Universe Scientific Publishing

Current Status and Outlook of Research on Emergency Drills for Public Health Emergencies

Lisha Wu[1], Xiongyong Zhou[2], Zeqiong Pu[2], Pei Pang[2], Chengming Zhang[2]; Guiyang Zhou[2]*

1. Longgang Central Hospital, Shenzhen 518038, China.

2. Jinshan Hospital of Fudan University, Shanghai 201508, China.

Abstract: Public health emergencies are major infectious disease outbreaks, mass unexplained diseases, major food and occupational poisoning and other events that seriously affect public health that occur suddenly and cause serious damage to the public health of society. In the absence of certain preplanned preparations and experience in emergency response, the outbreak of public health emergencies always catches us off guard and poses a huge challenge and burden to public health and social safety. At present, due to the late start of the emergency management of public health emergencies, the lack of a perfect theoretical system of emergency management, the weak public awareness of emergencies, the lack of scientific emergency measures, the lack of a perfect and flexible public health emergency management system, and the lack of an advanced emergency management level of society as a whole, all of these factors have led to inefficiency, communication and a lack of experience in dealing with public health emergencies such as the new coronary pneumonia outbreak in the early stage. In this context, it is important to take a deeper look at the problems of inefficiency and poor communication in handling public health emergencies. In this context, it is important to examine the current research status of emergency drills for public health emergencies in China, investigate the typical problems, and propose a series of innovative practical strategies for emergency drills for public health emergencies, such as exploring the closed-loop management mode of emergency drills for public health emergencies and giving full play to the role of information technology as a driver of innovation, according to the current development level of China as a whole.

Keywords: Public Health Emergencies; Emergency Drills; Research Status; Future Outlook

Introduction

Public Health Emergency is a major infectious disease outbreak, mass unexplained disease, major food and occupational poisoning and other events that seriously affect public health that occur suddenly and cause or may cause serious damage to public health[1]. The causes of public health emergencies are characterized by the diversity of causes, suddenness, group nature, differences, extensiveness and seriousness[2-3]. In particular, the occurrence of major public health emergencies is very likely to pose a great threat to people's health, life and property safety, stable social and economic development, and the implementation of national strategic planning[4-5]. Since the beginning of the 21st century, there have been outbreaks of public health emergencies in countries around the world, such as the SARS epidemic in 2003 and the new coronavirus pneumonia outbreak in 2019[6-7]. Therefore, an in-depth analysis of the current research status of public health emergency drills at home and abroad is carried out, and targeted considerations are made from the problems that still exist in the current society in the emergency response to public health emergencies. Innovative response implementation strategies are proposed from multiple perspectives, such as individuals, government administration, and the professionalism of conducting public health emergency drills.

1. Research Status

1.1 Current status of domestic research

Sudden public health events have obvious suddenness in time, complexity in cause, severity in consequence, and controllability in process[8]. Jiang Hui and Zhu Wentao comprehensively reviewed 5412 related studies in the field of public health emergencies from 2010 to 2019 in the Web of Seience database. IS pointed out that emergency medicine, infectious diseases, air pollution and emergency management, and major infectious viruses are hot issues in the research field of sudden public health events[9]. Lu Quan pointed out the multiple advantages and defects of China's social security system during the COVID-19 epidemic and put forward policy implementation suggestions on deepening social security reform and optimizing social insurance, public health and medical security, social assistance, social welfare services and charity systems with the support of relevant theories[10]. Dang Xiaohong and Zhang Jing pointed out that early Chinese research work on this aspect presents a research perspective on the whole, and the research focus is on the relevant system and mechanism construction. From 2020, Chinese research work on this aspect shows diversified characteristics on the whole. In addition, the research focuses on specific coping subjects, urban coping ability, and overall processing mode and makes scientific prospects for innovative practices in this field[11]. Chen Yang and Zhao Man provided certain theoretical innovation strategies for the construction of emergency mechanisms and the realization of agile governance in the case of epidemic prevention and control in Sichuan Province[12]. Li Lei and Zhi Mei conducted a specific analysis from the perspective of communication and pointed out that relevant government departments should adopt differentiated intervention policies for such problems to improve the specific work efficiency of regulatory departments[13]. Li Zhen developed a set of questionnaires to evaluate the response ability of primary medical institutions to public health emergencies in line with the actual situation in Guangxi border minority areas[14].

1.2 Current status of foreign research

Yi and Sweileh analyzed the current status and trends of Ebola research and the link between natural disasters and public health emergencies from 1977-2014 and identified the main research countries and research hotspot areas focusing on this topic[15-16]. In terms of emergency decision management for public health emergencies, Cosgrave argued that the emergency decision problem can be described in terms of quality requirements, acceptance requirements, and problem urgency [17], Ikeda et al. pointed out that the emergency decision organization should be composed of four subjects: decision executors, expert advisors, managers, and decision makers[18], Wybo proposed a four-pronged approach based on professional competence in terms of staffing, matching Wybo proposed four principles to construct emergency decision-making organization based on professional ability of staffing, matching degree, team type, and function assignment[19], Tamura et al. established a systematic decision analysis method based on decision tree analysis of expected utility theory[20], and Mendonca believed that the evaluation system should be composed of two elements: measurement system and evaluation system[21]. At present, foreign countries have many achievements in emergency exercise simulation system research; for example, the National ExerciseSimulation Center (NESC) in the United States has conducted simulation exercises for various types of disasters in a virtual environment and constructed scenario models, capability models, and decision models[22].

In summary, foreign scholars started their research activities on public health emergencies earlier and made important definitions of a series of basic concepts and classifications, which laid a solid theoretical foundation for the advancement of subsequent research activities. However, with the frequent occurrence of public health emergencies in recent years, an increasing number of scholars have started to pay attention to this issue and conduct in-depth research. In the face of socially dangerous public health emergencies, scholars in China have conducted research from various perspectives, such as psychology, economics and communication, and proposed corresponding response strategies, and their research results have important theoretical value. However, in general, the research activities from the perspective of guiding the public and related subjects to carry out advance planning and emergency drills are not very rich and comprehensive, and we need to carry out theoretical and practical research to address the lacking parts and propose constructive solutions.

2. Problems of emergency drills for public health emergencies and countermeasures

2.1 Problems

2.1.1 Personal perspective

From a personal point of view, the majority of our society has a serious lack of crisis awareness in their daily lives, and they always take a chance on possible public health emergencies, believing that the probability of being involved in a large public health emergency threat is extremely small. The general public lacks comprehensive knowledge of the events involved, their knowledge of public health emergencies is only superficial, and they do not know how serious the consequences of such events will be if they occur, which leads to a serious lack of emergency treatment capabilities in our society as a whole. In the absence of scientific knowledge of public health emergencies, the general public also lacks a certain amount of attention to long-standing public health emergency drill services and seldom takes the time and energy to participate in and learn from the relevant emergency drill activities, resulting in a state of panic and overwhelm when they are truly faced with danger. Due to panic about the danger of life, many people not only have difficulty making correct scientific handling measures in critical situations but also always aggravate their own critical situation in panic and disorientation, resulting in the low crisis response ability of society as a whole. From the perspective of the relevant emergency disposal staff, there is the problem of untimely and inadequate implementation of emergency disposal measures. Public health emergencies are often characterized by strong danger, suddenness, contagiousness and difficulty of control. If we do not carry out the corresponding emergency disposal at the first time after discovering its problems but waste time in a series of unnecessary procedural reviews, it is likely to delay the best emergency disposal time and cause serious consequences that are difficult to recover.

2.1.2 Government management perspective

From the perspective of government management, some systems and regulations related to public health emergencies are incomplete, and because the relevant managers lack a certain degree of attention to their work, the preparation of systems and regulations is more like a "decoration" used to deliver to the leadership, which looks cumbersome and complicated and professional, but in fact, it is difficult to truly use in the emergency response process of public health emergencies. The most typical problem is that the management department has to deal with the emergency situation. The most typical problem is that the management has a habit of distributing the authority to implement a measure among different management departments so that staff and people who want to mobilize local equipment and personnel in a crisis situation must first go to the management department with complicated documents for approval, and the staff responsible for signing and stamping will shirk their responsibility to confirm each other for fear of taking responsibility. At the same time, because public health emergencies are often secretive and delayed in their early stages, interventions and support from higher levels of government do not intervene in a timely and effective manner, requiring grassroots units in the governance hierarchy to take on the responsibility of early response[23]. In such a situation, a large amount of time and energy is already spent in the process of obtaining permission at each level, which in turn delays the optimal emergency response time for public health emergencies. In addition, the worldwide outbreak of novel coronavirus pneumonia, a public health emergency, not only made the public deeply aware of the importance of learning the relevant emergency response knowledge and skills in advance but also reflected the important problem of "fragmentation" and lack of social responsibility in the process of specific law enforcement and assignment of tasks by the relevant government management departments in China.

2.1.3 Professional perspective of conducting emergency drills for public health emergencies

While emergency drills for public health emergencies have achieved actual work effectiveness or purpose, there are also many common and prominent problems, such as the characteristics of drills, too many drills, too few drills, i.e., too many performance-type, display-type drills, too few test and examination drills, misconceptions, organizational irregularities, and task-complete perfunctory, coupled with the lack of standards for technical specifications in emergency drills in China, which

makes drills as ineffective as some irresponsible preplans[24-25].

2.2 Countermeasures

2.2.1 Personal perspective

From an individual perspective, it is important to focus on raising the importance of public health emergencies in the community and to raise the public's awareness of the importance of having the ability to deal with public health emergencies in their own lives. The community should be invited to participate in the activities to help them improve their knowledge and to be able to respond correctly to the signs of danger in their daily lives. In schools, students are encouraged to acquire the awareness and skills to deal with public health emergencies from an early age and are encouraged to pay attention to the importance of having the ability to deal with public health emergencies through continuous knowledge inculcation. At the same time, provinces and municipalities create special short video accounts by geographical departments and regularly update their accounts with theoretical knowledge and/or practical measures related to emergency response to public health emergencies. Other professional emergency response staff should mainly devote themselves to improving their work attitude, establishing a positive and responsible working attitude, maintaining responsibility in the specific public health emergency drill and disposal, and doing their best to help the social public deal with the relevant emergency problems. In addition to repeatedly disseminating information about emergency drill operations to the public in general, staff members related to public health emergencies also need to actively encourage people to participate in the specific drill process, and for each drill activity, select different social people to participate in the local public health emergency drill activities in the field to enhance the public's attention to this self-help activity and preparation. The permanent exhibition of similar scenarios and the provision of free places to experience public health emergencies in different areas through VR technology and model-making techniques encourage the public to realize the extreme importance of being prepared in the process of being close to the real experience.

2.1.2 Government management perspective

From the perspective of government management departments, it is necessary to fundamentally strengthen its departments in the simplification of the implementation procedures of emergency disposal of public health emergencies, enhance the publicity of relevant emergency disposal exercises, and improve the emergency handling capabilities of the general public in the region. While continuously raising the height of awareness of emergency drills for public health emergencies, government management departments should adjust and optimize the emergency disposal work system for public health emergencies as soon as possible, improve the emergency disposal protection work mechanism for public health emergencies, improve the decision-making, coordination, command and other work processes of relevant government management departments, and make the allocation of major decision-making powers precise and concise while actively promoting government. At the same time, we actively promote the digitalization of government information, promote the openness and transparency of data and important information, and ensure that the staff of various departments will not make mistakes in decision-making due to the existence of blind spots in relevant information in the process of task implementation and promotion. In addition, it is advocated to open an authoritative emergency drill display platform for public health emergencies, produce thematic short video works based on the application of applications such as WeChat Public, Jitterbug, Xiaohongshu and Weibo, and make full use of modern information technology to enhance the dissemination of relevant knowledge and information and improve the crisis response ability of the public.

2.1.3 Professional perspective of conducting emergency drills for public health emergencies

The concept of emergency management of public emergencies is "prevention oriented, combined with civilian warfare, promoted by exercises, and improved by exercises". The combination of civilians and combat is the key to rehearsal. The

modern disaster medicine rescue has the theory of "three out of seven": three out of war and seven out of rehearsal is a true reflection of it. To improve the emergency response capability of public emergencies, repeated rehearsals are needed[26].

Establishing a new view of emergency drills for public health emergencies, not for the sake of drills. First, it is necessary to establish a holistic view of emergency drills for public health emergencies. Second, it is necessary to establish a systematic view of emergency drills for public health emergencies. Third, it is necessary to establish a professional view of emergency drills for public health emergencies. Fourth, through emergency drills for public health emergencies, it is necessary to standardize the work system, support platform and concise and applicable operational procedures or guidelines for the disposal of public health emergencies[27-28].

Establishing and improving the analysis and evaluation system of emergency drills for public health emergencies. The evaluation of emergency drills for public health emergencies is mainly to assess and propose improvements based on the performance of the participants in completing key tasks against the requirements of emergency management capabilities and the objectives of emergency drills for public health emergencies[28]. By determining the assessment points, evaluation standards and methods for emergency drills for public health emergencies, we can provide a comprehensive and systematic understanding of emergency drills for public health emergencies, summarize and analyze the whole process of emergency drills for public health emergencies, and accurately evaluate the effectiveness of the drills, focusing on the interface of emergency plans at all levels, cooperation and coordination of emergency disposal subjects, resource integration and deployment, personnel, and other difficulties. It is an important way to further strengthen and improve the response to public health emergencies and enhance emergency response capabilities and levels[29-30].

3. Research outlook

Exploring the closed-loop management mode of public health emergency drills to inject new vitality into the emergency management of public health emergencies. By establishing a closed-loop management model for emergency drills for public health emergencies, under the guidance of the closed-loop management model for emergency drills for public health emergencies, and in accordance with the requirements of "long-term preparation and focused construction", we will first conduct a series of emergency drills for public health emergencies and, second, strengthen the basic work of preparation, implementation, evaluation, and optimization of emergency drills for different categories, different levels, different scenarios, and different stages of public health emergencies. The second is to strengthen the basic work of preparation, implementation, evaluation, and optimization of emergency drill management for different categories, levels, scenarios, and stages of public health emergencies, to continuously improve the comprehensive emergency response capabilities of medical institutions to deal with public health emergencies, and to optimize the construction of systems and processes on the basis of daily emergency drills for public health emergencies so that the management of emergency drills for public health emergencies is more scientific, standardized, refined, and process-oriented. Process.

The role of innovation-driven information technology is to provide new momentum for the high-quality development of emergency public health incidents. There are various limitations in organizing hierarchical and hierarchical public emergency drills, such as cost, personnel, and space, which in turn lead to lower drill frequency and lower quality of drills. With the development of modern science and technology, it is possible to develop a virtual emergency drill system, innovate the form of emergency drills for public health emergencies, and promote the normalization of emergency simulation drills for public health emergencies in medical institutions. Explore the construction of emergency rehearsal systems for public health emergencies based on virtual simulation technology and on the basis of 3D scenarios and data fusion, build a visualization platform for emergency management and simulation of emergency rehearsals for 3D wisdom emergency rehearsal scenarios and even larger regional spaces, use virtual reality technology to realistically restore the disaster site environment, and realize real-time monitoring of spatial data, historical playback, and simulation rehearsals through the presentation of all-time and spatial situations. Simulation rehearsal so that the law is clearly visible. The first is to make the decision of emergency management of public health emergencies countable and more efficient to improve the emergency handling capacity of medical institutions in response to public health emergencies; the second is that through the emergency management of public health emergencies and virtual simulation emergency drill platforms, it is conducive to the immersion of front-line

personnel in training and improving their emergency rescue capacity of public health emergencies and to the realization of multimedical institutions and multidepartmental joint cross-territory emergency response. It is also conducive to the realization of cross-regional joint emergency drills for public health emergencies between multiple medical institutions and departments. At the same time, the establishment of online emergency drills public welfare accounts, the use of VR technology to widely carry out virtual displays of relevant scenes, the establishment of emergency drills related to sudden public health event network self-learning websites, etc., through the full implementation of such work, China's emergency drills related to sudden public health events can get twice the effect of publicity and popularization with half the effort.

4. Conclusion

The occurrence of a sudden public health event is not an everyday occurrence, but whenever it breaks out, it means huge casualties and halting effects on social development. By actively carrying out emergency public health emergency response drills, we help the public master certain temporary emergency knowledge and skills in the demonstration of the professional staff's plan response drills to guarantee that the majority of the social groups remain calm in the face of sudden public health events and make the most efficient measures to save themselves and rescue others. In the future social development process, we should not only pay attention to the scientific promotion of social emergency public health incident drills but also carry out theoretical and high level of continuous investigation from the level of scientific research, think about how to strengthen the strengths and improve the deficiencies from emergency public health incident drills, take emergency public health incident drills as the grasp, and turn the results of drills into real power, which is the task of emergency public health incident emergency management in the future. The future tasks and goals of public health emergency management will provide more groundbreaking and effective guidance for specific practical activities.

References

[1] State Council of the People's Republic of China. Regulations on Emergency Response to Public Health Emergencies [M] Beijing: China Law Press, 2003.1-2

[2] Zhang WS, et al. Characteristics of urban public health emergencies and response strategies[J]. Modern preventive medicine,2006(04):637-638.

[3] Qian J, et al. Construction and evaluation of health emergency response capacity for public health emergencies[J]. Journal of PLA Preventive Medicine, 2016, 34(01): 132-134.

[4] Li WC, et al. Research progress on the characteristics of health emergency work and its system construction in China[J]. Chinese Health Emergency Electronic Journal,2016,2(06):370-374.

[5] Meng J. Ideas and countermeasures on strengthening health emergency management [J]. Tianjin People's Congress, 2017(10): 39-40.

[6] Yang Z, et al. Macroeconomic shocks, financial risk transmission and governance responses under major public emergencies[J]. Management World, 2020, 36(05): 13.

[7] Ellwanger JH, Kaminski VL, Chies J. Emerging infectious disease prevention: Where should we invest our resources and efforts[J]. Infect Public Health, 2019, 12(3): 313-316.

[8] Wang S. Research on government crisis communication strategy in public health emergencies in China [D]. Jilin University,2014.

[9] Hu J, et al. Current status and evolutionary path of international public health emergency research development: a bibliometric-based review and recommendations [J]. Science and Technology Management Research,2021,41(11):195-203.

[10] Lu Q. Response to major public health emergencies and modernization of social security governance capacity--a review of the views of the "Workshop on Combating the New Coronary Pneumonia Epidemic and Social Security (Correspondence)"[J]. Social Security Review,2020,4(02):3-6.

[11] Dang XH, et al. A review of research on emergency management of public health emergencies[J]. Logistics Technology,2021,40(06):45-52,137.

[12] Chen Y, et al. A study on the agility mechanism for responding to major public health emergencies--the case of the

Xinguan epidemic in Sichuan Province[J]. Public Management and Policy Review,2022-01:73-87.
[13] Li L, et al. Ship dynamics of public opinion on the network of the new crown epidemic [J]. Journal of Xi'an University of Science and Technology, 2022:47-54.
[14] Li Z. Research on the evaluation of the response capacity of primary medical institutions in border minority areas in Guangxi for public health emergencies [J]. Guangxi Medical University,2017-05.
[15] Yi F, Yang P, Sheng H. Tracing the scientific outputs in the field of Ebola research based on publications in the web of science[J]. BMC Research Notes, 2016, 9(1): 221.
[16] SWeileh WM. A bibliometric analysis of health-related literature on natural disasters from 1900 to 2017[J]. Health Research Policy and Systems, 2019, 17(1):1-11.
[17] Cosgrave J. Decision making in emergencies[J].Disaster Prevention and Management,1996, 5(4).
[18] Ikeda Y, Beroggi GEG, Wallace WA. Supporting multigroup emergency management with multimedia[J]. Safety science, 1998, 30(1-2): 223-234.
[19] Wybo JL, Kowalski KM. Command centers and emergency management support[J].Safety Science,1998,30(1-2):131-138.
[20] Tamura H, Yamamoto K, Akazawa K, et al. Decision analysis for mitigating natural disaster risks[C]//Systems,Man, and Cybernetics,2000 IEEE International Conference on. IEEE, 2000.
[21] Mendona D, Beroggi GEG, Gent DV, et al. Designing Gaming Simulations for the Assessment of Group Decision Support Systems in Emergency Response[J]. Safety Ence, 2006,44(6):523-535.
[22] Kai H, et al. The development and inspiration of emergency drill system in the United States[J]. China Emergency Management,2011(09):54-59.
[23] Lin X, et al. A review of international public health emergency research: a bibliometric analysis[J]. Risk Disaster Crisis Research,2020(02):29-49.
[24] Li XF. Analysis and suggestions for improving the effectiveness of emergency drills[J]. China Emergency Management,2018(12):44-45.
[25] Zhang XB. Reflections on several basic issues of emergency drills [J]. Journal of Henan University of Technology (Social Science Edition),2019,20(03):54-59.
[26] Zhang XL, et al. Organization and implementation of emergency medical rescue emergency drill for sudden public events and reflections [J]. Chinese Journal of Emergency Resuscitation and Disaster Medicine,2019,14(3):249-251.
[27] Li XF. Guide to emergency drill specifications [M]. Beijing: People's University of China Press, 2018.4-115.
[28] Li XF. Guide to evaluation of emergency drills [M]. Beijing: People's University of China Press, 2018.4-115.
[29] Deng QB. Innovative exercise forms to enhance combat capability: Exploration and practice of "double-blind" surprise emergency exercises in Guangzhou [J]. China Emergency Management, 2013(06):54-58.
[30] Li XF. Types, design, implementation and evaluation of emergency drills[J]. China Disaster Reduction,2019(23):14-17.
Fund projects: 2020 Shanghai Jinshan District Health and Health Special Research Project (JSKJ-KTGW-2020-05); 2020 Shanghai Hospital Association Hospital Management Research Fund (X2020032); 2021 Policy Research Self-selected Project of Shanghai Municipal Health and Health Commission (2021HP68).

Author: Lisa Wu (1991-), Research Assistant, Research Interests: Hospital Management, Health Emergency Management.
Corresponding author: Guiyang Zhou (1993-), physician, research interests: social medicine and health care management, health emergency management.