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Abstract

Background: During epidemics and pandemics, health systems, and especially hospitals, face many challenges in the management of patients and staff. Hospital preparedness measures are critical for hospitals to respond effectively to the admission and management of COVID-19 patients. Ministry of health policy for pandemics must cover the ability of hospitals to respond to COVID-19.

Aims: The aim of this study was to develop a checklist for evaluating the preparedness of hospitals to respond to the COVID-19 pandemic.

Methods: We searched for and reviewed available evidence, including the literature and guidelines presented by related organizations. Due to the COVID-19 outbreak, face-to-face interview was not possible so we used telephone and video connections, mobile applications and email for unstructured interviews. Checklist development was carried out by a multidisciplinary panel of experts.

Results: After applying the opinions of the experts, the final checklist had 2 main domains: measures at national and measures at hospital level. Preparedness at national level was categorized into 3 aspects that are implemented by the health ministry. Preparedness at hospital level was categorized in 24 subgroups.

Conclusion: Hospital preparedness for admission and management of COVID-19 patients is essential. A checklist for the assessment of hospital preparedness for COVID-19 patient management and hospital management was designed and developed. Our preparedness assessment checklist is an expanded tool that provides clear and practical guidance that can be adapted for any hospital admitting COVID-19 patients.

Keywords: hospital preparedness, checklist, epidemic, pandemic, COVID-19

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Introduction

Novel Coronavirus disease 2019 (COVID-19) is a potentially severe acute respiratory infection. The COVID-19 outbreak began in December 2019 in Wuhan City, Hubei Province, China (1). The COVID-19 pandemic has become a global health concern since it infects people worldwide (2). It spreads quickly, and many countries have now reported laboratory-confirmed cases. The World Health Organization (WHO) has confirmed 16 495 309 cases and 654 327 deaths have been detected globally (28 July 2020). During disease outbreaks, health systems, especially hospitals, may face many challenges, including shortages of hospital personnel, medical supplies and support services, which all make it difficult for managers to effectively manage hospital overcrowding. Hospital preparedness activities are an essential component of hospital disaster preparedness for mass casualty incidents and need to address all hazards, including infectious disease outbreaks and pandemics (3). Due to the main role of hospital preparedness, especially, in response to outbreaks, it is important to focus on hospital and personnel preparation. Recently, looking at the situation of hospitals in the face of the COVID-19 pandemic (4–6), and based on studies that have been carried out, it is clear that most hospitals across the world are not prepared for the biological emergency and may inappropriately

respond to disease outbreaks, particularly in their capacity to care for large numbers of patients (7,8).

Standard operating procedures and guidelines are necessary to remind clinicians of the need for medical evaluations and to incorporate certain aspects of treatment (9). Governance, especially from the health ministry, plays an important role in hospital management through external collaboration, government policies, the national health care system and government financial incentives (10).

The COVID-19 epidemic is unique because of its extensive scale, the high rate at which it spread globally, the lack of pre-existing scientific information and the importance of media coverage (10). It forced hospitals to face significant new challenges associated with this epidemic (11). Hospitals will face an increasing number of COVID-19 patients and have to forecast the consequences, including the need for an increase in the number of beds, trained health care workers and ventilators (12).

Specific hospitals should be prepared for the admission of COVID-19 patients, and these hospitals should ensure their staff are trained and equipped with personal protective equipment (PPE). The spread of COVID-19 within the health care facility should be prevented; patients with possible COVID-19 should be identified; care for a limited number of patients with confirmed or suspected COVID-19 should be performed routinely; all health care personnel should be monitored and managed due to the possibility of exposure to COVID-19; and effective communication within the facility should be conducted. Planning for proper external communication related to COVID-19 should also be incorporated (13).

Hospitals should be evaluated regarding their preparation for the pandemic and for admitting patients. This requires the proper tools for evaluation of preparedness functions and subsequently resolving weakness and improvement of strengths. Therefore, the aim of this study was to develop a checklist for the evaluation of hospital preparedness for COVID-19. Our checklist will assess the status of hospitals and can be used by hospital managers, directors and authorities and the health system. The output and results of this report may help to promote hospital preparedness for an appropriate response to the COVID-19 pandemic.

Methods

Review of literature and guidelines

To determine the nature and format of the core information to be contained in a hospital

preparedness checklist for COVID-19 patients, we searched for and reviewed available evidence, including the literature and guidelines presented by related organizations. We searched Web of Science, PubMed and Google Scholar for relevant articles from January 2019 to April 2020. We also searched specialized databases and websites such as the Federal Emergency Management Agency (FEMA), the WHO, the Pan American Health Organization (PAHO) and the Centers for Disease Control and Prevention (CDC). Combinations of the following Medical Subject Headings (MeSH) key words were used: “COVID-19”, “hospital”, “emergency room”, “preparedness”, “preparation”, “management”, “response”, “epidemic”, “pandemic”, “outbreak”, “infectious disease” and “biological event”. Then the bibliographies of all relevant articles were reviewed to identify additional studies. We conducted a focused study of selected available resources (Open Research Dataset, Biorxiv and Medrxiv, PubMed – LitCovid, Cochrane Library, GIDEON, CDC and Jove) related to COVID-19 that had been published after 2019.

Consultation with experts by interview

This study was conducted from 10 January to 18 July 2020. Due to the restrictions implemented during the COVID-19 outbreak, face-to-face interviews were not possible and we used telephone and video connections, mobile applications and email for unstructured interviews. Participants included experts from multiple disciplines, including hospitalists, hospital administrators, hospital managers, disaster committee managers, matrons, nurses, researchers, emergency physicians, infection physicians, academics, and hospital administrators who had had direct experience in hospital management and infectious diseases. The composition of the panel is shown in Table 1.

The main focus of the topics discussed included effective measures for hospital management in the COVID-19 outbreak and the strengths and weaknesses of the hospital in the face of the outbreak. The draft checklist was then shared with the panel members to seek their input.

This checklist has been developed to improve hospital management during the COVID-19 outbreak. The elements described in the list may not be applicable to all hospitals and may need to be adapted to the specific characteristics of the hospital, the individual national health system, and the legislation and community norms where the hospital is located.

Checklist development

The results of the literature review were further supplemented with expert opinion and practical advice. As a first step, the panel of experts reviewed existing toolkits and evidence-based recommendations around best hospital preparedness practices (details of the make-up of the expert panel are shown in Table 1). During meetings via video connection or mobile

applications, panel members were assigned to 3 groups and instructed to review summarized toolkits and literature using context-specific aspects (infection control, patient management, surge capacity) (Figure 1). Following the meeting, each group was tasked to generate a list of evidence-based items necessary for COVID-19 hospital preparedness within the context of the group's assigned aspect. Every subgroup reached consensus on items specific to its context. An initial draft checklist was generated based on input from all subgroups. The checklist was created using recommended PAHO, WHO and CDC concepts. The next meeting provided the opportunity for individual comments and feedback on the initial draft checklist. Three cycles of checklist revision were conducted followed by comments and feedback through exchanges via email and mobile applications. A final meeting resulted in consensus of the expert panel on every element of the hospital preparedness for COVID-19 checklist. During this final meeting, approval of the checklist was completed.

Ethical approval

This study was completed in accordance with the ethical principles of, and was approved by, the research ethics committee of Iran University of Medical Sciences, Tehran (IR.IUMS.REC.1397.1379).

Results

After applying the opinions of the experts, the final checklist had 2 main domains: measures at national level and measures at hospital level. Preparedness at national level was categorized into 3 aspects: coordination, referrals hospitals and legal subgroups; these measures are performed by the ministry of health. Preparedness at the hospital level was categorized in subgroups: planning, surveillance system, prioritization and triage, external cooperation and interaction of hospitals, hospital incident command system, surge capacity, COVID-19 patient management, non-COVID-19 patient management, intensive care unit, drug and medical equipment management, management of volunteers, management of companions of patients, hospital personnel management, security, nutrition and food health, research and documentation, communications, quarantine, exercises and training, laboratory, PPE, environmental health, hospital infection prevention and control, and dead body management. Each subgroup encompasses related indicators and is classified according to whether it is "Completed", "In progress" or "Not started" (Table 2). Items classed as in progress will be followed up for completion. Then, attempts will be made to initiate those items that have not been started.

Because of variability between outbreaks and the characteristics of individual hospitals (such as patient population, size of hospital/community and scope of service), each hospital will need to adapt this checklist to meet its unique needs and situation.

Discussion

Hospital preparedness for disasters such as epidemics is critical. This checklist was designed to prepare hospitals for effective management of COVID-19 patients; it was designed and developed at a time when all countries already had many COVID-19 patients and hospitals were dealing with them. Nevertheless, the checklist is extremely useful: it and can help hospitals to best assess their situation and make necessary improvements for COVID-19 management. We used a consensus process among stakeholders to develop the checklist for the assessment of hospital preparedness for COVID-19 that needs to be completed for every hospital admitting COVID-19 patients. The hospital response to epidemic and pandemic situations (with high numbers of patients and visits) demands a proper evaluation tool. We believe that preparedness planning starts before the event. The components of the assessment checklist should include all aspects of hospital management to ensure proper response and care of patients.

Some tools and checklists have been developed for hospital assessment by PAHO (14), CDC (15), and the European Centre for Disease Prevention and Control (ECDC) (16). One study was conducted with the aim of developing an assessment tool for the evaluation of hospital preparedness in chemical, biological, radiological and nuclear emergencies through the cross□sectional Delphi technique (17). Assessment items were categorized into 7 sections: planning and organization, safety and security, standard operation process, communication, resources, medical management and decontamination. In comparison, our checklist focused on the biological event and COVID-19 disease. In 2004, Hopkins et al. developed a SARS preparedness checklist for state and local health officials covering 6 issues: legal authority and policy issues, surge capacity, communication, laboratory, surveillance, and preparedness in other agencies (18). Another report was published by Adini et al. in 2014 on the development of an evaluation tool for assessing the preparedness of medical facilities for epidemics and pandemics. Five categories (evaluation dimensions) were described: policy and planning, medical management, personnel, communication and infrastructure (19).

We categorized measures based on the tasks of the ministry of health at the national level and on hospital activities. Our expert panel was multidisciplinary and had broad representation from physicians, managers, policy-makers and nurses, incorporating all possible aspects of hospital preparedness (Table 1). Our tool extends beyond a checklist of tasks to be conducted: rather it serves as a platform and model to facilitate inter-professional collaboration through joint meetings with the participation and collaboration of various experts. In addition, our tool follows an explicit and defined consensus process. Finally, our proposed checklist better follows a recommended checklist format. It prompts hospital providers to perform the steps necessary for successful COVID-19 patient management while allowing for other hospital services and other (non-COVID-19) inpatients to continue. We suggest using the checklist during the first and recovery phases and before facing a large number of patients to ensure proper management of suspected and confirmed patients.

Several limitations of this study should be considered. First, the current literature on COVID-19 is limited. Second, the checklist has not yet been tested. The next step of this research is to assess the checklist in a pilot study. We plan to collect baseline, process and outcome measures before and after the implementation of the checklist in a hospital.

Conclusion

Standardization of preparedness measures is critical to the response of hospitals regarding the admission and management of COVID-19 patients. Our preparedness assessment checklist is an expanded tool that provides clear and practical guidance for each hospital, it can be adapted for any hospital admitting COVID-19 patients and will aid interdisciplinary efforts towards successful hospital management. We suggest future studies be carried out to assess hospital preparedness using this the checklist to improve the strengths and minimize the weaknesses of the hospital.

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Competing interests: None declared.

Établissement d’une liste de contrôle sur la préparation des hôpitaux pour évaluer leur capacité à riposter à la pandémie de COVID-19

Résumé

Contexte : Pendant une épidémie ou une pandémie, les systèmes de santé, et en particulier les hôpitaux, font face à de nombreuses difficultés dans la prise en charge des patients et la gestion du personnel. Les mesures de préparation des hôpitaux sont essentielles pour leur permettre de réagir efficacement à l’admission et à la prise en charge des patients atteints de COVID-19. La politique du ministère de la santé en matière de pandémies doit couvrir la capacité des hôpitaux à riposter face à la COVID-19.

Objectifs : Le but de la présente étude était d’élaborer une liste de contrôle pour évaluer l’état de préparation des hôpitaux en vue de riposter à la pandémie de COVID-19.

Méthodes : Nous avons recherché et examiné les données disponibles, y compris la littérature et les lignes directrices présentées par les organisations concernées. En raison de l'épidémie de COVID-19, les entretiens en présentiel n'ont pas été possibles ; nous avons donc eu recours à des connexions téléphoniques et vidéo, des applications mobiles et au courrier électronique afin de mener des entretiens non structurés. L'établissement de la liste de contrôle a été réalisé par un groupe d'experts multidisciplinaire.

Résultats : Après avoir appliqué les avis des experts, la liste de contrôle finale comportait deux domaines principaux : des mesures au niveau national et hospitalier. La préparation au niveau national a été classée en trois aspects qui sont mis en œuvre par le ministère de la santé. La préparation au niveau hospitalier a été répartie en 24 sous-groupes.

Conclusion : La préparation des hôpitaux à l'admission et la prise en charge des patients atteints de COVID-19 est essentielle. Une liste de contrôle pour l'évaluation de la préparation des hôpitaux à la prise en charge de ces patients et la gestion hospitalière a été mise au point et appliquée. Notre liste de contrôle pour l'évaluation de la préparation est un outil élargi qui fournit des indications claires et pratiques pouvant être adaptées à tout hôpital qui admet des patients atteints de COVID-19.

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التوجيهية المقدمة من المنظمات المعنيّة . ونظرًا لتفشي كوفيد -19 ، لم يمكن إجراء
المقابلات وجهًا لوجه، لذا استعملنا اتصالات الهاتف والفيديو وتطبيقات الهاتف
المحمول والبريد الإلكتروني لإجراء مقابلات غير مُنظَّمة . وأعدَّت مجموعة خبراء
متعدّدة التخصصات القائمة المرجعية .

: اشتملت القائمة النهائية، بناءً على آراء الخبراء، على مجالين رئيسيين النتائ: **ج**
التدابير على الصعيد الوطني، والتدابير على صعيد المستشفى . وصُنِّفَ التأهب على
الصعيد الوطني إلى ثلاثة مجالات تنفّذها وزارة الصحة . وصُنِّفَ التأهب على صعيد
المستشفى إلى 24 مجموعة فرعية .

: لا غنىً عن تأهب المستشفى لإدخال مرضى كوفيد -19 إلى المستشفى وعلاجهم الاستنتاجات
وقد صُمِّمَت وأُعِدَت قائمةٌ مرجعيةٌ لتقييم تأهب المستشفى لمعالجة مريض كوفيد -19
وإدارة المستشفى . والقائمة المرجعية لتقييم التأهب هي أداة موسعة توفّر إرشادات واضحة
وعملية يمكن تكييفها مع أي مستشفى يقبل مرضى كوفيد -19.

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