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Developing a Roadmap for Mass Vaccination of COVID-19 in Iran: A Qualitative Study

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Abstract

Background: Nowadays, the Covid-19 pandemic is 1 of the most important challenges worldwide, especially in terms of health. The most important strategy to prevent and control the Covid-19 pandemic is mass vaccination. This study aimed at developing a roadmap for the mass vaccination of COVID-19 in Iran.

Methods: The current study was conducted using a qualitative approach with a content analysis method. In the first step, the review of literature and documents was carried out by a search in scientific databases. In the next step, the data were amassed via in-depth and semi-structured interviews with experts who were selected purposefully, including policymakers, health care workers, and managers. After this, 3 multidisciplinary expert panels for roadmap development were held.

Results: Based on the literature review, interviews, and 3 stages of an expert panel, the final roadmap was developed with 5 dimensions. These included outcomes, planning and preparation, strategies, and preparation, implementation, monitoring, and evaluation.

Conclusions: This roadmap was developed to improve mass vaccination during the COVID-19 pandemic. According to our findings, it is strongly recommended that the vaccination roadmap with all the above-mentioned features and comprehensive structure should be applied to mitigate the consequences of the COVID-19 pandemic.

Introduction

In 2019, Wuhan province, China, was the first place where the novel human coronavirus (COVID-19), also known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) emerged.[1] From the beginning of the pandemic until October 27, 2021, almost 291 million people were infected with COVID-19, and more than 4.5 million of the infected people passed away.[2] During the initial period of the disease, attempts were made to prevent and retard its transmission.[3] Despite taking preventative public health measures, including physical distancing, mask usage, and improved sanitation procedures to ease the strain on the health system and diminish community transmission, COVID-19 is still 1 of the most critical health challenges around the globe.[4] The commencement of the pandemic in China presented a major threat to other countries, including Iran. On February 19, 2 cases of death resulting from COVID-19 were confirmed in Iran. Despite an early identification of the disease, measures aimed at preventing the pandemic from spreading have been inadequate.[5] On October 27, 2021, statistics for patients with COVID-19 showed that Iran was ranked 8th in the world. The total number of COVID-19 patients in Iran reached 588 million, with more than 126000 deaths.[6] To respond to the pandemic, the national committee for COVID-19 management was established. The main measures include preventing mass gatherings, closing educational institutions, national screening programs, and physical distancing coupled with national coordination by volunteers, civilians, and armed forces.[7] It is now known that the long-term solution to the effective fight against the COVID-19 pandemic is worldwide vaccination.[8] Immunization through vaccines has prohibited premature disease, perpetual disability, and suffering in all regions in the world more than any other medical intervention. Without vaccination, many of the health, economic, and social gains of the past 200 years would not have been possible.[9] The launch of vaccination programs across the world has revealed that the COVID-19 vaccines have been effective in preventing symptomatic and asymptomatic SARS-CoV-2 infections and COVID-19-related hospitalizations, severe COVID-19 infections, and death across all ages.[10]

An auspicious solution to this public health calamity has been provided by recent announcements about developing multiple, safe, and effective vaccines for COVID-19. However, production, distribution, and convincing people to accept a COVID-19 vaccine are key challenges.[11] In addition to these obstacles, the COVID-19 vaccine in Iran has been faced with several other major challenges, including economic and political sanctions.[12]

Some countries have already deployed mass vaccination campaigns, which can take place in sizeable off-site vaccination centers set up in car parks, stadiums, commercial centers, and so on.[13] Nevertheless, the mere accessibility of a vaccine is not sufficient to assure broad immunological protection.[8] Research has indicated that diminishing friction (e.g., having trouble signing up for programs) and hassle factors (e.g., troublesome service locations, waiting times, and paperwork) enhances the acceptance of services.[13]

Some studies related to COVID-19 vaccination have been conducted. Maserat *et al*., in a research study, developed a multidimensional framework to show current interventions and areas in which technology could be used for bettering vaccine communication in Iran.[14] DeRoo, in a study entitled 'Planning for a COVID-19 Vaccination Program,' has pointed to the need to provide and distribute vaccines quickly and fairly, tackle the potential impediments to vaccine acceptance, and develop a strong educational campaign related to the COVID-19 vaccine by social media.[8] Kumar *et al.* reviewed strategies for COVID-19 vaccination and examined the various aspects of the vaccination program in India as well as the vaccines in use.[3]

Content-wise, a roadmap generally refers to the systematic representation of pathways according to a specific interest.[15,16] Its major purpose is the identification, bundling and assessment of expert opinion to predict specific future developments. Roadmapping is a method to structure and visualize possible or expected development paths to reach a specific goal in the future.[15–17]

Due to the multidimensional and complex nature of the vaccination process, the need for a roadmap to support the vaccination program seems essential. Therefore, this study aimed to present a comprehensive and practical roadmap to promote the vaccination program in Iran.

Method

Review of literature and documents

Searching and reviewing the available pieces of evidence, including the literature, documents, and reports/guidelines developed by relevant organizations, we determined the characteristics of the core information to be included in the COVID-19 vaccination.

Scientific databases and gray literature from January 2020 to August 2021 were utilized to conduct a comprehensive literature search (see Table 1). The bibliographies of all the articles germane to our study were also reviewed to find further studies.

Interview with experts for consultation

We interviewed the main members of the national committee for COVID-19 management and some experts in this field. Participants were experts from various disciplines, namely hospitalists, health administrators, and health managers, as well as disaster managers, internal medical specialists, pulmonary diseases specialists, and infectious diseases specialists. Researchers, emergency medicine specialists, academics, and virologists who had had direct experience in COVID-19 management and vaccination, were also involved. We undertook individual semi-structured interviews with some experts. Some of them were members of the National Committee for COVID-19 management. By reason of the limitations during the COVID-19 pandemic, face-to-face interviews were impossible in some cases, and we employed telephone and video connections via Skype to conduct interviews, which were audio-recorded and transcribed in full. The discussed topics chiefly focused on the effective management of mass vaccination for COVID-19 and the strengths and weaknesses of the health system. The participants received the interview guide in advance, and the questions covered gaps and challenges of mass vaccination, practical recommendations, and available capacities, as well as threats and opportunities, the main strategies, and actions required.

We used a thematic method for data analysis, and the collected data were coded by 2 researchers independently. In the first example, coding was made based on immersion in the data (listening to complete interview recordings and working with transcripts). Subsequently, themes and sub-themes emerging from data analysis were given to expert panel participants. Their validation assisted us in establishing the credibility of our themes. Furthermore, online panel discussions brought about additional data, indicating useful lines for further detailed analysis.

Table 1. Databases and Key words

Databases
Web of Science, PubMed, Cochrane Library, Scopus, Google scholar and Federal Emergency Management Agency (FEMA), WHO, Centers for Disease Control and Prevention (CDC), United Nations Children's Fund (UNICEF), and the Ministry of Health of the countries. Open Research Dataset, Biorxiv and Medrxiv, PubMed – Lit Covid, Cochrane Library, GIDEON, CDC, and Jove
Key Words
'COVID-19,' 'vaccination,' 'vaccine,' 'preparedness,' 'prevention,' 'control,' 'immunization,' 'management,' 'public vaccination,' 'mass vaccination,' 'epidemic,' 'pandemic,' 'outbreak,' 'infectious disease,' 'plan,' 'strategy,' and 'roadmap'

The expert panel for roadmap development

We used a 3-step modified consensus meeting involving a multidisciplinary expert panel of relevant stakeholder groups to develop the roadmap of mass vaccination for COVID-19. The findings of the literature review and interviews were additionally accompanied by expert comments and practical advice. Initially, the experts reviewed present toolkits and evidence-based recommendations about the best mass vaccination for COVID-19 practices.

We conducted 3 expert panels. Panel 1 involved PhD students and faculty members of health in disaster and emergencies department and healthcare management. Panel 2 involved the managers and experts of the Vice Chancellor for Health, University of Medical Sciences, and Panel 3 involved the members of the Academy of Medical Sciences. Panel members were selected based on their nationally recognized expertise in the health sector and mass vaccination. All the experts were known nationally for their research in the health sector and clinical expertise in COVID-19 vaccination, or they were in leadership positions in national or regional organizations (Figure 1).

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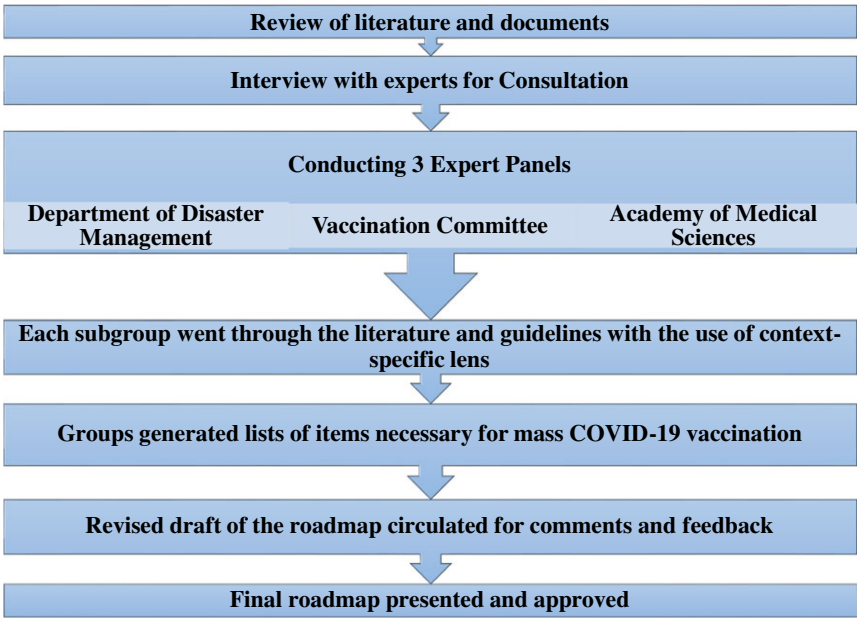


Figure 1. Roadmap development process.

In the meetings through video connections, the members of the panel were allocated to 5 groups, and they were instructed to examine summarized toolkits and literature using context-specific aspects (outcomes; planning and preparation; strategies; preparation and implementation; and monitoring and evaluation). After each meeting, the groups were requested to generate a list of evidence-based items necessary for COVID-19 vaccination, considering the assigned aspect of each group. There was a consensus among the subgroups on items peculiar to the context. The first draft of the roadmap was prepared based on the input from all the subgroups. The draft roadmap was then submitted to the panel members to get their input. In the following meeting, an opportunity for offering individual comments and feedback on the initial draft roadmap was created. After completing 3 cycles of checklist revisions, the exchange of comments and feedback through email and mobile applications was done. A final meeting led to the agreement among experts on every element of the mass vaccination for the COVID-19 roadmap. In this meeting, the approval of the roadmap was achieved.

The meeting was conducted by an independent facilitator. Expert panel members were requested to explore any further topic they deemed to be important. If the panel members could not join the meeting, an individual interview with them was administered by the researchers to discuss their comments and bring them into discussion in the group meetings. Afterward, the researchers' reports of the meeting were emailed to all panel members to comment upon them. In the next consensus meeting, ambiguous issues and comments of panel members were also discussed until a consensus was achieved.

In total, 3 panel discussions took place, during which the experts' comments were discussed. The discussions sometimes conceded extra comments of attention due to the interaction between the expert panel members of various professions. However, a unanimous consensus was developed for all items in the consensus meetings.

Results

The content provided in this roadmap is based on a systematic search in scientific databases to extract documents and articles published as well as reviews of guides, instructions, documents, and protocols, a well as processes, lessons learned, and experiences developed by the WHO and other international organizations. Also, opinions, comments, and experiences of important and prominent persons were received and applied by the interview and expert panel.

Based on the literature review, interview, and 3 stages of the expert panel, the final roadmap was developed with 5 dimensions including outcomes, planning and preparation, strategies, preparation and implementation, and monitoring and evaluation (Table 2).

The strategies were categorized into 11 sections: (1) organization and coordination of the inner and outer sectors, (2) training, (3) risk communication and public information, (4) finance and logistics, (5) facilitation of the efficiency of the supply chain and distribution, (6) human resource management, (7) management of vulnerable groups, (8) documentation, reporting and management of knowledge and research, (9) information systems, (10) monitoring and evaluation, as well as (11) reporting adverse effects, security, and safety (Figure 2).

Implementing the roadmap

Some strategies and measure of the roadmap were implemented completely while some of them were partially used or running continuously. Main strategies such as security, safety, vulnerable groups, and human resource management, as well as risk information and communication, training, inner sector and outer sector organization and coordination, and the facilitation of the efficiency of the supply chain (distribution, financial, and logistic information systems) belong to all stages of the vaccination process as well as to all areas.

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Table 2. Dimensions of roadmap

Organization and coordination of the inner and outer sectors	Establishing the incident command system in all universities and health centers to manage vaccination properly;	
	forming executive teams in the form of a health council comprised of ministers, governors, and officials of other units non-related to the Ministry of Health (appropriate to national, regional, and local levels) for coordination and synergizing external capacities;	
	preparing a workbook describing the duties of all governmental and non-governmental organizations non-related to the Ministry of Health to clarify their role in the vaccination process and its announcement by the presidency;	
	forming scientific teams comprised of clinical, paraclinical, and basic sciences specialties, such as epidemiology, management, heart, lung, oncology, and nephrology at the national level to organize individuals' prioritization, to precisely define the general target groups and vulnerable people at each stage of vaccination, and to define vaccine distribution strategies.	
Training	a. **Training for the community and the media workers**	Extensive training for people and media workers to create culture, gain trust, correct beliefs, address their concerns about vaccine safety, and strengthen vaccine acceptance through mass media, virtual media, campaigns, brochures, and paper and virtual posters.
		Extensive general training about the vaccination system, side effects of the vaccination, vaccination management, how to register and apply for the vaccine, and how to follow up in case of the exacerbation of the symptoms for treatment by means of face-to-face training, mass media, virtual media, campaigns, brochures, paper, and virtual posters.
	a. **Training for healthcare and logistics workers**	Providing medical and nursing teams based in the private and public sectors with specialized training in the vaccination process and the management of vaccine side effects in accordance with the characteristics of the injectable vaccine
		Specialized training related to the duties of all members of the vaccination and volunteer teams in accordance with their job descriptions in the vaccination process
Risk communication and public information	Identifying and removing barriers (socio-cultural, political, technical, facilities, and logistics) to vaccination.	
	Management of rumors and incorrect information by forming cyberspace monitoring and control teams to identify rumors and intervene in a timely manner and to provide clear and regular information about the progress of vaccination and vaccine side effects using a committee of virtual content development.	
	Using popular artistic, sports, cultural and scientific figures to educate and inform people, or broadcasting educational audio files by these figures.	
	Considering ethnical and religious characteristics and local languages and publishing information in local languages in each city.	
	Cooperating with religious and influential leaders and convincing and empowering community leaders by providing them with detailed information about the vaccine and its official supply programs.	
	Establishing a call center or phone query system in the local language and using voluntary services of individuals to answer questions.	
Finance and logistics	Financing universities to provide consumable and non-consumable essentials for vaccination and personal protective equipment.	
	Concluding a special contract with companies producing consumable and non-consumable essentials regarding the timely provision of required supplies.	

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Table 2. (*Continued*)

	Increasing the capacity of units involved in the vaccination process to prevent disruptions to essential and routine services.
	Expanding and upgrading innovative systems, such as digital tools for training, monitoring, and supporting.
	Facilitating and accelerating the process of importing vaccines and consumable supplies by customs and other related organizations and eliminating unnecessary administrative procedures and formalities for importing and distributing vaccines.
Facilitation of the efficiency of the supply chain and distribution	Investigating, supplying and increasing the capacity of the essential needs of the cold chain; ensuring that standard executive processes of the cold chain are met; monitoring adherence to execution processes of the cold chain to prevent vaccine wastage.
	Ensuring storage and warehousing infrastructure (during the reception, storage, warehousing, repackaging, transport, and monitoring) in the time of vaccine transportation.
	Proper supply and vaccine storage planning in universities and vaccination centers for the first and second stages of vaccination; Daily preparation of a suitable data entry form, including the number of existing vials at the beginning of the week, the number of received vials, the number of vaccinated people, the number of usable residual vials using an application or website (these data should be confirmed and recorded by a doctor and a person responsible for the cold chain of the vaccine in the vaccination center at the end of each day).
	Development of an information system for supply chain monitoring, tracking, distribution and warehouse management and provision of a mechanism for recording data and reporting on vaccines.
	Mapping of the places with the potential for distributing vaccinations proportional to the local population, including outpatient or inpatient departments, pharmacies, private or governmental institutions, clinical or paraclinical centers, sports stadiums, mosques, hotels, and cinemas
	Deciding on the composition of injectable vaccines in different cities and provinces based on capacity and justice and preparing strategies for the distribution of vaccine and vaccination considering the differences in the mechanism of vaccines.
	Preparing a comprehensive instruction on vaccine distribution and injection by hiring private companies to do the mentioned tasks and choose a suitable vaccine distribution system according to national ID or date of birth in the priority of national document for the quadruple phase.
	Developing a registration, tracking and automated SMS system regarding the time and location of injection and allocating a telephone line for reserving vaccines for those who do not have access to the Internet.
	Establishing round-the-clock vaccination centers and making mobile vaccination teams along with special equipment.
	Preparing a checklist of people's conditions before vaccination and recording the checklist data by phone or in person.
	Providing an individual vaccination certificate or card for such purposes as health, occupation, education, and travel (in accordance with national policies) in an integrated manner in the country
	Requiring all businesses, banks, and organizations to provide services to customers/clients with the vaccination card.

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Table 2. (*Continued*)

Human resource management	Workforce needs assessment for general vaccination and identification of human resource needs and increasing the required human resource capacity from inside and outside sources of the organization and volunteer forces using correct criteria in selecting people.	
	Signing inter-organizational cooperation agreements at national, provincial, and local levels to strengthen the workforce.	
	Doing practice and simulation of vaccination, especially for external organizations, before providing general vaccination services to identify strengths and weaknesses and modify processes.	
	Liability insurance for all staff and volunteers involved in the vaccination program.	
Management of vulnerable groups	Preparing a database of vulnerable groups using such tools as insurance databases.	
	Accurate identification of the type of vaccine that can be harmful to vulnerable groups such as pregnant women and people with weakened immune systems (in accordance with the recommendations of the National Group of Vaccine Technical Advisers).	
	Allocating special bases to vulnerable groups, in which the vaccine has special facilities and spaces and is accompanied by very strict and special protocols.	
Documentation, reporting and management of knowledge and research	Documenting all activities and preparing periodic reports for policymakers by executive units.	
	Carrying out research projects by research centers to record and transfer lessons learned and experiences and knowledge management.	
	Conducting studies to evaluate the effectiveness of the vaccine and the performance of the vaccination program after vaccination.	
Information systems, monitoring and evaluation as well as reporting adverse effects	Increasing the capacity of applications and systems for recording data and information related to vaccination with the ability to connect to electronic health records.	
	Development of a platform for electronic health records and registration of people's information in electronic records (as a golden and unique opportunity for entering the information of all the Iranians in these systems).	
	Preparing a database of people, diseases, and disease distribution in the country.	
	Making a connection between the information of the Civil Registration Organization and the systems of the Ministry of Health, namely Sib, Sina, Nab and Parsa. Establishment of a vaccination care system.	Development of a tracking system of short-term and long-term effects arising from vaccination.
		Establishing a system for registering vaccine-related complications in the private and governmental sectors.
		Preparing an appropriate form in which the data related to vaccine side-effects in the private and governmental sectors can be entered, using the application or site as well as announcing a dedicated phone number.
		Formation of a special committee to investigate the side effects of vaccination.
	Using the capacity of volunteer teams such as the Red Crescent and other governmental and private organizations to enter data into an electronic system and define the level of limited access appropriate to the type of performance of volunteers in information registration systems.	Population demographic information
		Statistics of vaccination coverage indicators
		The ratio of vaccinated vulnerable people
		The ratio of people not referring for the second vaccine dose
		The ratio of available vaccines to the target population
		Clients' satisfaction with vaccination
		Scores obtained from the quality of vaccination
		The rate of registered complications of vaccination
		The rate of registration of the injected vaccines based on their type and the turn of vaccination
		The amount of vaccine waste disposal in a hygienic way
		The trained staff for vaccination

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Table 2. (*Continued*)

		The cold chain provided for vaccination
		Trained people to participate in the implementation of the vaccination plan
		Prepared training packages
		Population demographic information
	Preparation of management dashboards and related indicators	Population demographic information
		Statistics of vaccination coverage indicators
		The ratio of vaccinated vulnerable people
		The ratio of people not referring for the second vaccine dose
		The ratio of available vaccines to the target population
		Clients' satisfaction with vaccination
		Scores obtained from the quality of vaccination
		The rate of registered complications of vaccination
		The rate of registration of the injected vaccines based on their type and the turn of vaccination
		The amount of vaccine waste disposal in a hygienic way
		The trained staff for vaccination
		The cold chain provided for vaccination
		Trained people to participate in the implementation of the vaccination plan
		Prepared training packages
	Informing people about the registration of complaints in the 190 system, filing a complaint in the system, and necessary investigations and follow-ups by medical universities.	
Security	Preparing security instructions and maintaining the security of vaccines and vaccine storage facilities in storage centers and the centers providing vaccination services and preventing the theft and destruction of vaccines.	
	Preparing an adequate protection and security program for all forces involved in the vaccination process in cooperation with agencies and organizations.	
	Coordinating with military and disciplinary forces to combat sabotage during the vaccination process.	
	Controlling the distribution of counterfeit vaccines and the distribution of vaccines among people in the black market.	
Safety	Assigning a senior safety officer to control safety issues, prevent and control infection in all centers, ensure the safe distribution of the vaccine, and ensure the safety of the injection.	
	Designing processes related to equipment preparation, collection, and proper disposal of infectious waste of vaccination.	

Implementing some measures including vaccine side effect evaluation, monitoring of vaccination performance and process, studying and evaluating vaccine effectiveness, and changing the structure of the vaccine following possible vaccine mutations have significant role in effective management of the vaccination process.

Using strategies and measures such as strengthening stakeholder cooperation, attracting public participation, pursuance of improvement in foreign vaccine import, and strengthening inter-sector and cross-sector cooperation and coordination, as well as establishing the incident command system in all universities and health centers for proper vaccination management, supporting the production and development of domestically produced vaccines and production lines with other countries, formation of scientific and executive working groups, and developing required guidelines for general training, vaccine advertisement, staff specific training, side effects treatment, pre- and post-injection cares rate of vaccination in all countries was raised significantly.

Discussion

This study aimed at developing a roadmap for mass vaccination of COVID-19 to effectively manage the mass vaccination of the COVID-19 process in Iran.

We represented the findings with an emphasis on increasing the capacity of units involved in the vaccination process to provide consumable and non-consumable supplies for vaccination and personal protective equipment and make timely provision of required supplies approved in the roadmap for COVID-19

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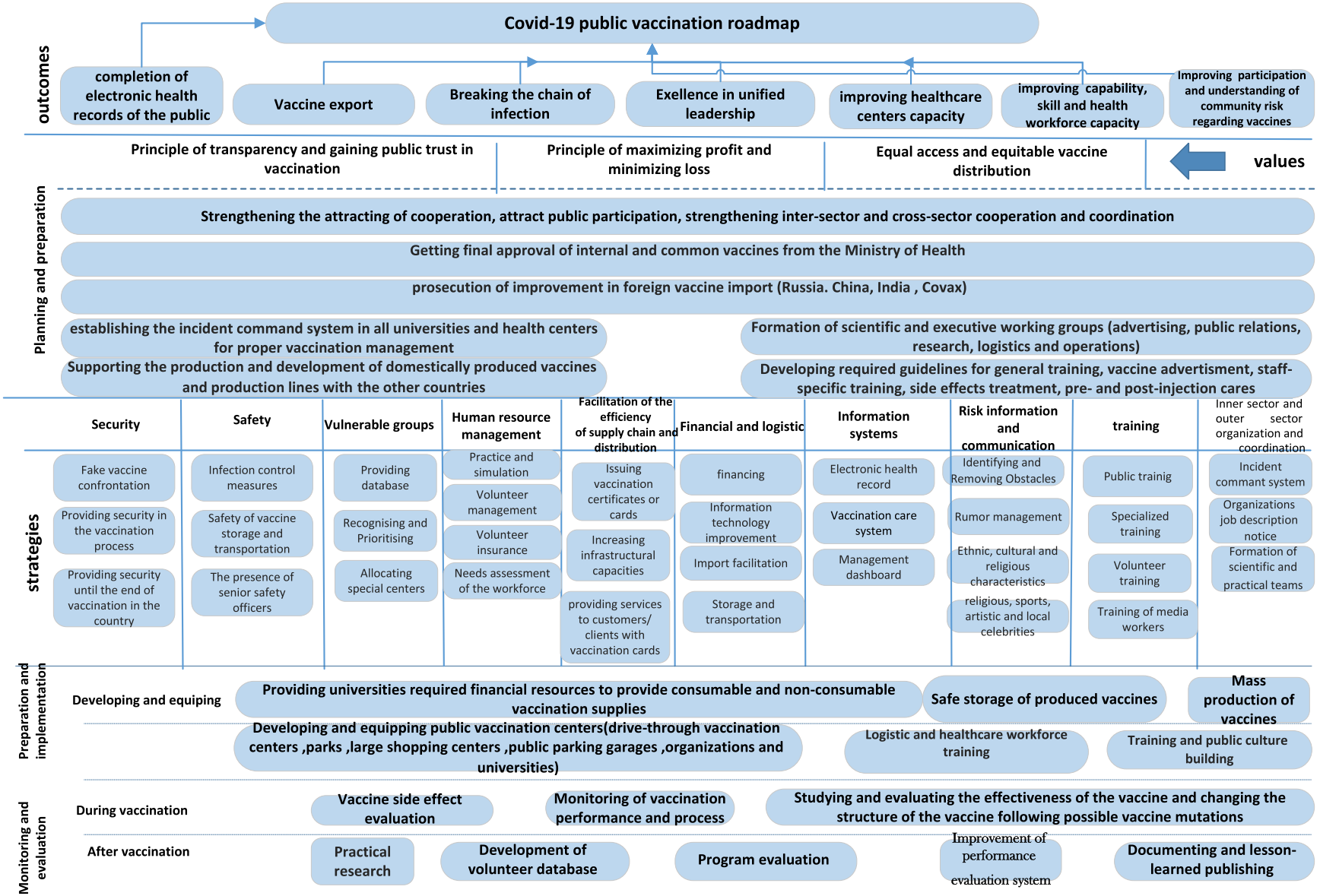


Figure 2. Roadmap development process.

Vaccination. This roadmap describes such aspects to be considered in a vaccination program as planning and setting up a vaccination center including logistics and vaccine distribution, legal consideration, and documentation.[18]

In a study, Zozani *et al.* concluded that negative actions to face COVID-19 disease include the delays and cancelations of international flights and ignoring the importance of the disease, confirming that the organization and coordination of the inner and outer sectors are not done properly. Without a doubt, coordination between policymakers at the national, regional, and local levels is the main principle in planning, which can affect performance.[19]

Research on India's resurgence of COVID-19 suggests that using appropriate technologies for the management of resources, evidence-based information in management, active collaboration with NGOs, and governmental organizations help to promote vaccinations. Findings also showed that health workers need data on hospitalization, mortality rate, and coverage rate of people's vaccination to measure the effectiveness of treatment protocols. It means that the strategies applicable to information systems, reporting adverse effects, and research management can be essential.[20]

Training for medical personnel has been 1 of the results of this study. The results of other studies indicate that the implementation of cold chain management and vaccination is not easy, and it is necessary for health and medical forces to be trained on how to maintain and transport the vaccines and manage their side effects according to the instructions and standards. Moreover, these types of training have been done through virtual programs. The results of these studies are consistent with the present study.[13,21]

Based on the present findings, the vulnerable groups were 1 of the most effective people, and vaccination for this group should be given priority. In a study conducted in 2021, with the aim of prioritizing the COVID-19 vaccine for vulnerable groups, Rachel Strodel *et al.* showed that prison and prison workers (49%), law enforcement officers (63%), the elderly (65+ years, 59%), and residents of long-term care centers (100%), are a priority in COVID-19 vaccine allocation programs.[22] Also, another study by Alberto Giubilini *et al.* aimed at vaccination against COVID-19 to protect the elderly or young people, made it clear that the elderly and high-risk groups are more vulnerable to the virus. Nevertheless, this is not necessarily the case. Shielding the most vulnerable groups may necessitate vaccination prioritization, by which the benefits of indirect immunity for the elderly and other vulnerable groups can be maximized. This strategy, as the best from a public health perspective, hinges on the features of the vaccine and the virus, which are presently enigmatic.[23] Furthermore, Govind Persad *et al.* found that the priority of vaccination is first with health care providers, followed by people over 75 years of age, people from 65-74 years of age, and finally by people with high-risk medical conditions.[24] Our study is in line with the findings of this research.

The study conducted by DeRoo *et al.* focused on training for the members of the media. The role of the media is very important in creating right or wrong beliefs. Therefore, the media should be aware of their role. The result of this study also reinforces our findings.[25]

The need to educate people has been another finding of this study. The results of the study suggest the need to increase public awareness about vaccines and create campaigns aimed at educating people by religious leaders, health workers, and influential people in the community. These results reinforce the findings of the present study.[26]

Other findings of this study were the distribution and supply chain of necessities. The need to plan for the distribution of vaccines in urban and rural areas as well as the distribution of essentials such as syringes, personal protective equipment, cold boxes, and ice packs, as well as alcohol and other items, has been indicated in a study. It also mentions the temperature control of vaccines digitally in all stages of transmission, the use of food refrigerators, the need to increase capacity, and the role of the private sector in vaccination. The results of this study also confirm our results.[13]

Safety was another finding mentioned in other studies in which the ongoing assessment of the true safety of FDA-approved vaccines is crucial.[27] A study by Xing *et al.* aiming at the efficacy and safety of COVID-19 vaccines found that most COVID-19 vaccines are effective and safe. 2-dose vaccination is recommended.[28] Based on the results of a study performed by Gee *et al.*, vaccine safety monitoring should be considered the most severe and comprehensive measures for health care personnel and long-term care residents after injection, using the vaccine adverse event reporting system. The adverse event reporting system, an automated reporting system, and an active monitoring system were employed during the early stages of the COVID-19 national vaccination program which performed descriptive analysis of safety data from the first month of vaccination. The data system provides reliable and useful information about what health care providers and vaccine recipients might expect after vaccination.[29]

Risk communication was another finding which is in line with some similar studies. The other studies stated that people should be given accurate and clear information about the speed and time of distribution and the side effects of the vaccine without any worries according to the culture and language of the people of the region. The presence of religious leaders is considered effective in establishing appropriate communication and success in vaccination. The results of these studies were in line with the present study.[21,30]

Personnel management was another important finding. In a study, trained human resource management were identified as a key factor in the proper management of the COVID-19 vaccination program. This study also recommended the use of different types of occupations and specialties such as doctors, nurses, support staff including firefighters, and people familiar with information management technology. The results of this study also confirm our findings.[31]

Another finding from security research is that vaccination plays an important role in global health security. In cases where public health law is important for the prevention, diagnosis, and response to infectious diseases, it is necessary to amend the public health law to implement the global health security agenda.[32]

Conclusion

This roadmap has been developed to improve mass vaccination during the COVID-19 pandemic. Iran, like other countries, has been affected by the devastating economic and social consequences of the COVID-19 global pandemic. Statistics show that Iran has been 1 of the countries with the highest number of patients and deaths. Nowadays, along with maintaining physical distance, vaccination is 1 of the main ways to save people's lives and the best approach to end this pandemic. After the challenge of producing effective and safe vaccines against COVID-19, the most important challenge of the current stage in the pandemic is the mismatch

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between the demand and supply of COVID-19 vaccines. The disproportion between demand and supply of vaccines is an important challenge for the control of the COVID-19 pandemic, and the vaccination roadmap document is critical to more effective access to health care services. All aspects in this study were presented to foster equal access, fair vaccination allocation, and the principle of transparency and trust in the vaccine. Therefore, it is strongly recommended that the vaccination roadmap with all the above-mentioned features and comprehensive structure should be applied to make the most profit and the least loss.

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Competing interests. The authors declared that they have no competing interests.

Author contribution. HS designed the main ideas and aims of the research and supervised the study. MD and HS designed the methodology of the research, and were responsible for leadership of the study management and coordination. MR and SB collected the data. MD, MR, and MB wrote and collaborated in editing the original draft. SB, HA, FB, and MR analyzed the data. They also prepared the manuscript for publication. MB revised the manuscript to English. All authors reviewed the manuscript. The author(s) read and approved the final manuscript.

Abbreviations. NGO, Non - Governmental Organization

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