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A Comparative Study of COVID-19 Disease Management in the Selected Countries and Designing a Model for Iran

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ABSTRACT

Background: Acquiring knowledge and information about successful policies and localizing them for Iran can lead to disease control. Therefore, the present study aims to review the managerial performance of the selected countries against COVID-19 virus in order to provide a model, based on the experience of the countries in decision/policy making and performing appropriate strategies for their healthcare systems.

Methods: The present study was a cross-sectional comparative study in the field of COVID-19 disease in the selected countries. The countries performance data were gathered from documents published in databases like WHO, CDC, WORLDOMETER, Science Direct, PubMed, NCBI, OURWORLDINDATA, DOL, IMF, website of the Ministry of Health, Medical Education, website of Iran Statistics as reliable informative sources.

Results: Responses of the selected countries healthcare systems to present the managerial model for COVID-19 in Iran, involving perspectives of experts were categorized and registered in 6 areas and 78 fields, including a) governance and leadership (14 fields), b) economic (13 fields), c) demographic (17 fields), D) technology (10 fields), e) transnational (7 fields), and f) healthcare services (17 fields)**.**

Conclusion: Efficient management of some countries has proven that geographical boundaries and population density are less important than the determined and proper decisions.

Keywords: Disease Management, Iran, Comparative Study

Introduction

Disease management and control are concerned as a substantial duty for every health care system. Obviously, management system has to be designed and enabled based on each disease characteristics, facilities, needs, and in proportional with various resources (Goya et al.,2012). On December 31st 2019, a type of atypical pneumonia was reported in Wuhan China by novel Corona Virus SARS-COV-2 outbreak (Xu et al., 2020; Zangrillo et al., 2020). The SARS-COV-2 is a novel virus of Corona Virus specie, a natural biologic hazard, emerging for several months (Smith et al., 2006). The novel Corona Virus called SARS-COV-2 and the disease originated from it "COVID-19" is a global challenge which has been changed to an unprecedented pandemic, the epidemic of which rapidly altered to a Pandemic (Kannan et al.2020;Zhai et al., 2020; Zhang, 2020). The WHO stated on January 30th 2020 that the novel Corona Virus outbreak is recognized as the sixth factor of emergency situation in the public hygiene and health, across the world which was accounted not only a threat for China but also for all the countries (Farnoosh et al ., 2020). Up to date, Corona virus has never been limited to border lines and more than 200 countries have been involved with the novel Corona virus and no certain treatment has been prescribed for it (Kannan et al.2020;Zhai et al., 2020; Zhang, 2020). Many countries have experienced unexpected management and challenges with the virus and governments are under a severe pressure, in which negative effects increase in people worldwide (Ge et al., 2020; Jin et al., 2020; Paudel et al., 2020).

Numerous actions have been carried out to lessen or stop the virus transmission chain. Although these measures decrease the stress and time collapse for healthcare systems, they impose high economic and social costs(Schoch. 2020). Healthcare systems play a vital role on improvement, treatment, and recovery of people`s health and pave the way of an optimum health status access using optimized accessible resources (HEYMAN., 2020).

Considering the intensity of the disease prevalence, healthcare systems should prepare an acceptable program to face with such a disease. Unless, the countries face many unexpected difficulties with a plenty of work stress on healthcare system staff, where there are no adequate policies and plans, the results of which may not be compensable in different aspects. Some affected dimensions include economic, social stress, and lack of healthcare system accountability to the patients and community. Therefore, the healthcare system has to encounter the disease in a targeted appropriate way (Amiri et al., 2020). Dilant et al. have pointed out in a rapid analysis, the necessity of coordination in health, emergency, and disaster risk reduction reactions in viewpoint of Sanday's framework. They analyzed and concluded that the current mechanisms and strategies for strengthening against disasters as specified in SFDR could accelerate the reactions to the pandemics like COVID-19. Therefore, this study aims to provide an appropriate model for the management of COVID-19 disease for the health system of Iran and control the mortality rate in the target communities.

Methods

The present study is a comparative and mixed method study conducted on the research community of the international realm of organizations and countries involved in COVID-19 disease, providing services to these patients. According to the reports of the World Health Organization in 3 two-month periods, the countries with the highest number of deaths due to Covid-19 were as follows:

April 30, 2020: Iran, Italy, Korea, Japan, France and the Philippines

February 30, 2020: United States, Italy, France, Great Britain, Belgium, Germany, Iran, China and the Netherlands

June 30, 2020: United States, Brazil, United Kingdom, Italy, France, Spain, Mexico, India, Iran and the Netherlands

A total of 16 countries with the highest number of deaths due to Covid-19 were selected.(Table 1).

In the first stage, all available databases were searched and the texts presented in them related to COVID-19 were reviewed. The databases included WHO, CDC, World meters, Science Direct, PubMed, ncbi, ourworldindata, dol, IMF, and the site of the Ministry of Health, Medical Education , Iran.

In the second stage, a group of experts, such as the faculty members of the Department of Health Services Management or Health Economics, with a doctorate or master's degree in the above fields with at least 5 years of experience in the country health system were used. They were asked about appropriate special indicators in order to design a conceptual management model of COVID-19.

According to the studies, seven groups of indicators were selected: a) governance and leadership (14 indicators), b) economic factors (13 indicators), c) demographic factors. (19 indicators), d) technology and technology (10 indicators), e) transnational factors (7 indicators), c) health service factors (17 indicators).

The indicators were put in the form of a questionnaire with the opinion of experts.In this study, structural equation models were tested using structural equation modeling (SEM) method. The approach in this section is a two-step approach. This means that it is necessary to formulate a research model in order to consider a model in terms of compilation. They have the ability to make endogenous predictions of the model.

Results

Firstly, the selected countries performances were analyzed and prepared in terms of COVID-19 management. Statistical data of the selected countries with the highest mortality rates are given in Table 1.

According to studies conducted in East Asian countries, given the history of pandemics of the past few decades, such as esophagus, n1h1 flu and SARS, and the use of past experiences, it shows a good response to this disease. Due to the high statistics of European countries due to the elderly population, Germany and Belgium have increased the country's ability to deal with this disease by strengthening the infrastructure and increasing the number of beds and special beds and have performed well among European countries. The countries of the American continent have performed poorly in this regard due to the studies and reports published by COVID-19 with negligence and lack of proper response. Iran has no experience of such diseases and due to the lack of rapid response to combat COVID-19 disease by enacting travel laws, free treatment of patients, increasing the capacity of hospital beds in the country and employing military force to enforce performance regulations. It has been appropriate in this regard.

Designing the COVID-19 management model for Iran

In the first stage, the initial model of COVID-19 disease management was designed according to the disease management in Iran (initial model). This initial model of COVID-19 disease management included policy, resource management, service management, financing, cross-sectoral measures, social health factors, and evaluation and control.

This study presents the final model of COVID-19 disease management in Iran using a comparative study of health system management models in 16 countries, including Germany, USA, UK, Iran, Japan, Canada, Netherlands, India, Mexico, Brazil, Republic of Korea, Philippines, France, Italy, China and Belgium.

In this study, 40 people were selected and invited as a panel of experts. Criteria for selection of the participants were Faculty members of the Department of Health Services Management or Health Economics, and have a doctorate or master's degree in the above fields with at least 5 years of experience in the health system.

Thirty people agreed to participate in the study. Most of the participants in the study were male (68%), had a doctoral degree (84%) and had 4 to 6 years of work experience (24%). They have

served in the Ministry of Health and the universities of Tehran, Iran, Ahvaz, Mashhad, Isfahan, Shahrekord, and Shiraz. They worked in the field of health. Nine faculty members and 12 scholars had doctoral degrees and the rest were university executives.

In the first stage, the initial model of COVID-19 disease management in Iran was given to the panel members in the form of a questionnaire (120 questions). The questionnaire was reviewed by five professors of health policy and management services to confirm its face and content validity. Professors were asked to comment on the clarity, conciseness, and relevance of the questions and to provide necessary corrections and suggestions. In this questionnaire, using open-ended questions, experts' opinions about the strengths and weaknesses of the proposed model, possible challenges facing its implementation and proposed solutions were asked. Field responses of health systems of the selected countries to present the management model of COVID-19 in Iran with the opinion of experts in 6 areas and 78 areas: a) governance and leadership (14 areas), b) economic (13 areas), c) population (17 areas) D) technology (10 fields), e) Transnational (7 fields), and c) health services (17 fields) were identified and registered.

The results of the analysis are as follows:

Table 2 shows that the mean value of the governance component among the respondents was 4.10 and its minimum and maximum values were 2.36 and 4.79, respectively. The mean value of population component among the respondents was 4.49 and its minimum and maximum values were 2.15 and 5, respectively. The mean value of population component among the respondents was 3.90 and the minimum and maximum values were 2.42 and 4.89, respectively. The mean value of the technological component among the respondents was 3.34 and its minimum and maximum values were 1.90 and 4.80, respectively. The mean value of the transnational component among the respondents was 3.81 and its minimum and maximum values were 2 and 5, respectively. The mean value of component of health services among respondents was 3.98 and its minimum and maximum values were 2.47 and 4.88, respectively.

Load factor is a numerical value that determines the intensity of the relationship between a hidden variable and the corresponding explicit variable during the path analysis process. The higher the load factor of an index in relation to a given structure, the more that index plays a role in explaining that structure. Also, if the load factor is a negative indicator, it indicates its negative impact in explaining the relevant structure. In other words, the question about that indicator is designed to be inverted. Figure 2 shows the load factors which are greater than 0.6, so the validity of the model in terms of load factor is confirmed.

Predictive relationship is another indicator in evaluating the structural model and its quality, which aims to examine the ability of the structural model to predict by ignoring. The most famous and well-known measure of this ability is the Aston Geisler Q2 index, according to which the model should predict the indicators of endogenous latent variables. Q2 values above zero indicate that the observed values are well reconstructed and the model is predictable. In other words, if all the values obtained for the CV Red index are positive, it can be said that the structural model is of good quality.

Divergent validity

The third criterion for examining the fit of the measurement model is to examine the divergence validity of the structures (Fernell and Larker, 1981). They recommend that the AVE root of a structure should be greater than the correlation of that structure with other structures. This indicates that the correlation of that structure with its markers is more than its correlation with other structures. Table 2 presents the results of this criterion, which indicate the appropriate validity of the structures.

1- According to the results of the analysis of the data, it can be said that the governance index with path coefficients of 0.229 and statistics of 16.08

has a positive and significant effect on the management of the COVID-19 epidemic.

2- According to the results of the analysis of the data, it can be said that the transnational index with path coefficients of 0.110 and statistics of 19.47 has a positive and significant effect on the management of the COVID-19 epidemic.

3- According to the results of the analysis of the data, it can be said that the technology and technology index with path coefficients of 0.40 and statistics of 16.18 has a positive and significant effect on the management of the COVID-19 epidemic.

4- According to the results of the analysis of the data, it can be said that the health services index with path coefficients of 0.240 and statistics of 21.59 has a positive and significant effect on the management of the COVID-19 epidemic.

5- According to the results of the analysis of the data, it can be said that the economic index with path coefficients of 0.216 and statistics of 14.75 has a positive and significant effect on the management of the COVID-19 epidemic.

Ethical considerations, such as obtaining a code of ethics from the Vice Chancellor for Research of Shahrekord Azad University, obtaining informed consent, freedom of experts to participate in the study, respect for their independence in research, maintaining the confidentiality of personal information of experts, and impartiality of researchers in all stages of data collection, analysis, and reporting, were observed.

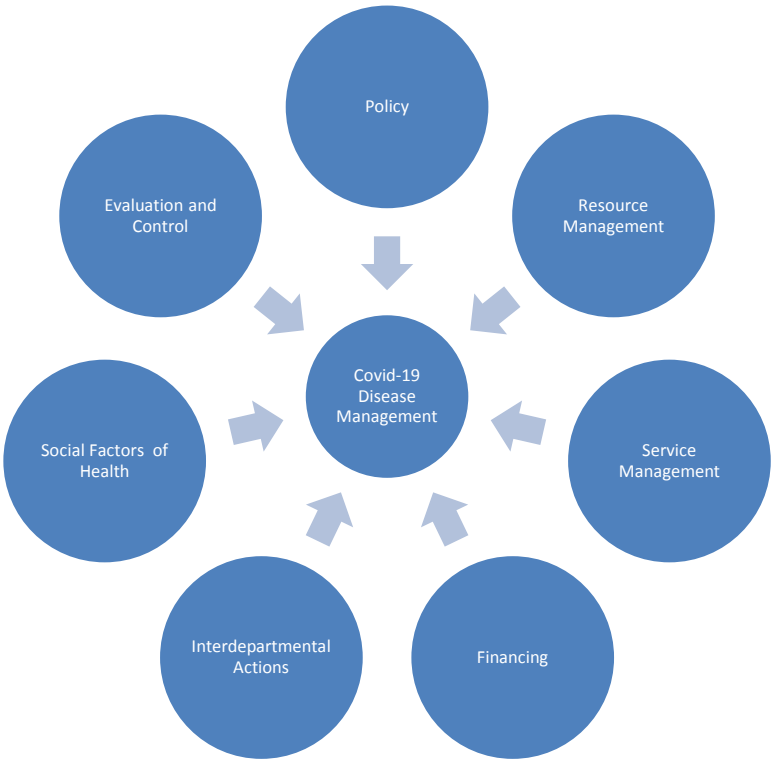

Figure 1. Conceptual model of COVID-19 management

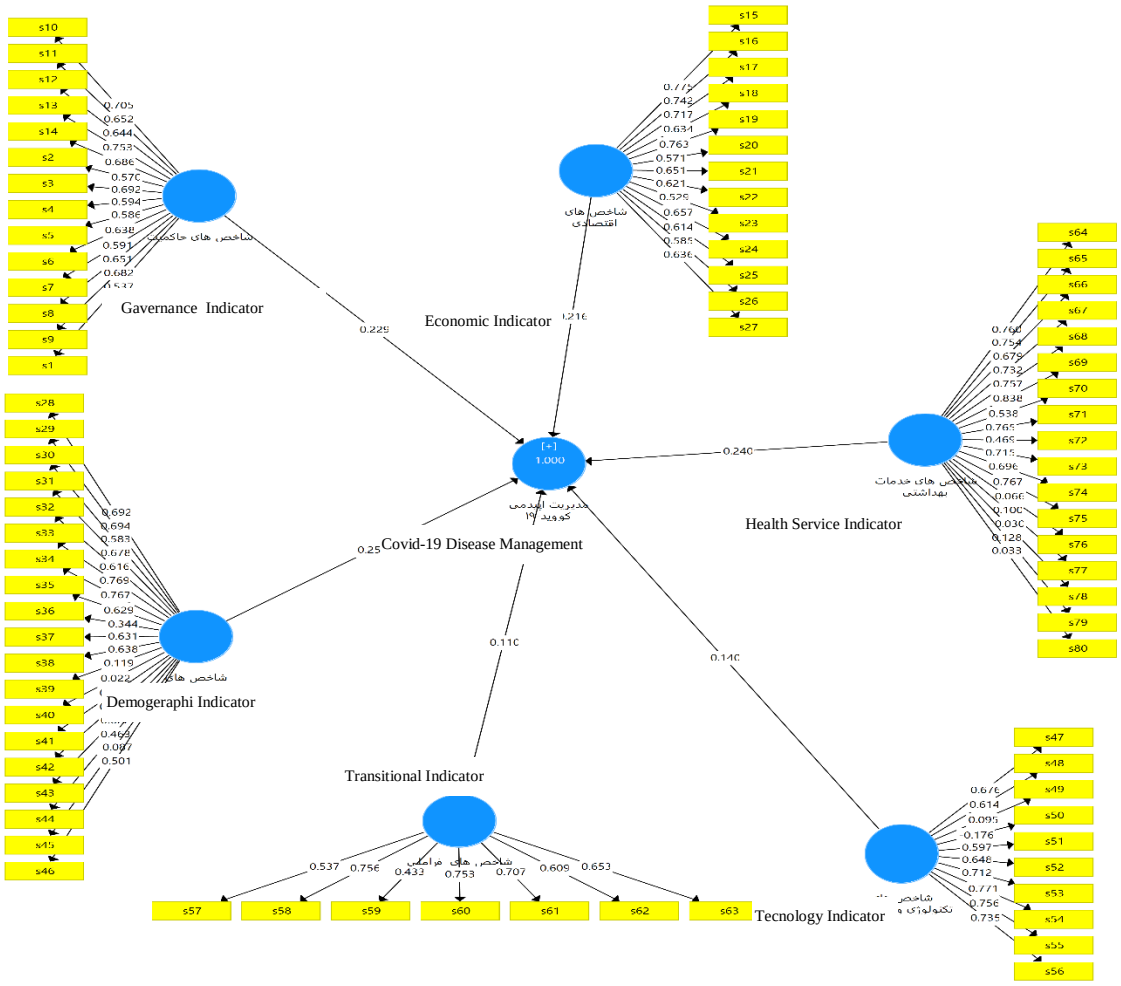

Figure 2. Graphic model of the research (showing the path coefficients and determination coefficient)

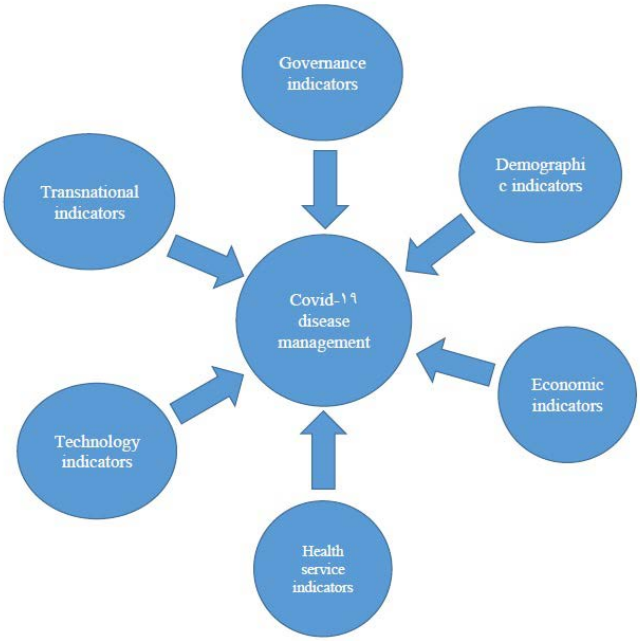

Figure 3. Suggested model for COVID-19 management in Iran

Table 1. Statistical information of the selected countries with the highest mortality of COVID-19

Demographic indicators	First two month death toll	Second two month death toll	Third two month death toll	Total death
Netherlands	0	4,566	6,107	610699
Republic of Korea	21	246	282	28199
Japan	6	389	972	97199
Philippines	1	530	1,255	125501
Chain	0	4,643	4,648	464801
Germany	0	6,115	8,973	897301
Belgium	0	7,331	9,747	974699
Iran	42	5,877	10,670	1067000
India	0	1,007	16,893	1689301
Mexico	0	1,434	26,648	2664801
Spain	0	23,822	28,346	2834599
France	2	23,627	29,730	2973000
Italy	25	27,359	34,744	3474401
UK	0	21,678	43,575	4357501
Brazil	0	4,543	57,622	5762199
USA	0	50,492	126,203	12620301

Table 2. Descriptive statistics of indicators based on the views of respondents

	Governance	Economy	Demographic	Technological	Transnational	Health service
Mean	4.1000	4.4923	3.9018	3.3400	3.8190	3.9804
Middle	4.3571	4.6923	4.0789	3.3500	3.7143	4.0588
Standard deviation	.65212	.69879	.66326	.72283	.78509	.63868
Variance	.425	.488	.440	.522	.616	.408
Skew	-1.604	-2.251	-.893	.098	-.236	-.542
Skew error	.427	.427	.427	.427	.427	.427
Elongation	1.939	4.797	-.025	.132	-.433	-.401
Stretching error	.833	.833	.833	.833	.833	.833
At least	2.36	2.15	2.42	1.90	2.00	2.47
Maximum	4.79	5.00	4.89	4.80	5.00	4.88

Table 3. Correlation matrix and validity study of research variables based on Fornell-Larcker criterion

	Sovereignty index	Sovereignty index	Sovereignty index	Sovereignty index	Sovereignty index
Sovereignty index	0.717	*	*	*	*
Economic indicators	0.535	0.645	*	*	*
Technological and technological index	0.768	0.533	0.703	*	*
Transnational index	0.487	0.735	0.538	0.622	*
Health services index	0.657	0.643	0.644	0.605	0.638

Note: Numbers on the diameter matrix are the root mean square variance of the extracted variance

Table 4. Statistics values of the variables

Row	Variable effect	On the variable	Path coefficient	T statistic	Result
1	Sovereignty Index	COVID-19 epidemic management	0/229	16/08	Confirmation
2	Transnational	COVID-19 epidemic management	0/110	19/47	Confirmation
3	Technology and technology	COVID-19 epidemic management	0/140	16/18	Confirmation
4	Health services	COVID-19 epidemic management	0/240	21/59	Confirmation
5	Economical	COVID-19 epidemic management	0/216	14/75	Confirmation

Discussion

Outbreaks of Coronavirus 1 (SARS-CoV-1) was in China in 2002 and Coronavirus Middle East Respiratory Syndrome (MERS-CoV) was in Jordan in 2012's outbreaks of Coronavirus 2019 (COVID-19), and Acute Respiratory Syndrome Virus 2 (SARS-CoV-2) is currently the third most common coronavirus outbreak in the 21st century (Hu, Ben, et al.2021, Zaigham, M,et al,2020). SARS-CoV-2 was first reported in Wuhan, China in December 2019 and has spread rapidly worldwide (Zhu, N., et al.2020). On January 31, 2020, the outbreak of a public health emergency with international concern and on March 11, 2020, the World Health Organization (WHO) declared a global epidemic (Müller, O., et al. 2020).

Various strategies have been proposed and attempted to curb the COVID-19 epidemics. Approaches range from reducing the incidence in a country to zero ("aggressive suppression" means elimination strategy) or at least to very low levels, so that almost all infections can be detected by rapid testing, back-and-forth tracking of infected people, and controlling. All of these strategies have advantages and disadvantages. Elimination strategies require aggressive control measures backed by appropriate technology (such as tracking programs, mobile support, and extensive testing) and strong political support. They have a negative impact on people's freedom, but they can keep Covid-19 and SARS infections and deaths very low. (Li, Z., et al. 2020, Li, Zhongjie, et al. 2020).

However, the vast majority of countries around the world have implemented non-pharmacological interventions (NPIs) (e.g., face masks, physical distance rules, mobility restrictions, and social gatherings) with TTT interventions as well as mitigation strategies such as frequent quarantines. Finally, the implementation of the herd immunity strategy in an industrialized country has only been tried in a planned manner in Sweden, but may be true in many very low-income countries as well as in parts of India and Brazil (Walker, Patrick GT, et al. 2020, Weible, C.M., et al. 2020)

Recent studies, however, have shown that population indicators, such as poverty, population density, overcrowding, and poor workplace conditions prevent social distance (Shuchman, M, 2020. Mehtar, S., et al. 2020). In addition, different mortality trends are also affected by the burden of various diseases due to economic and social slopes that the poorest regions have the highest preventable mortality rate (Regmi, K., et al. 2019)

New coronavirus vaccines have begun to be developed among emerging SARS-CoV-2 strains, there are many scientific uncertainties that determine how vaccination campaigns affect the epidemic process. For example, it is not yet clear whether the vaccine prevents the transmission of SARS-CoV-2 and its variants or only protects against the more severe consequences of disease

and death (Lancet, T.2020, Ledford, and H.2020). Under these circumstances, non-pharmacological interventions are the most promising policy levers to reduce virus transmission (IHME COVID-19 forecasting team. 2020)

Considering the challenges of infectious disease management in the Iranian health system, studying the experiences of successful countries and using the opinions and experiences of health system experts in this field will lead to strengthening the country's health system. Health system policymakers can improve health system performance by strengthening health system governance. According to the opinions and suggestions of health system experts, it is required to develop an integrated model of disease management that leads to increasing the effectiveness, efficiency, and productivity of the health system.

Conclusion

There is rapid and critical situation perception to reduce efficiency management, identification, and treatment. Efficient management of geographical boundaries and population density is less important than the right and decisive decision.

Countries that were able to effectively manage the prevention, identification, and treatment of the new coronavirus pandemic all had a history of dealing with previous years' epidemics. The efficient management of some countries has proven that geographical boundaries and population density are less important than the right and decisive decision.

Considering the challenges of infectious disease management in the Iranian health system, studying the experiences of successful countries and using the opinions and experiences of health system experts in this field will lead to strengthening the country's health system. Health system policymakers can improve health system performance by strengthening health system governance. In this study, a disease management model for the Iranian health system was designed using a comparative review of the performance of 16 countries (Germany, USA, UK, Iran, Japan, Canada, Netherlands, India, Mexico, Brazil, Republic of Korea, Philippines, France, Italy, China, and Belgium). Then, this model was developed and finalized with the opinions of experts.

Conflict of interest

Authors declare no conflict of interest.

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Authors' contribution

Conceptualization, M.M.; Methodology, L.GH; Formal Analysis, SH.SH.; Investigation, L.GH.; Writing-Review and Editing, M.M.; Supervision,.SH.SH; Writing-Original Draft, M.M.

All authors read and approved the final manuscript and are responsible about any question related to the article

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