ORIGINAL ARTICLE

Assessing Iran's health system according to the COVID-19 strategic preparedness and response plan of the World Health Organization: health policy and historical implications

MAHBOUBEH KHATON GHANBARI[1,2], MASOUD BEHZADIFAR[3], AHAD BAKHTIARI[4,5], MEYSAM BEHZADIFAR[6], SAMAD AZARI[1], HASAN ABOLGHASEM GORJI[1], SAEED SHAHABI[7], MARIANO MARTINI[8], NICOLA LUIGI BRAGAZZI[9,10]
[1] Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran; [2] Zoonoses Control Unit, Center of Diseases Control, Ministry of Health and Medical Education, Tehran, Iran; [3] Social Determinants of Health Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran; [4] National Center for Health Insurance Research, Iran Health Insurance Organization, Tehran, Iran; [5] Department of Health Management and Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran; [6] Department of Epidemiology and Biostatistics, School of Public Health and Nutrition, Lorestan University of Medical Sciences, Khorramabad, Iran; [7] Health Policy Research Center, Institute of Health, Shiraz University of Medical Sciences, Shiraz, Iran; [8] Department of Health Sciences, University of Genoa, Italy; [9] Department of Health Sciences (DISSAL), Postgraduate School of Public Health, University of Genoa, Italy; [10] Laboratory for Industrial and Applied Mathematics (LIAM), Department of Mathematics and Statistics, York University, Toronto, ON, Canada

Keywords

COVID-19 • Prepardness and response to pandemic • Iran • Qualitative study

Summary

Background. *The role of health systems in the management of disasters, including natural hazards like outbreaks and pandemics, is crucial and vital. Healthcare systems which are unprepared to properly deal with crises are much more likely to expose their public health workers and health personnel to harm and will not be able to deliver healthcare provisions in critical situations. This can lead to a drammatic toll of deaths, even in developed countries. The possible occurrence of global crises has prompted the World Health Organization (WHO) to devise instruments, guidelines and tools to assess the capacity of countries to deal with disasters. Iran's health system has been hit hardly by the COVID-19 pandemic. In this study, we aimed to assess its preparedness and response to the outbreak.*

Methods. *The present investigation was designed as a qualitative study. We utilized the "COVID-19 Strategic Preparedness and Response Plan" devised by WHO as a conceptual framework.*

Results. *The dimension/pillar which scored the highest was national laboratories, followed by surveillance, rapid response teams and case investigations. Risk communication and community engagement was another pillar receiving a high score, followed by infection prevention and control and by country-level coordination, planning and monitoring. The pillars/dimensions receiving the lowest scores were operational support and logistics; case management; and points of entry.*

Discussion. *The COVID-19 pandemic has represented an unprecedent event that has challenged healthcare systems and facilities worldwide, highlighting their weaknesses and the need for intersectoral cooperation and collaboration during the crisis. Analyzing these experiences and capitalizing on them, by strengthening them,will help countries to be more prepared to face possible future crises.*

Background

On December 30th 2019, the People's Republic of China reported a cluster of atypical pneumonia cases occurred in the city of Wuhan, Hubei Province. A novel coronavirus, initially termed as 2019-nCov and later named as "Severe Acute Respiratory Syndrome Coronavirus type 2" (SARS-CoV-2), was identified as the infectious agent responsible for the "coronavirus disease 2019" (COVID-19), a generally mild but occasionally severe and life-threatening infection [1, 2]. On January 13th 2020, public health officials confirmed a COVID-19 case in Thailand, the first case recorded outside mainland China [3], pointing at the global, quick spread of the virus, despite initial allegations that the human-to-human transmission potential of the coronavirus was limited.

As of January 30th 2020, the "World Health Organization" (WHO) characterized the ongoing COVID-19 outbreak as a "Public Health Emergency of International Concern" (PHEIC) and later, on March 11th 2020, as a global pandemic [4, 5]. As of April 13th, over 1,800,000 confirmed and 410,000 recovered cases have been reported, as well as over 100,000 deaths, in more than 210 countries and territories, including developed and developing settings. Data from mainland China shows that up to 15-20% of COVID-19 cases need hospitalization, with approximately 15% of them being severe and 5% requiring intensive care [6]. The spread of the virus has strained and overwhelmed the public health capacity of healthcare systems worldwide [7, 8], challenging their resilience [9, 10].

The role of health systems in the management of Emerging and reemerging infections like outbreaks and pan-

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demics, such as the "Middle East Respiratory Syndrome" (MERS) and the "Severe Acute Respiratory Syndrome" (SARS), is crucial and vital, and their resilience can be defined as "*the capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learned during the crisis, reorganize if conditions require it*" [11]. Healthcare systems which are unprepared to properly deal with crises are much more likely to expose their health care workers to harm [12, 13]. Furthermore, unprepared health systems will not be able to deliver healthcare provisions in critical situations, and this can lead to a drammatic toll of deaths, even in developed countries [14-16].

The possible occurrence of global crises has prompted the WHO to devise instruments, guidelines and tools to assess the capacity of countries to deal with disasters. These include the "International Health Regulations" (IHR) "Monitoring and Evaluation Framework and the Global Health Security Agenda country assessment" and its consolidated version "Joint External Evaluation" (JEE) [17, 18]. In more detail, these tools enable to measure country public health capacity to prevent, detect, and rapidly respond to risks, whether occurring naturally or due to deliberate or accidental events.

On February 19th 2020, Iran has reported its first confirmed COVID-19 case [19]. As of April 13th 2020, more than 73,000 people have been infected, 45,000 have recovered, and more than 4,500 have died [20]. Currently, 981 hospitals with more than 130,000 beds are providing health services to over 80 million people. The ongoing outbreak is responsible for 79.2% of all deaths and 74% (71.5-76.4%) of the burden of disease attributable to non communicable disorders. Iran's health system has been hit hardly by the COVID-19 pandemic. In this study, we aimed to assess its preparedness and response to the outbreak.

Methods

The present investigation was designed as a qualitative study. We utilized the "COVID-19 Strategic Preparedness and Response Plan" devised by WHO as a conceptual framework.

Conceptual framework

The "COVID-19 Strategic Preparedness and Response Plan" consists of eight dimensions/pillars to measure the capacity of countries' health systems to respond to the COVID-19 pandemic [21]. These are: 1) country-level coordination, planning, and monitoring (12 actions); 2) risk communication and community engagement (11 actions); 3) surveillance, rapid response teams, and case investigation (10 actions); 4) points of entry (5 actions); 5) national laboratories (10 actions); 6) infection prevention and control (IPC) (13 actions); 7) case management (11 actions); and, finally, 8) operational support and logistics (6 actions). Each dimension/pillar has three steps indicating the set of actions that need to be taken and implemented by the national health system.

Data collection

Data was collected through a purposeful content analysis, based on the WHO's tool and its related eight dimensions/pillars. Relevant documents, including programs, reports, guidances, action plans, official statements of country's officials, were retrieved by mining the official websites of the Ministry of Health and Medical Education (MoHME) (https://behdasht.gov.ir/step2corona), the Parliament)https://rc.majlis.ir/fa/report?keyword=&lu_type=&contact=&from_publish_date=&to_publish_date=&tag=&tag_lang=&o=&ot=d&departments= (and the Government (http://www.qavanin.ir/), Universities and hospitals.

Data analysis

After collecting the relevant documents, these were analyzed and scored independently by two researchers, based on the above-mentioned Conceptual Framework. Three possible replies for each dimension/pillar were considered: "yes", "no", and "unclear". The results of the two researchers were compared, and any disagreement was discussed, until a consensus was reached. Furthermore, a committee of 20 experts, including provincial, national, and university policy- and decision-makers was established to review and evaluate the scores assigned to each pillar/dimension. Cohen's kappa coefficient was used to assess the level of agreement. Once again, potential disagreement was resolved by discussion until a consensus was achieved.

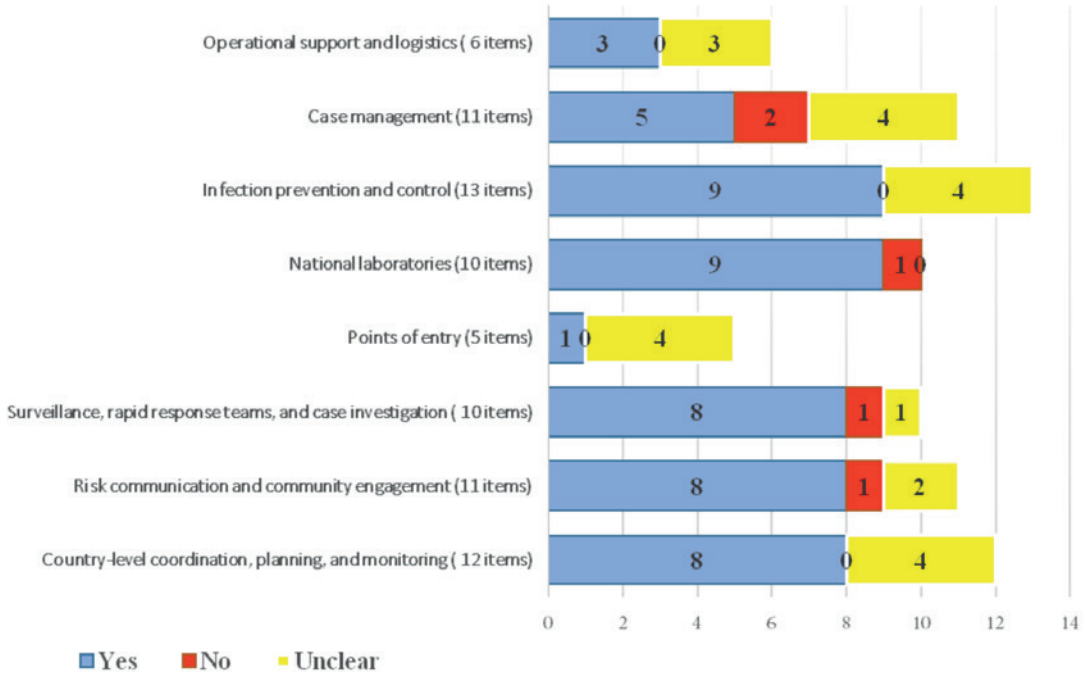
Results

The resilience, readiness and preparedness of Iran's health system to cope with the COVID-19 pandemic has been evaluated based on the WHO's "Strategic Preparedness and Response Plan" items. Scores are pictorially reported in Figure 1 and Table I. The dimension/pillar which scored the highest was national laboratories, followed by surveillance, rapid response teams and case investigations. Risk communication and community engagement was another pillar receiving a high score, followed by infection prevention and control and by country-level coordination, planning and monitoring. The pillars/dimensions receiving the lowest scores were operational support and logistics; case management; and points of entry. The evaluation of the Iran's health system according to the COVID-19 strategic preparedness and response plan of the WHO is reported in Appendix.

Discussion

The WHO has issued a checklist of operational planning documents to guide and inform in an evdence-based fashion the response and preparation of countries to the currently ongoing outbreak [22]. The purpose of this program was to provide immediate support to governments to implement measures and interventions aimed at containing and managing the pandemic [23]. Furthermore,

Fig. 1. Iranian health system preparedness score in response to COVID-19 pandemic.



the WHO has also set a series of field-visits around countries. For instance, Dr. Hamelmann, WHO's Representative for Iran, has planned visits to this country from March 2nd to March 12th 2020, to assess the extent of difficulties and challenges faced by the Iranian healthcare system and provide critical feedback on Iran's response capacity.

Based on the experiences of the previous outbreaks [24, 25], including SARS and MERS, the Iran Ministry of Health has sought to provide the best response according to the country's cultural, social and economic conditions [26]. In Iran, on March 28th 2020, the "COVID-19 Epidemiology Committee" was established [27] to investigate the epidemiological situation, reviewing documents and facts, and predict the disease trend, by simulating hypothetical scenarios under the implementation of different behavioral, non-pharmacological interventions (NPIs), including physical/social distancing, self-isolation, quarantine and even lock-down [28].

Pillar 1: National laboratories

This dimension/pillar obtained the highest score based on the evaluation of the panel of researchers and experts. Before the first official COVID-19 case in Iran (February 19th 2020), when the disease was confined within mainland China, an early diagnosis of the disease was delayed due to the unknown characteristics of the infectious agent and the lack of specific diagnostic kits. In late January, the disease caused by the virus was apparently mild, circulating in several cities, and, since the first cases were asymptomatic or had no specific symptoms, the Iranian health system could not promptly identify the virus at that time.

The first identified cases were reported on February 19th 2020, when assays based on Real-Time Polymerase Chain Reaction (PCR) were available, enabling to confirm the first two deaths occurred in the Qom province as attributable to the viral outbreak [29]. Earlier, the Pasteur Institute of Iran (as the National Reference Labora-

Tab. I. Evaluation of the preparedness of Iranian health system to the COVID-19 pandemic.

Items	Yes (%)	No (%)	Unclear (%)	Kappa
Country-level coordination, planning, and monitoring	66.66	0	33.34	0.73
Risk communication and community engagement	72.72	9.1	18.18	0.68
Surveillance, rapid response teams, and case investigation	80	10	10	0.81
Points of entry	20	0	80	0.71
National laboratories	90	0	10	0.86
Infection prevention and control	69.23	0	30.77	0.68
Case management	45.45	18.19	36.36	0.79
Operational support and logistics	50	0	50	0.87
Total	65.38	6.42	28.20	0.76

tory – NRL – for COVID-19) had begun designing techniques for the molecular detection of the virus, utilizing pan-coronavirus kits instead of COVID-19 specific diagnostic assays. Furthermore, initially there were few laboratories, with the only *ad hoc* COVID-19-related facilites being based in the capital (Tehran), in Qom and Arak, areas characterized by a high prevalence rate of COVID-19. Later, the network of COVID-19 dedicated laboratories across the country was strenghtened with the establishment of 126 laboratories (40 of which belonging to the private sector), to respond more quickly and effectively to the outbreak.

The country's testing capacity has reached the figure of about 10,000 daily tests, with the ambitious goal of delivering more than 20,000 tests per day [30]. Iran's testing capacity is low compared to developed countries. Creating a global rapid response network of diagnostic kits and medical supplies manufacturers will enable the Iranian healthcare system to be equipped more quickly and adequately during future health crises.

To strengthten the technological know-how of the Iranian manufacturers, the Pasteur Institute of Iran has invited more than 50 companies to produce kits, of which five have been approved, since production kits have to be comparable to the WHO's reference kits and have to be approved by the MoHME. All services provided by the laboratory network are delivered almost free of charge (being paid by the government and insurance companies) for COVID-19 inpatients and outpatients, and sampling is done through hospital referrals from urban and rural primary healthcare (PHC) centers. Iran, along with the WHO and the Pasteur Institute's global network, is seeking to sequence the genome of the coronavirus and its local mutations, collaborating as well for good laboratory practices (GLPs). Although the embargo and economic sanctions have affected Iran's capacity to respond to health crises [31, 32], including purchasing, transferring goods/materials, and cooperating with other facilities abroad to expand laboratory capacity, the global laboratory network has rapidly improved its response and reaction to the pandemic.

Pillar 2: Surveillance, rapid response teams, and case investigation

According to the indicators of the "Sustainable Development Goals" (SDGs), Iran is the third country in the Eastern Mediterranean region (EMRO) after Bahrain and Egypt in terms of the implementation of an electronic health system, capturing, for instance, birth and death rates [33]. This electronic health system was finally fully established after the 2015 "Health Transformation Plan" (HTP), with electronic accounts being available for more than ten millions of rural and urban citizens. In Iran, more than 100,000 health service providers are using the electronic health information system in more than 30,000 centers [34]. The deployment of an electronic health system was beneficial in dealing with the new virus and the related pandemic.

In the management of infectious diseases, especially those emerging/re-emerging, it is crucial to provide up-to-date guidelines for physicians and service providers [35, 36] in order to implement adequate, evidence-based diagnostic, protective, and therapeutic protocols.

Initially, in Iran, assessing gaps in active case finding was not comprehensive, documented, and study-oriented, but mainly based on feedback and single cases. Subsequently, the guidelines issued by the WHO and the "Centers for Disease Control and Prevention" (CDC) were translated immediately after the request of the "Coronavirus National Committee" and modified and adapted according to the country's health system.

The Ministry of Health monitored adherence to the protocols of all public and private health centers. Records of patients were extracted from the health information system and reviewed, and related interventions were designed *ad hoc* as needed. Data related to clinical and demographic indicators were updated regularly, and rapid response teams were established to identify and actively trace cases. Asymptomatic cases were initially not followed-up and, in a second period, followed-up by phone. Outpatient cases without severe symptoms were tested rarely. Low testing capacity is, indeed, the major variable negatively impacting disease surveillance.

Pillar 3: Risk communication and community engagement

The "National risk-communication and community engagement plan for COVID-19" in Iran was designed based on the national flu response program, with precise strategies and tasks for each ministriy as well as with the measures to control borders and various scenarios simulations.

Regarding the general population, in addition to the basic principles of prevention such as hands washing and observing safe distances, infected areas or areas with a high probability of infection were promptly identified. Social media and networks have constantly informed and updated the at-risk population.

Specific groups, such as the elderly, people with underlying co-morbidities, especially chronic diseases, and high-risk workers, including medical staff, received special messages from the Ministry of Health and were monitored by phone.

Famous individuals (actors, religious leaders, and celebrities), Non-Governmental Organizations (NGOs), and social activists [37] provided COVID-19 related messages to the community, as well as television and radio programs broadcasted non-scientific, popular interventions to increase awareness about the infection.

Pillar 4: Infection prevention and control

Ensuring staff safety during an emergency is crucial for maintaining the capacity of a country's health system [38, 39]. With the spread of the disease to all provinces of Iran, the country's health system faced the challenge of a lack of front-line health workers. Infection prevention and control (IPC)-related capacity at all levels of the healthcare system, including public and private sectors, and pharmacies at the national and provincial levels, is constantly updated by monitoring indicators such as the number of intensive care units (ICU) beds,

human resources available, medications, and related protection items. The country was able to assess IPC-related capacity to respond to COVID-19 and make relevant decisions.

Private hospitals were prepared to accept referrals if capacity of public facilities was saturated. Safe recovery beds were provided for the patients after discharge so that the ICU/critical care units (CCU) beds would be discharged faster, and patients would not spend their recovery period in isolated places contaminating the society.

The plan for monitoring healthcare personnel exposed to confirmed COVID-19 cases was initially challenged by the shortages of protective equipment in some centers, which was resolved by increasing the production capacity of personal protective equipment (PPE). IPC guidance was provided to patients, health workers, and the general public. However, sanitizers for hand washing and personal hygiene could not be provided in high-risk and crowded places. Also, regular testing of health care providers and hospital staff could not be alaways performed in a timely manner to ensure their safety. On the other hand, mental health support was provided to the healthcare staff.

Pillar 5: Country-level coordination, planning, and monitoring

One of the challenges in the management of COVID-19 is bureaucracy and the executive barriers to cross-sectoral cooperation. The lack of multidisciplinary teams for implementing the necessary coordination to produce evidence in the field of IPC, especially in developing countries, affects the rapid and successful response to the spread of infections and emerging diseases [40, 41].

Prior to the outbreak, the Supreme Council for Health and Food Security was the center for inter-sectoral cooperation and joint activities with health-oriented activities in Iran. After the first confirmed COVID-19 case in Iran, in addition to the council chaired by the President, a special council was set up as the "National COVID-19 Command Center", which includes the country's ministers. This council has social, economic, educational, health, security, and labour support committees. Decisions in this committee, with the leading role of the Ministry of Health, are made collectively, and all public and private sectors are required to comply with them.

Various departments of the Ministry of Health, including those dealing with non-communicable and communicable disorders, maternal, neonatal and community health, were instructed by the National Headquarters and the Minister of Health to prepare and implement programs for high-risk populations, including phone tracking of more than 9 million people with chronic diseases, preparation of standards and nutritional recommendations for healthy indviduals as well as patients. Decision to escalate or lift restrictions depended on the geographical areas, their epidemiological features (hotspots, low *versus* high prevalence rates) and type (commercial, residential, or industrial).

Pillar 6: Points of entry

The world is facing new, unprecedentd challenges in controlling infectious diseases in the 21st century, since globalization, urbanization and new lifestyles make it easier for infections to quickly spread between countries [42]. In the first month of the epidemic in Iran, by examining the records of patients' travels, travel restrictons were implemented, including limiting or banning intercity trips. Active cases surveillance was established at borders. More than 70 million people have been screened electronically and by telephone, and cases have been reported to the WHO. Funeral protocols for deaths from COVID-19 or other causes were planned in advance to avoid gatherings.

At the beginning of the spread of the disease, 212,000 people from Iranian airports (Tehran, Rasht, and Arak) traveled to international destinations; also, several thousand people from other countries entered Iran [43]. This contributed to the diffusion of the virus. Adopting and implementing stricter rules regarding the control of points of entry, especially hotspots or epicenters, was therefore crucial.

Pillar 7: Case management

In the field of case management of infectious diseases, ensuring high standard of care and therapeutic interventions to reduce the prevalence and mortality rates is of paramount importance [44]. Currently, the only way to deal with COVID-19 is through support, and prevention to reduce transmission in society [45]. Recommendations for mild cases have been communicated by social media and educational materials have been prepared in collaboration with the WHO and divulged through medical universities. Motorcycle ambulances were very helpful in investigating the initial cases in large cities. They were sent to transport the persons in need, and at the same time, the person's family received basic training and information about the disease. According to the principles of the WHO, nutritional and activity principles for patients were prepared by the Nutrition Improvement Office of the Ministry of Health and were implemented in all medical centers.

Pillar 8: Operational support and logistics

While developed countries have adequate funds to support and respond to COVID-19 rather than developing ones, Iran has also suffered due to sanctions and reductions in oil price. However, the Supreme Council for Health and Food security implemented some necessary policies to support vulnerable groups including delayed bills such as electricity and bank loan repayments, despite financial constraints [46].

As the number of patients increased, the Minister of Health asked to speed up mask production, and in a letter asked the President for a credit of 250 million Euros [47]. All religious and non-religious ceremonies, celebrations and gatherings, entertainment and sports centers were closed. Schools and universities were also closed. Efforts were made to provide online courses. Hotels and accommodation centers almost did not accept anymore guests [42]. The military force contributed to support the fight against COVID-19, by cleaning up public areas from possible sources of the virus and creating urgent hospital beds.

Sixty-seven Iranian Universites of Medical Sciences, thousands of general practitioners, clinical specialists, nurses, and basic medical scientists contributed to the support. Using the capacity of donors was very helpful, especially at the beginning of the epidemic. Also, NGOs mobilized people's capacity.

Recommendations

Countries should find a balance between disease-related and economic policies, in order to mnimize financial losses and protect vulnerable groups by providing subsidized protective items (such as masks and disinfectants). Control of internal borders and restriction of travels across inter-provincial borders as well as of international travels have played a crucial role in controlling the spread of the disease.
The involvement of all relevant stakeholders and the technical support of international organizations, including the WHO, have given Iran the opportunity to take appropriate actions.

Limitations

The present study is a pilot study, devised as a qualitative investigation. More quantitative information should be collected.

Conclusion

The COVID-19 pandemic has represented an unprecedent event that has challenged healthcare systems and facilities worldwide, highlighting their weaknesses and the need for inter-sectoral cooperation and collaboration during the crisis. Analyzing these experiences and capitalizing on them, by strengthening them, will help countries to be more prepared to face possible future crises. Studies such as those based on the WHO framework can identify weaknesses and help researchers and policy-makers investigate and address them. By determining the current crisis situation, health systems can increase their capacity for similar crises in the future.

Ethical approval

Ethical approval was not required for this work as no new empirical data were collected.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

MKG, MaB, AB, MeB and NLB were the principal investigators who contributed to the conception and design of the study, collected, entered, analyzed, interpreted the data, prepared the manuscript. AB acted as a corresponding author. SA, HAG, SS and MM contributed to data analysis, interpretation and drafted the manuscript. All authors read and approved the final manuscript.

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Correspondence: Ahad Bakhtiari, Department of Health Management and Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran - E-mail: ah.bakhtyari@gmail.com

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Appendix

The Iran's health system according to the COVID-19 strategic preparedness and response plan of the WHO.

Tab. A. Country-level coordination, planning, and monitoring.

	Yes	No	Unclear
Activate multi-sectoral, multi-partner coordination mechanisms to support preparedness and response	X		
Engage with national authorities and key partners to develop a country-specific operational plan with estimated resource requirements for COVID-19 preparedness and response, or preferably adapt, where available, an existing Influenza pandemic preparedness plan			X
Conduct initial capacity assessment and risk analysis, including mapping of vulnerable populations	X		
Begin establishing metrics and monitoring and evaluation systems to assess the effectiveness and impact of planned measures			X
Establish an incident management team, including rapid deployment of designated staff from national and partner organizations, within a public health emergency operation centre (PHEOC) or equivalent if available	X		
Identify, train, and designate spokespeople	X		
Engage with local donors and existing programmes to mobilize/allocate resources and capacities to implement operational plan	X		
Review regulatory requirements and legal basis of all potential public health measures	X		
Monitor implementation of CPRP based on key performance indicators in SPRP and produce regular situation report			X
Conduct regular operational reviews to assess implementation success and epidemiological situation, and adjust operational plans as necessary	X		
Conduct after action reviews in accordance with IHR (2005) as required	X		
Use COVID-19 outbreak to test/learn from existing plans, systems and lesson-learning exercises to inform future preparedness and response activities			X

Tab. B. Risk communication and community engagement.

	Yes	No	Unclear
Implement national risk-communication and community engagement plan for COVID-19, including details of anticipated public health measures (use the existing procedures for pandemic influenza if available)	X		
Conduct rapid behaviour assessment to understand key target audience, perceptions, concerns, influencers and preferred communication channels	X		
Prepare local messages and pre-test through a participatory process, specifically targeting key stakeholders and at-risk groups	X		
Identify trusted community groups (local influencers such as community leaders, religious leaders, health workers, community volunteers) and local networks (women's groups, youth groups, business groups, traditional healers, etc.)	X		
Establish and utilize clearance processes for timely dissemination of messages and materials in local languages and adopt relevant communication channels			X
Engage with existing public health and community-based networks, media, local NGOs, schools, local governments and other sectors such as healthcare service providers, education sector, business, travel and food/agriculture sectors using a consistent mechanism of communication	X		
Utilize two-way "channels" for community and public information sharing such as hotlines (text and talk), responsive social media such as U-Report where available, and radio shows, with systems to detect and rapidly respond to and counter misinformation	X		
Establish large scale community engagement for social and behaviour change approaches to ensure preventive community and individual health and hygiene practices in line with the national public health containment recommendations	X		
Systematically establish community information and feedback mechanisms including through: social media monitoring; community perceptions, knowledge, attitude and practice surveys; and direct dialogues and consultations		X	
Ensure changes to community engagement approaches are based on evidence and needs, and ensure all engagement is culturally appropriate and empathetic	X		
Document lessons learned to inform future preparedness and response activities			X

Tab. C. Surveillance, rapid response teams, and case investigation.

	Yes	No	Unclear
Disseminate case definition in line with WHO guidance and investigation protocols to healthcare workers (public and private sectors)	X		
Activate active case finding and event-based surveillance for influenza-like illness (ILI), and severe acute respiratory infection (SARI)	X		
Assess gaps in active case finding and event-based surveillance systems		X	
Enhance existing surveillance systems to enable monitoring of COVID-19 transmission and adapt tools and protocols for contact tracing and monitoring to COVID-19	X		
Undertake case-based reporting to WHO within 24 hours under IHR (2005)	X		
Actively monitor and report disease trends, impacts, population perspective to global laboratory/ epidemiology systems including anonymized clinical data, case fatality ratio, high-risk groups (pregnant women, immunocompromised) and children	X		
Train and equip rapid-response teams to investigate cases and clusters early in the outbreak, and conduct contact tracing within 24 hours	X		
Provide robust and timely epidemiological and social science data analysis to continuously inform risk assessment and support operational decision making for the response	X		
Test the existing system and plan through actual experience and/or table-top or simulation exercises, and document findings to inform future preparedness and response activities			X
Produce weekly epidemiological and social science reports and disseminate to all levels and international partners	X		

Tab. D. Points of entry.

	Yes	No	Unclear
Develop and implement a points of entry public health emergency plan			X
Disseminate latest disease information, standard operating procedures, equip and train staff in appropriate actions to manage ill passenger(s)			X
Prepare rapid health assessment/isolation facilities to manage ill passenger(s) and to safely transport them to designated health facilities			X
Communicate information about COVID-19 to travellers	X		
Regularly monitor and evaluate the effectiveness of readiness and response measures at points of entry, and adjust readiness and response plans as appropriate			X

Tab. E. National laboratories.

	Yes	No	Unclear
Establish access to a designated international COVID-19 reference laboratory	X		
Adopt and disseminate standard operating procedures (as part of disease outbreak investigation protocols) for specimen collection, management, and transportation for COVID-19 diagnostic testing	X		
Identify hazards and perform a biosafety risk assessment at participating laboratories; use appropriate biosafety measures to mitigate risks	X		
Adopt standardized systems for molecular testing, supported by assured access to reagents and kits	X		
Ensure specimen collection, management, and referral network and procedures are functional	X		
Share genetic sequence data and virus materials according to established protocols for COVID-19		X	
Develop and implement plans to link laboratory data with key epidemiological data for timely data analysis	X		
Develop and implement surge plans to manage increased demand for testing; consider conservation of lab resources in anticipation of potential widespread COVID-19 transmission	X		
Monitor and evaluate diagnostics, data quality and staff performance, and incorporate findings into strategic review of national laboratory plan and share lessons learned	X		
Develop a quality assurance mechanism for point-of-care testing, including quality indicators	X		

Tab. F. Infection prevention and control.

	Yes	No	Unclear
Assess IPC capacity at all levels of healthcare system, including public, private, traditional practices and pharmacies. Minimum requirements include functional triage system and isolation rooms, trained staff (for early detection and standard principles for IPC); and sufficient IPC materials, including personal protective equipment (PPE) and WASH services/hand hygiene stations	X		
Assess IPC capacity in public places and community spaces where risk of communtiy transmission is considered high			X
Review and update existing national IPC guidance: health guidance should include defined patient-referral pathway including an IPC focal point, in collaboration with case management. Community guidance should include specific recommendations on IPC measures and referral systems for public places such as schools, markets and public transport as well as community, household, and family practices	X		
Develop and implement a plan for monitoring of healthcare personnel exposed to confirmed cases of COVID-19 for respiratory illness	X		
Develop a national plan to manage PPE supply (stockpile, distribution) and to identify IPC surge capacity (numbers and competence)	X		
Engage trained staff with authority and technical expertise to implement IPC activities, prioritizing based on risk assessment and local care-seeking patterns	X		
Record, report, and investigate all cases of healthcare-associated infections	X		
Disseminate IPC guidance for home and community care providers	X		
Implement triage, early detection, and infectious-source controls, administrative controls and engineering controls; implement visual alerts (educational material in appropriate language) for family members and patients to inform triage personnel of respiratory symptoms and to practice respiratory etiquette	X		
Support access to water and sanitation for health (WASH) services in public places and community spaces most at risk			X
Monitor IPC and WASH implementation in selected healthcare facilities and public spaces using the Infection Prevention and Control Assessment Framework, the Hand Hygiene Self-Assessment Framework, hand hygiene compliance observation tools, and the WASH Facilities Improvement Tool			X
Provide prioritized tailored support to health facilities based on IPC risk assessment and local care-seeking patterns, including for supplies, human resources, training	X		
Carry out training to address any skills and performance deficits			X

Tab. G. Case management.

	Yes	No	Unclear
Map vulnerable populations and public and private health facilities (including traditional healers, pharmacies and other providers) and identify alternative facilities that may be used to provide treatment		X	
Identify Intensive Care Unit capacity	X		
Continuously assess burden on local health system, and capacity to safely deliver primary healthcare services		X	
Ensure that guidance is made available for the self-care of patients with mild COVID-19 symptoms, including guidance on when referral to healthcare facilities is recommended			X
Disseminate regularly updated information, train, and refresh medical/ambulatory teams in the management of severe acute respiratory infections and COVID-19-specific protocols based on international standards and WHO clinical guidance; set up triage and screening areas at all healthcare facilities	X		
Establish dedicated and equipped teams and ambulances to transport suspected and confirmed cases, and referral mechanisms for severe cases with co morbidity	X		
Ensure comprehensive medical, nutritional, and psycho-social care for those with COVID-19	X		
Participate in clinical expert network to aid in the clinical characterization of COVID-19 infection, address challenges in clinical care, and foster global collaboration (optional based on country capacity)	X		
Prepare to assess diagnostics, therapeutics, and vaccines for compassionate use, clinical trials, regulatory approval, market authorization, and/or post-market surveillance, as appropriate			X
Adopt international R&D blueprint guidance and WHO protocols for special studies (companionate use, Monitored Emergency Use of Unregistered and Investigational Interventions) to investigate additional epidemiological, virologic, and clinical characteristics; designate a clinical trial or study sponsor			X
Evaluate implementation and effectiveness of case management procedures and protocols (including for pregnant women, children, immunocompromised), and adjust guidance and/or address implementation gaps as necessary			X

Tab. H. Operational support and logistics.

	Yes	No	Unclear
Map available resources and supply systems in health and other sectors; conduct in-country inventory review of supplies based on WHO's a) Disease Commodity Package (DCP) and b) COVID-19 patient kit, and develop a central stock reserve for COVID-19 case management			X
Review supply chain control and management system (stockpiling, storage, security, transportation and distribution arrangements) for medical and other essential supplies, including COVID-19 DCP and patient kit reserve in-country	X		
Review procurement processes (including importation and customs) for medical and other essential supplies, and encourage local sourcing to ensure sustainbility	X		
Assess the capacity of local market to meet increased demand for medical and other essential supplies, and coordinate international request of supplies through regional and global procurement mechanisms	X		
Prepare staff surge capacity and deployment mechanisms; health advisories (guidelines and SOPs); pre- and post-deployment package (briefings, recommended/mandatory vaccinations, enhanced medical travel kits, psychosocial and psychological support, including peer support groups) to ensure staff well-being			X