing become the factors that impact to HCWs' performance and pressure. Gómez-Salgado et al., (2020) also mentioned that it is essential to take care of the mental health of HCWs during the outbreak of the pandemic. The author addressed that HCWs who fight on the frontline against the disease should be protected, and the risk during work should be minimized by providing them with sufficient resources and support with up-to-date training. Developing HCS performance to support HCWs can lead to the sustainability in social dimension and leads to the quality of treatment, patient

and personnel safety, and enhance the community healthcare system [13].

B. Social Sustainable in healthcare supply chain

United Nation General Assembly addressed the idea of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [17]. Nowadays the interest in Triple Bottom Line (TBL) is growing towards sustainability in HSC. It was first introduced in 1990, TBL concepts consist of three aspects of Environmental, Social and Economic [18]. Most of the previous literature focused on the environment and economy particularly in the COVID-19 situation [19]. Jaeger et al., (2021) studied and identified supply chain environmental bottlenecks that the organizations should concentrate the effort to reduce their challenges. There is also a study addressing the sustainability of Information and Communication Technologies (ICT) in healthcare settings. The ICT framework developed by Land et al., (2008) shows the classification of sustainability in different types i.e., resource, culture, management control, and physical environment. The study also shows that the COVID-19 situation creates room for developing an agile, flexible, and resilient supply chain system to maintain the

economic and social sustainable process [22]. As organizations adopt supply chain management as a strategy, the necessity to deploy supply chain strategies with sustainability input becomes more and more intense [23].

Social Sustainability (SS) is involved with the human side of sustainability [24]. The social system in the healthcare setting is complex and consists of various stakeholders. SS plays a significant role in enabling other sustainability dimensions. It is found in the study of Miani et al., (2015) that SS can significantly increase supply chain performance. The research shows the core dimensions of supply chain social sustainability such as equity, safety, health and welfare, human right, culture, and charity. [26]. The COVID-19 pandemic has indicated the vulnerability of global supply chain sustainability, many developing countries have been subjected to the same social susceptibility as economic downturn [19]. Sarker et al., (2021) examined the critical challenges to SS in the post-COVID-19 era for the Bangladesh footwear industry by using the Best Worst method approach and proposed model to investigate the challenges of sustainable development goals. Ibra Hossain et al., (2020) identified the factors of the SS criteria concerning the healthcare supply network using the Bayesian network approach. Maghsoudi et al., (2020) addressed six collaborative networks that can contribute to developing a social sustainable-oriented healthcare system. From the study, it shows that collaborative networks, communication, and sharing of information are crucial to the performance of the healthcare system that can lead to healthcare sustainability.

In Cambodia, even both the public and private sector are increased in the infrastructure and human resources in recent years but there is still a need for further investment. The study mentioned that most sick or injured people seek care from the private sector because they still lack of trust in public health facilities and professionals [29]. Moreover, Marinuzzi and Paulose (2016) also studied the emergence of sustainability in healthcare, the study addressed the key factors for an operating process that consists of environmental concerns, patients' needs, employees' needs, and community concerns. The drivers for sustainability practices and strategies are discussed [30].

III. KEY RESEARCH OBJECTIVES

- 1) To identify HSC performance related to social sustainability in the context of developing countries.
- 2) To illustrate the novel model of HSC performance for social sustainability in the context of developing countries.

IV. RESEARCH METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) was conducted in this study by searching the research in databases published over the past 20 years (from 2002 to 2022) i.e., ScienceDirect, ResearchGate, IEEE, Emerald insight, and Springer. The search terms used were "Healthcare, Supply Chain Performance", "Sustainability", "Social Sustainability", "healthcare workers", "healthcare personnel", and "COVID-19". Figure 2 shows the PRISMA diagram of the articles included in this review.

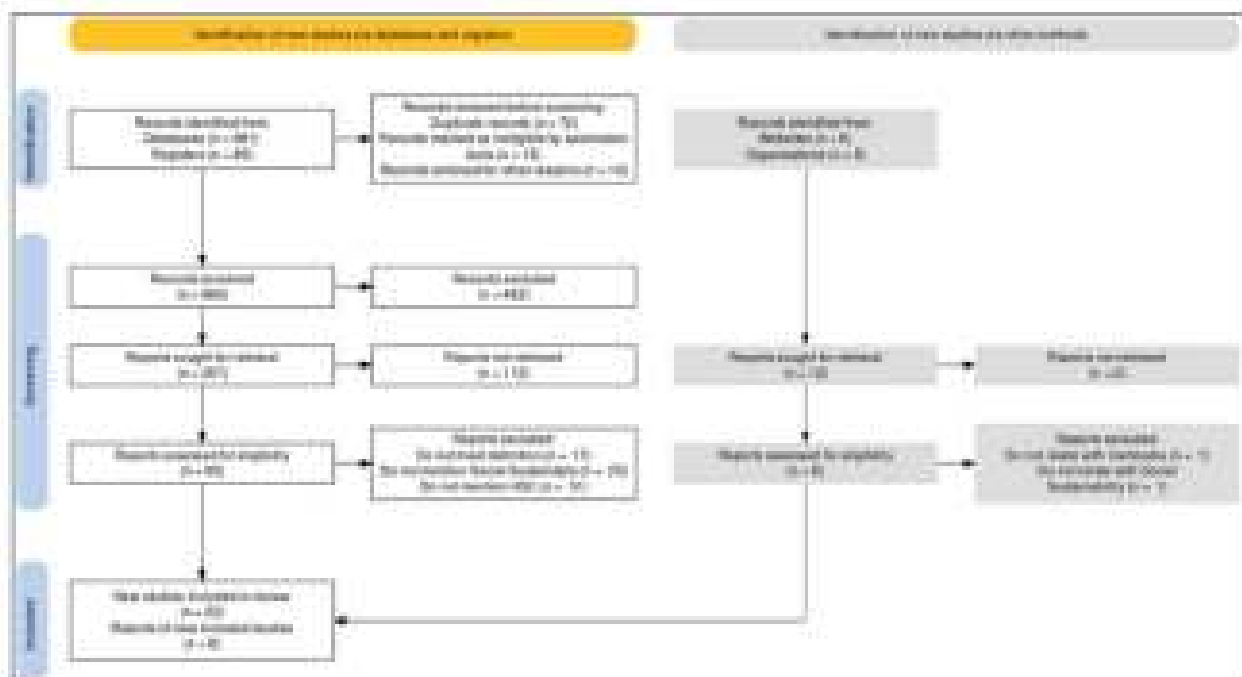


Figure 2: PRISMA diagram for supply chain performance for social sustainability concerning HCWs

V. RESEARCH RESULTS

The extensive search using the terms "Healthcare", "supply chain performance", "sustainability", "sustainable", "healthcare workers", "COVID-19" and "social sustainability" was performed. The Meta-analysis is conducted using a PRISMA flow diagram [31]. The 766 articles, 6 websites, and 8 organization papers were discovered under 5 databases. Non-English and duplicate articles were eliminated after the screening process for the

abstract. The articles were excluded ($n = 462$) if they are not relevant to supply chain and sustainability. The remaining articles ($n = 95$) were screened accordingly. In the final full-text review, there were 22 articles, 3 websites, and 5 organization papers. With the Meta-analysis, 3 aspects of social sustainability as Human beings, Society, and Consumer Safety and 12 HSC factors relevant to these 3 aspects focusing on healthcare practitioners were discovered and presented in **Table I**.

Table I: Social sustainability in healthcare supply chain

Aspect	Factors	Description	Sources
Human beings	Health and Safety at Work	Ensure safety of employees for physical and mental health and increase safe environment at the workplace to avoid any harm that may occur.	[32], [13], [34], [35]
	Innovation and Technology	Bringing in technology to support HCWs in their non-clinical activities so that they can spend more time with clinical tasks. Innovation in healthcare such as Telemedicine can accelerate the healthcare system to be more practical for providing sustainability in healthcare services.	[4], [28], [36], [37], [38]
	Skills, Knowledge & Training	It is much more challenging in developing countries due to a lack of resources and a weaker healthcare system. Transformative learning deals with these challenges and builds training and education in a sustainable manner.	[77], [79], [80], [41], [42]
	Collaboration network	The collaborative play the important role in a supply chain through a stakeholders' outcome measure. HCS comprises of various participants, the contribution of each participant will lead to social sustainability and reflection in the health outcome improvement. It is proven that working collaboratively with a network of physicians can result in SS development.	[26], [45], [44], [46], [48], [47]
Society	Job creation	In Southeast Asia, the pandemic has led to an unprecedented economic crisis caused millions of jobs lost and company bankrupt. The healthcare sector is got a lesser impact on the unemployment issue but the issue of insecurity in safety during work, work overload, and exhaustion are obviously seen among HCWs. The investment in sustainable employment is a cost-effective way to deliver long-term, positive development impact.	[48], [49], [50], [51]
	Stakeholders' satisfaction	The key success factor in many industries is the satisfaction of stakeholders. It has been identified as crucial to create value in the long term. In healthcare settings, stakeholders' satisfaction and engagement are very essential for quality improvement and derive the organization toward the ultimate goal of sustainable patient and personnel safety.	[52], [53], [54], [33], [54]
	Health education and system	An increase in population well-being in the community is one of the sustainable goals for society as WHO mentioned. The ill health represents an economic expense to the nation and affects both educational attainment and productivity.	[21], [29], [55], [57]
	Corporate Social Response (CSR)	As the studies mentioned above CSR is central and integral strategies, the internal CSR strategies have shown the directly linked to employee well-being, engagement, and job satisfaction. The external CSR strategies related to the community and broader society and reflect the organization's reputation and image.	[26], [34], [57], [58]
Consumer's Safety	Product Quality	Increase product quality to ensure safety and reduce the hazard incident from unqualified product.	[35], [38], [39], [59]
	Reliability	The report of Joint Commission International addressed the illicit and counterfeit products including medical devices, medicine and supplies keep increasing in number due to less oversight and regulation by many countries. It is crucial to build and enhance to strong reliability of HSC in order to ensure the safety of both patients and personnel and lead to sustainable manners in HSC for SS.	[25], [28], [60], [61]
	Product Safety	Failure of medical products due to inadequate testing and inspection may cause unforeseen incidents that may lead to life-threatening events for both personnel and patient.	[21], [34], [35], [62]
	Awareness	It is obviously addressed that awareness of safety measures is very important. The safety factors such as sufficient training, reviewed and updated protocols, working instruction and policies, and Standard Operating procedures (SOP) play an important role in HSC performance that stakeholders require to focus on.	[34], [35], [63], [64], [65]

VI. DISCUSSIONS

The comprehensive exploration using the Meta-analysis categorized SS into 3 aspects and identified 12 HC'S factors relevant to HCWs under each aspect. The novel model is proposed in Figure 3 to illustrate the diagram of HCWs sustainability with HSC performance. It displays the factors synthesized from the literature under the healthcare settings context and under the uncertain situation e.g., the epidemic crises in the past, the first phase of the COVID-19 pandemic, resilience and recovery phase. The synthesis from various uncertain situations aims to ensure the model is adaptable in the post-COVID-19 era or in future crises.

The proposed model shows the essential aspects that are unique to the healthcare industry, especially from the safety perspective. Physical and mental safety is deployed in the aspect of Human beings, for instance, HCWs' safety with low infection rate during serving the COVID-19 cases and managing the depression of HCWs after taking care of COVID-19 cases.

Product safety is also one of the crucial factors addressed in the Consumer's safety aspect. The illicit, counterfeit, and substandard health products could harm one's life and result in unexpected death. The implementation of sustainable HCWs for both Human beings and Consumers' safety can lead to Society in a sustainable manner. The COVID-19 outbreak has affected the healthcare industry and various supply chain stakeholders. It attracts many researchers to investigate the vulnerability of HSC. This model's contributions include identifying factors for HCWs' sustainability. The model can provide greater insight into the issue of HCWs and reflect the essential aspects of the implementation of social sustainability. The model also aims to help the healthcare organization prioritize the factors relevant to areas it needs to address. Prioritization of important factors would help management to improve and execute strategies effectively.



Figure 3: A novel model of HCWs social sustainability in healthcare supply chain

VII. CONCLUSION

Although many countries are able to cope and recover well from the COVID-19 pandemic situation. However, the uncertainties such as wars, natural disasters, and economic crises persist. The limited resources and difficulty to access public health across the country are still noticeably seen in developing countries. The aforementioned challenges have highlighted that healthcare system development must be focused on and accelerated especially in HSC. The HSC development can lead to social sustainability by improving the well-being of the employee, employee's family, and broader to improve the well-being of the community and society respectively. In this study, SS concerning for HCWs and HSC factors have been explored. The novel model integrating the HSC factors for SS in the context of developing countries has been proposed.

Moreover, this study shows the imperative of HSC factors that can lead to future research opportunities for social sustainability models in the healthcare setting in developing countries.

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