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Review Article

COVID-19: National Pandemic Management Strategies and their Efficacies and Impacts on the Number of Secondary Cases and Prognosis: A Systematic Review

Abstract

Background: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the pathogen responsible for an acute respiratory disease designated COIVD-19, which has spread throughout the world. Despite all the struggles with this virus, still, the majority of societies are affected by COVID-19, which raises many questions such as are these ways of management enough, which is crucial in order to contain the virus spread, and which is not effective. In this systemic review, we tried to summarize the data on different ways of managing COVID-19 outbreaks. Through understanding the efficacy and downsides of different approaches to manage COVID-19, public health officials, governing bodies, and health care administrators may be better equipped with the tools necessary to best manage COVID-19 and pandemics. **Methods:** This systematic review was carried out by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol. Articles were selected using several databases PubMed, ScienceDirect, and Google Scholar, all peer-reviewed and published articles from December 1, 2019 to April 23, 2020 that met the inclusion criteria were selected. **Results:** The majority of the included articles were mathematical modeling, cohort studies (n = 9), cross-sectional (n = 6), and one case series. Most articles originated from China and then Singapore. The measures that have been practiced in these articles consisted of close contact tracing and case isolation, quarantine, strict surveillance, lockdown, and travel surveillance. **Conclusions:** The most effective approach is at least the combination of case detection and isolation, and contact tracing or containment measures. In the literature, travel controls seem to be ineffective, personal hygiene should be tough and emphasized.

Keywords: *COVID-19, pandemics, population surveillance, prognosis, public health surveillance, SARS-CoV-2, systematic review*

Hossein Hatami, Shohra Qaderi[1], Jaffer Shah[2], Ahmad Reza Rezaeian[3], Yeganeh Farsi[3], Faeze Alinasab[4], Farah Qaderi[3], Afifeh Khosravi[5,6], Narges Bazgir[3], Asghar Shah[7]

Department of Public Health, School of Public Health and Safety and Occupational Hazards Control Research Center, Shahid Beheshti University of Medical Sciences, [1]Student Research Committee, School of Medicine, Shahid Beheshti University of Medical Sciences, [2]Drexel University College of Medicine, Pennsylvania, United States, [3]Student Research Committee, School of Medicine, Shahid Beheshti University of Medical Sciences, [4]Student Research Committee, School of Medicine, Islamic Azad University Tehran Medical Branch, [5]Sports Medicine Research Center, Neurosciences Institute, Tehran University of Medical Sciences, [6]School of Nursing and Midwifery, Tehran University of Medical, Tehran, Iran, [7]Brown University, Rhode Island, USA

Address for correspondence:
Dr. Narges Bazgir, Student Research Committee, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
E-mail: drnargesbazgir@gmail.com

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Introduction

The emergence of acute respiratory disease, in Wuhan, China, in December 2019,[1] has led to a wide outbreak across China and many other countries.[2,3] In February 2020, the WHO designated the disease COVID-19, which stands for coronavirus disease 2019.[4] On January 30, the WHO declared the COVID-19 pandemic as the sixth public health emergency of universal concern, following H1N1 (2009), polio (2014), Ebola in West Africa (2014), Zika (2016), and Ebola in the Democratic Republic of Congo (2019).[5] As of August 26th, 2020, COVID-19 has spread to nearly all countries and authorities with more than 25 million confirmed cases and more than 820,000 deaths globally, and it has become a major global health concern.[6]

The pathogen responsible for COVID-19 is referred to as the severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2), a member of the coronavirus family,[7] and studies have increasingly demonstrated human-to-human transmission through droplets or direct contact.[3,8,9] Due to the evidence of a rapidly increasing incidence of infection[10] and the possibility of transmission by asymptomatic carriers,[11] SARS-CoV-2 can be transmitted effectively among humans and exhibits high potential for transmission.[9,12,13] The spread of SARS-CoV-2 must be solved dramatically and immediately, the Italian situation demonstrated how quickly the health care system can be overwhelmed.[14] Owing to the high transmission efficiency of SARS-CoV-2, many approaches have been taken by almost all countries throughout

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the world. These approaches focused on travel ban and monitor, contact tracing, case isolation, strict surveillance, self-isolation, and quarantine. Major quarantine throughout the world that includes major cities/villages and public areas has been applied, including China[15,16] and many other countries to prevent further spread of the infection. Approximately 7 weeks after the first confirmed case in Washington state, on March 12, 2020, the governor of Washington declared a statewide prohibition of a large gathering, canceling events, and school closure; meanwhile, there was a temporary shutdown of restaurants, bars, and entertainment and recreational facilities, similar intervention has now been enacted in several states in the US and European countries.[17] Border controls have been reinforced in many countries and active surveillance has been intensified to rapidly detect and isolate importation, trace contacts, and isolate suspect cases.[18,19] On using a phone-based online survey, in order to reduce the time of identification of suspected individuals and apply rapid isolation,[20] AI (artificial intelligence) argued to be a useful tool in assisting diagnosis and treatment decision making.[21,22] Despite all the struggles with this virus, still, the majority of societies are affected by COVID-19, which raises many questions such as are these ways of management enough, which is crucial in order to contain the virus spread and which is not effective. In this systemic review, we tried to summarize the data on different ways of managing COVID-19 outbreaks. Through understanding the efficacy and downsides of different approaches to manage COVID-19, public health officials, governing bodies, and health care administrators may be better equipped with the tools necessary to best manage COVID-19 and pandemics. As such, it is anticipated that these results will be of assistance to the global community, to better apprehend this novel disease, and to successfully treat it.

Methods

Protocol and registration

This protocol follows the recommendations established by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, and it was reported in the International Prospective Register of Systematic Reviews (PROSPERO) database (ID = 184155).

Eligibility criteria

We have included all the articles that were peer-reviewed and published that reported the different ways of managing COVID-19 pandemic including case series, cross-sectional, cohort, and review of different approaches that were obtained from different countries. Article language limit was not set, and we included publications from December 1, 2019 until April 23, 2020. We included PubMed, ScienceDirect, and to review the gray literature we also search from December 1, 2019 until April 2, 2020 the Google Scholar database.

We have excluded opinion articles, editorials, comments, letters, or studies that were not related to our topic after analyzing abstracts and full text thoroughly as shown in Figure 1.

Information sources and search strategy

We conducted a systematic review using PubMed, ScienceDirect, the Google scholar. The following search terms used: "severe acute respiratory syndrome coronavirus 2", "COVID-19", "COVID-19 virus", "SARS-CoV-2", "coronavirus-19", "COVID-19 virus", "population surveillance," and "public health surveillance." The search in Google scholar was conducted on April 2nd, 2020 and in PubMed and Science Direct on April 23rd, 2020. The search was independently evaluated by two researchers.

Study selection

The results of the initial search strategy were first screened by title and abstracts. Then, the full texts of relevant articles were examined for inclusion and exclusion criteria. [Figure 1]. Duplicated articles were excluded at first by title. We have included mathematical models.

Data collection process and data items

Data extraction forms included information on the country, date of publication, the population that was studied, the strategy of public health surveillance, and the results of the

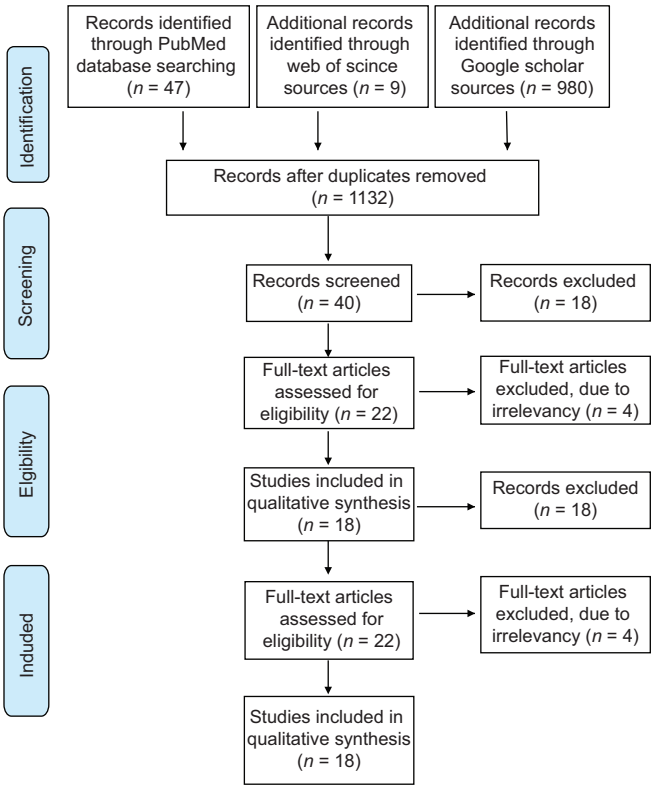

Figure 1: The fig has described method steps shortly; identification, screening, eligibility and included

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measures to have unified thinking on each article. Articles were studied by four investigators.

6. Assessment of methodological quality and risk of bias for quality assessment. Any article that was related to our topic and was published and reviewed by journals was included in our quality synthesis.

Results

After using the noted search strategy, a total of 1136 articles were retrieved. After screening the abstracts and titles, 40 articles were selected for full-text assessment. Out of 40 articles, 7 were mathematical models, 4 of them were from Metrix database and as they were not still evaluated, they were excluded. Four articles after full-text assessment were excluded because they were irrelevant to the subject. The main characteristics of the included studies are shown in [Supplement Table 1]. Our review included 18 studies that were published between February 4th, 2020 and April 13th, 2020. From these 18 articles, these studies included 463 COVID-19 patients and they evaluated different ways of COVID-19 epidemic management. The majority of articles included were mathematical modeling.

Demographic characteristics and the way of management female to male proportion driven from three studies was approximately 1/1. From 18 studies, 9 studies were cohort,[2] cross sectional[6], and case series.[1]

The measures that have been practiced in these articles consisted of close contact tracing and case isolation, quarantine, strict surveillance, lockdown, and travel surveillance. All articles and the management ways that have been a proposal by them and the summarized results can be observed in Table 1.

As it can be seen from the table, more than 30 percent of studies are mathematical modeling. Half of the studies were done on the population.

Most articles originated from China and then Singapore, with Singapore having the greatest number of population-based studies.

Discussion

Severe acute respiratory syndrome 2 (SARS-CoV-2) is a pathogen responsible for COVID-19 disease.[7] COVID-19 is highly infectious and transmitted from person to person through droplets and close contact.[3,8,9]

COVID-19 emerged in December 2019 in Wuhan, China[1] and then spread worldwide. On January 30th, the WHO declared that COVID-19 cases around the world rose to about 2719897 confirmed cases and more than 187 thousand people died because of SARS-CoV-2. Now, nearly all countries are affected by this virus.As yet there is no effective treatment for this disease, the best way to manage COVID-19 is prevention.

Approximately, all countries affected by this virus introduced their own system of surveillance. The approaches to contain the spread of COVID-19 mostly consist in travel ban and monitor, contact tracing, case isolation, strict surveillance, self-isolation, and quarantine.

Despite all the struggles with this virus, still, a majority of societies are affected by COVID-19, which raises many questions such as are these ways of management enough, which is crucial in order to contain the virus spread, and which is not effective. In this systemic review and meta-analysis, we tried to summarize the relevant data on different ways of managing COVID-19 outbreaks.

In this systematic review, we tried to summarize data that was published until April 23rd. We have searched through two databases (PubMed and ScienceDirect), and we also search in Google Scholar database in order to cover the gray literature. Our eligibility criteria were relevancy and a higher level of evidence. After studying the full text, 18 articles were included, and we managed to analyze 463 patients and over 4000 close contacts to evaluate the efficacy of different ways of managing the spread of COVID-19. Also, our study included over 4000 close contacts and different ways of managing them.

As it was demonstrated from studies, there are different types of management trying to contain COVID-19. These efforts consist of case definition, contact tracing, enhancing surveillance among different patients groups. Also, various ways of containment such as patients quarantine and isolation, active monitoring of contacts and border controls, isolation and quarantine of the whole society were used. As most countries used multiple ways of management to control SARS-CoV-2 spread, there is no evidence of each measure efficacy, solely.

Travel ban and surveillance

This was one of the early measures in countries. In Singapore, it included thermal surveillance, preventing entry of short-term visitors from specific countries, and mandatory quarantine for Singapore residents and long-term visitors.[23] In fact, thermo scan does not have a significant role to contain COVID-19.[24] Only more than half of patients can be recognized by this to measure. The uncertainty increases when the incubation period is longer.[24,25] In Italy, a study has revealed that travel ban from endemic countries such as China did not have an important impact.[26] As the travel control measures are not effective enough, it is important for the countries who are experiencing the burden of COVID-19 to set departure surveillance.[24,25]

There are several ways to improve the efficacy of travel surveillance: 1) increasing the efficacy of thermo scans, 2) designing an efficient questioner, and 3) setting arrival and departure surveillance.

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Concurrent, also smart phone–based self-reporting of temperature or symptoms is a cheaper alternative approach.

Case definition and early detection

From 15th January to 3rd February 2020, seven case definitions of COVID-19 were established by the National Health Commission in China.[27] Each new definition broadened to cover more patients, especially milder cases.[27] All these are important in order to control the pandemic. Case definition allows an integrated action toward this disease. In Singapore, they used the case definition and informed all physicians of it, to identify the cases in the community.[28] Obviously, no case definition is complete and guaranteed to identify all the cases, in order to omit this error, they also let the practitioner send a suspected case for rapid test based on their discrepancy. They also set up an enhanced surveillance system to identify the cases that did not meet the criteria.[28]

Contact tracing, isolation of close contacts, and active monitoring of contacts

As the SARS-CoV-2 is being transmitted via close contacts,[3,8,9] it is important to trace close contact and isolate infected patients. These measures have been taken by different countries such as France and Singapore.[28-31] In these three studies, more than 4000 cases of close contacts were traced and isolated, of whom only 10 confirmed to have COVID-19.[28-31] Although less than 0.22 percent of close contacts confirmed suffering from COVID-19, close contact tracing of the first 100 COVID-19 patients in Singapore led to identification of 53% of the cases.[28-31] Active monitoring of the other kind of contacts was also done in Singapore.

To increase case definition and early detection, several measures could be taken:

1. Designing a more comprehensive case definition and frequently updating the definitions to cover the new findings.
2. Sending suspected cases home and advise them to come back to health care places if they develop respiratory syndrome or become more ill.[28]
3. Providing more rapid tests for COVID-19, so practitioners can send suspected cases to be tested based on their discrepancy.
4. It is important to have an enhanced surveillance system.

To increase the efficacy of this measure, it is important to apply all four components together.

In France, contacts based on their risk of infection are divided into three groups: moderate/high risk, low risk, and negligible risk. Based on their risk group, contacts received different kinds of follow-up. In addition, in another study in France 112,020 health care workers who had unprotected close contact with confirmed cases were isolated for 14 days, none of them showed symptoms nor confirmed to be infected.

To address the conflict written above, we must consider:

1. The length of the outbreak.
2. The number of initial cases.
3. Delay from symptom onset to isolation.
4. The population of a country.
5. Resources of a country.

As it was noted less than 0.22 percent of close contacts were diagnosed with COVID-19, this statement raises an important question, whether or not close contact tracing is efficient? For answering the question, all five items listed above should be considered.

In a country with a larger outbreak, more community transmissions occur, this leads to more missed cases. In addition, it will be more different to link cases and contain the spread.[28] The number of initial cases is also very important. The higher number, the less probability of containing spread with this method.[32]

With a greater understanding of SARS-CoV-2, we will be more certain of the incubation period and the transmission mechanism before the onset of symptoms. Close contact tracing is more effective when there is little transmission before symptom onset and the delay from symptom onset to isolation is short.[32] As close contact tracing and isolation are resource heavy and time-consuming, [28,30,32] it may not be possible in a large run or larger outbreak, also in countries with intensive populations. This method is recommended to resourceful countries.[28,30,32]

To summarize, close contact tracing and isolation are recommended for countries with fewer initial cases with a smaller population and smaller and short-term outbreaks, which have enough resources in order to supply the demand of this method properly. A recent research article highlighted the need for governments to implement strategies to effectively allocate medical resources in the context of COVID-19. The most important recommendation they provide is the focus on maximizing benefits.

Quarantine, isolation, social distancing, and community containment

The goal is to decrease the human-to-human contact to manage the pandemic through limiting interpersonal contact and isolating known cases of COVID-19.

Isolation means separating an infected person from noninfected to protect the noninfected persons.[33]

Quarantine means restricted movements of exposed persons but not yet ill, either because they did not become infected or they are in incubation period.[33] Quarantine is most successful in setting where fast detection is possible, and contacts can be identified and traced in a short time.[33]

Social distancing is a measure that reduces the interactions between people in a larger community, in which people

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may be infectious but not yet identified, so they are not isolated. This method has the highest impact on children and the lowest on working-age adults.[34]

And among all these measures, the most serious is community-wide containment or lockdown.[26,33] This approach is used when other measures simply do not work.

We have explained isolation and contact tracing in the previous section. In a mathematical model, it was shown that the stricter the containment measures become, the less exposure occurs, thus leading to a smaller number of infected cases.[35]

Italy and China were among countries experiencing lockdown. In Italy, first, a red zone was designed. The red zone was designed for places with more than one person positive to COVID-19 but with unknown resources. Then, they expanded the red zone and finally, they declared a national red zone. In the red zone, appropriate containment measures were adopted.[26] On January 23rd and 24th, Chinawas put under lockdown. As the result of this lockdown, the number of cases dropped dramatically also they observed lengthening of doubling time.[36]

The limitation of all the studies is that they have estimated the effect of all approaches together; therefore, the exact effect of lockdown or quarantine is not clear. Because community-wide containment puts a huge burden on the economy, it is important to figure out whether this approach is effective enough. As such, all the related factors would need to be effectively disentangled to truly determine the exact implications of each individual approach.

As it was mentioned, after lockdown, a decrease in the number of patients was observed in both countries.[26,36] In Italy, establishing the red zone was effective only in one area, whereas in the neighboring provinces, the number of cases increased after establishing the red zone. To address this conflict, it is important to pay attention to the time of establishing the red zone if the red zone is established late, it is going to be less effective.[26] In fact, timing is crucial for any mass measurements.[26] A mathematical model also showed that physical distancing was most effective for children because they have closer contact, and this may lead to more infected cases, whereas working adults are less vulnerable. Social distancing decreases mortality among elders the most.[34]

Overall, in larger areas, containment measures and lockdown can be effective. The earlier the lockdown is announced and implemented, the more efficient they are going to be. It is important to lift the containment measures gradually to avoid a second peak. After lifting the containment measures, informing people and teaching personal hygiene to them through media, the public will play an important role in managing the COVID-19 pandemic.[34]

Others

There are other approaches worth to be noted, such as:

1. Establishing special public health centers to merge the COVID-19 cases.[28]

The hospitals should be strictly monitored. Practitioners' movement between health care institutions should be limited. Strict visitors' controls should be set. Strict infection controls should be practiced across all settings.[28] It is also important to assess patients with pneumonia or other respiratory infections.[28]

Publicities should be clear and detailed in reporting the true statistics and information and other medias spreading wrong information should be detected as early as possible and debunked quickly.[28]

The role of using technology in order to control the pandemic is getting bolder. We can use social media and other search engines to predict the peak of the cases.[36] The utility of smartphones for symptoms and thermal scanning is also a way to decrease expenditure and lowering contacts. For milder, symptomless, or suspected cases we can use teleconsultation in order to decrease the burden on health care providers. Supporting people for psychological problems that are imposed by quarantine also can be done through applications or telecommunication.[37,38] If the job can be done at home, telecommunication is the preferred method.[28]

This review has several limitations. There were few studies to include, and from which one-third of them were mathematical modeling. We need more detailed information for each approach and the impact of each should be measured solely. More observational studies are needed for certainly deciding the effect of measures. Most of the studies were from China and Singapore although our review also included studies from the United States, the United Kingdom, Germany, Brazil, India, France, and Italy. To account for the expansive list of national management strategies to COVID-19, more studies are required from other countries. Also, as the pandemic progresses and the international understanding of the nature of the virus develops, national pandemic management strategies may change within countries and between nations to best adapt to the particular context.

Conclusions

In conclusion, there are several ways of managing the spread of COVID-19 that are currently being used by different countries. The most effective one is at least the combination of two steps: case detection and isolation, and contact tracing for countries with less delay and more resources, or containment measures for countries with more patients and fewer resources. Travel controls seem to be ineffective. Finally, personal hygiene should be thorough and emphasized.

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Table 1: The articles types included in this study

Article title	Measures	Results
Evaluating the effectiveness of surveillance and containment measures for the first 100 patients with COVID-19 in Singapore - January 2- February 29, 2020	Case definition Tracing contacts Enhancing surveillance among different patients Allowing physician discretion containment	all measures recommended
Transmission dynamics of the COVID-19 outbreak and effectiveness of government interventions: A data-driven analysis	Harder governmental policies Isolation and preventive measures Improvement of therapeutic procedures	Recommended More cases less effective Best action than any prevention methods
Escalating infection control response to the rapidly evolving epidemiology of the coronavirus disease 2019 (COVID-19) due to SARS-CoV-2 in Hong Kong	Active surveillance with broad screening criteria and isolation Self-protecting manners	Making nosocomial transmission near zero Recommended
First cases of coronavirus disease 2019 (COVID-19) in France: surveillance, investigations, and control measures, January 2020	Active surveillance and categorization depends on exposure risk to implement defined actions. Active surveillance of close contacts of patients with COVID-19 confirmation	Decreases secondary transmission in health care workers in addition to the community. Recommended
Rapid viral diagnosis and ambulatory management of suspected COVID-19 cases presenting at the infectious diseases referral hospital in Marseille, France, - January 31st to March 1st, 2020: A respiratory virus snapshot	Early detection and isolation or rule outing healthy person of COVID-19	Stopping more transmission besides prevention of wasting time
Isolation, quarantine, social distancing and community containment: a pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak.	Isolation Quarantine Social distancing Community-wide containment	All measures are recommended based on the condition of the community
A Case for Participatory Disease Surveillance of the COVID-19 Pandemic in India	Participatory disease surveillance to detect early and do contact tracing	Controlling the pandemic and prohibiting the virus to spread
Immediate Health Surveillance Response to COVID-19 Epidemic	Self-protecting manners Health surveillance quickly	Both measures are recommended
COVID-19 in Italy: impact of containment measures and prevalence estimates of infection in the general population	General lockdown (mitigation) Checkpoint at airports with evaluating the temperature of passengers Execution of red zone	More impressive than other actions No dramatic effect Not enough impressive maybe because they were taken late
Effectiveness of airport screening at detection travelers infected with the novel coronavirus (2019-ncov)	Thermal screening Symptoms screening Exit screening Entry screening	The effectiveness of entry screening is largely dependent on the effectiveness of exit screening. All the flight screenings are more efficient for longer flights. Thermal screening seems to be ineffective.
Investigation of three clusters of COVID-19 in Singapore: implication for surveillance and response measures	Tracing the close contacts and isolating them. Enhanced surveillance	Tracing the close contacts and isolating them was an effective measure. Thermal scanning seems inefficient Self-hygiene is a very important measure in order to interrupt the COVID-19 pandemic
The effect of control strategies to reduce social mixing on outcomes of the COVID-19 epidemic in Wuhan, China: A MODELLING STUDY	Physical distancing	Physical distancing had the highest impact on children. Physical distancing had the lowest effect on working-age adults.

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Table 1: Contd...

Article title	Measures	Results
		Physical distancing decrease the mortality rate among elderlies
		The premature and sudden lifting of interventions lead to an earlier secondary peak
Interrupting transmission of COVID-19: lessons from containment efforts in Singapore	Case definition	All measures recommended
	Enhanced surveillance system	
	Practitioner discrepancy	
	Rapid test	
	Containment	
	Health care measures	
	Border control	
	Community and social measures	
The positive impact of lockdown in Wuhan on containing the COVID-19 outbreak in China	Lockdown	Significant increase in doubling time from 2 days to 4 days
	Changing diagnostic and testing methodology	Changing diagnostic and testing methodology was successful
		The correlation between domestic air traffic and COVID-19 spread became weaker
Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts	Modeling contact tracing	The effectiveness of contact tracing and isolation depends on the number of infections generated by each parameter and the proportion of transmission that occurs before symptom onset
		This measure alone is insufficient
The estimated effectiveness of symptoms and risk screening to prevent the spread of COVID-19	Travel screening	Screening would detect no more the half of the infected travelers
		Departure screening is more important
The novel coronavirus SARS-CoV-2) emergency and the role of timely and effective national health surveillance	Laboratory surveillance	The positive effect of rapid notification and visualization channel for timely action
	Data processing, sharing, and timely analysis of epidemiological data	
Retrospective analysis of the possibility of predicting the COVID-19 outbreak from internet social media, China, 2020	Analyzing the data obtained from google tends, Baidu Index, and Sina Webo Index	The advantage of internet surveillance
Global preparedness against COVID-19: we must leverage the power of Digital Health	Providing different use of cases for infection control, home base diagnosis, and screening.	Teleconsultation with early-stage or mild COVID-19
		Creative way of using commercial video
		Remote monitoring of infection prevention and control
		Home base diagnosis and screening
		Psychological intervention for the quarantine
		Contact tracing

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Conflicts of interest

There are no conflicts of interest.

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Supplementary Table 1: The including process of papers

Article title	Study	Journal	Date	Country	First author	Number of population
Transmission dynamics of the COVID-19 outbreak and effectiveness of government interventions: A data-driven analysis	Modeling	Medical virology	March 2020	China	Yaqing Fang	One million
Escalating infection control response to the rapidly evolving epidemiology of the coronavirus disease 2019 (COVID-19) due to SARS-CoV-2 in Hong Kong	Cross-sectional	Infectious control and hospital epidemiology	March 2020	Hong Kong (China)	Vincent C. C Cheng MD	1275 of normal population and 413 health care workers
First cases of coronavirus disease 2019 (COVID-19) in France: surveillance, investigations, and control measures, January 2020	Cross-sectional	eurosurveillance	January 2020	France	Sibylle Bernard Stoecklin	Not mentioned
Rapid viral diagnosis and ambulatory management of suspected COVID-19 cases presenting at the infectious diseases referral hospital in Marseille, France, - January 31st to March 1st, 2020: A respiratory virus snapshot	Cross-sectional	Travel medicine and infectious disease	March 2020	France	Sophie Amrane	approximately 280 persons
Isolation, quarantine, social distancing and community containment: a pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak.	review	Journal of travel medicine	February 2020	UK Germany USA	Wilder-Smith A. MD	Not mentioned
A Case for Participatory Disease Surveillance of the COVID-19 Pandemic in India	Cross-sectional	JMIR Public Health and Surveillance	April 2020	India	Suneela Garg Nidhi Bhatnagar Navya Gangadharan	Not mentioned
Global preparedness against COVID-19: we must leverage the power of Digital Health	Cross-sectional	JMIR Public Health and Surveillance	April 2020	United state	Sultan Mahmood	Not mentioned
COVID-19 in Italy: impact of containment measures and prevalence estimates of infection in the general population	Modeling	Acta Biomed	April 2020	Italy	Carlo Signorelli	Not mentioned
Evaluation of the Effectiveness of Surveillance and Containment Measures for the First 100 Patients with COVID-19 in Singapore - January 2-February 29, 2020	Case series	Morbidity and mortality weekly report	March 2020	Singapore	Yixiang Ng	100 persons
The estimated effectiveness of symptoms and risk screening to prevent the spread of COVID-19	Modeling	life journal	February 2020	USA	Katelyn Gostic	Not mentioned exactly
Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts	Modeling	Lancet	April 2020	UK	Joel Hellewell	Not mentioned exactly
Interrupting transmission of COVID-19: lessons from containment efforts in Singapore	review	Journal of travel medicine	April 2020	Singapore	Vernanj Lee	Not mentioned exactly
The positive impact of lockdown in Wuhan on containing the COVID-19 outbreak in China	Cohort	Journal of travel medicine	April 2020	USA	Hien Lav	Not mentioned exactly
Effectiveness of airport screening at detection travelers infected with the novel coronavirus (2019-ncov)	modeling	euro surveillance	February 2020	United kingdom	Billy j Quilty	Not mentioned
Investigation of three clusters of COVID-19 in Singapore: implication for surveillance and response measures	Cross-sectional	Lancet	March 2020	Singapore	Rachael Pung	36

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Supplementary Table 1: Contd...

Article title	Study	Journal	Date	Country	First author	Number of population
The effect of control strategies to reduce social mixing on outcomes of the COVID-19 epidemic in Wuhan, China,; A MODELLING STUDY	Modeling	Lancet	March 2020	China	Kiesha Prem	Not mentioned
The novel coronavirus (SARS-CoV-2) emergency and the role of timely and effective national health surveillance	review	Cadernos de saude publica	March 2020	Brazil	Raquel Martis Lana	Not mentioned
Retrospective analysis of the possibility of predicting the COVID-19 outbreak from internet social media, China, 2020	Retrospective cohort study	Eurosurveillance journal	February 2020	China	Cuilian Li	Not mentioned