

Identifying and Prioritizing Challenges in the COVID-19 Vaccine Supply Chain

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Abstract: Logistics is a very critical aspect for any industry and every product. When it comes to Covid Vaccine it adds even more pressure around timeliness and accuracy for the delivery. The COVID - 19 outbreak has demonstrated the diverse challenges that supply chains face to significant disruptions. Therefore, it is elemental that challenges to the COVID - 19 vaccine supply chain (VSC) are identified and prioritized to pave the way out of this pandemic. This work identifies 15 challenges and reveals that 'Limited number of vaccine manufacturing companies', 'Inappropriate coordination with local organizations', 'Lack of vaccine monitoring bodies', 'Difficulties in monitoring and controlling vaccine temperature', and 'Vaccination cost and lack of financial support for vaccine purchase' are the most critical challenges. The results offer practical approaches for stakeholders and policy makers around the world to develop an improved supply chain for vaccines.

Keywords: logistics, COVID-19 vaccine, supply chain, vaccine challenges, vaccine distribution

1. Introduction and Existing Methods and challenges

The main contribution of this paper is to give a comprehensive understanding of the challenges of the COVID - 19 Supply Chain and to facilitate the fight against the COVID - 19 outbreak so that all concerned organizations are better prepared to develop contingency plans for monitoring and restructuring supply chains in pandemic situations.

We could categorize the challenges in Four Major areas:

Key Challenges:

- Limited number of vaccine manufacturing companies
- Immunization program delivery strategies
- Inappropriate coordination with local organizations
- Topographical boundaries
- Difficulties in monitoring and controlling vaccine temperature
- Difficulty of tracking vaccinated population

Minor Key Challenges:

- Long distance between vaccine stores and vaccination camps

Independent Challenges:

- Unavailability of volunteers for vaccine trials

Indirect Challenges:

- Lack of correspondence between the VSC members
- Lack of accurate vaccine demand forecast
- Lack of proper planning and scheduling
- Consumers' unwillingness to vaccinate
- Increase in acquisition lead time
- Lack of proper storage systems
- Vaccination cost and lack of financial support for vaccine purchase Indirect challenges have high significance but low relation

All these challenges can be mitigated and covered with proper planning and accepting them. Supply Chain challenges are categorized into four categories: minor key challenges (high relation, low prominence), key challenges

(high relation, high prominence), independent challenges (low relation, low prominence), and indirect challenges (low relation, low prominence)

As depicted the minor key challenge category consists of only one challenge, which is "Long distance between vaccine stores and vaccination camps". This challenge has minimal impact on other challenges, and its potential significance is low.

The independent challenges category also contains one challenge, which is "Unavailability of volunteers for vaccine trials". It means that this challenge is not affected by other challenges.

The indirect challenges category consists of seven challenges. These are:

- 1) "Lack of correspondence between the VSC members",
- 2) "Lack of accurate vaccine demand forecast",
- 3) "Increase in acquisition lead time",
- 4) "Lack of proper planning and scheduling",
- 5) "Consumers' unwillingness to vaccinate", and
- 6) "Lack of proper storage systems",
- 7) "Vaccination cost and lack of financial support for vaccine purchase Indirect challenges have high significance but low relation".

The key challenges category comprises six challenges. These are ranked as follows:

- 1) "Limited number of vaccine manufacturing companies",
- 2) "Inappropriate coordination with local organizations",
- 3) "Lack of vaccine monitoring bodies",
- 4) "Difficulties in monitoring and controlling vaccine temperature",
- 5) "Difficulty of tracking vaccinated population", and
- 6) "Inadequate positive vaccine marketing".

Key challenges have the most influence on other challenges. All these challenges are in the cause group and must be given the highest priority for successful administration of the COVID - 19 Supply Chain. Focusing on and overcoming these challenges will assist

governments worldwide to formulate a proactive and responsive plan for efficient and effective vaccine supply and distribution.

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2. Conclusions

The COVID - 19 pandemic has created an immense global crisis causing severe damage to the sustainability of humans. Vaccines increase the chance of preventing the transmission of the disease and protect people's lives.

Therefore, the need to vaccinate the entire population against the COVID - 19 virus is not only pressing but also the most effective way to recover from the pandemic. Development, manufacturing, distribution, and administration of vaccines are challenging. The role of the Vaccine Supply Chain is to deliver the right vaccine in the right quantity to be delivered to the right place at the right time. Governments will be required to develop evidence – based strategies for ensuring that COVID - 19 vaccines lead to widespread vaccination. This paper investigates and classifies challenges of the COVID - 19 Vaccine Supply Chain to contribute to the fight against the global pandemic. Considering supply chain challenges long before a vaccine is administered to the general population can help design successful vaccination campaigns. Therefore, identification of key challenges to the COVID - 19 Vaccine Supply Chain is customary for a sustainable Vaccine Supply Chain that could help the countries around the world to getting out of the pandemic.

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