

Barriers and Enablers to Using an Emergency Operations Center in Public Health Emergency Management: A Scoping Review

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Systematic Review

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Keywords:

emergency operation center; incident management; public health emergency; public health emergency management

Abbreviations:

CDC, United States Centers for Disease Control and Prevention; EVD, Ebola Virus Disease; EOC, Emergency Operations Center; EOC-NET, Public Health Emergency Operations Centre Network; GHSA, Global Health Security Agenda; IHR, International Health Regulations; IMS, Incident Management System; MOH, Ministry of Health; NHCC, National Health Command Center; PHEOC, Public Health Emergency Operations Center; SARS-CoV, Severe Acute Respiratory Syndrome Coronavirus; WHO, World Health Organization

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Abstract

Objectives: The aim of this study was to review the role of public health emergency operations centers in recent public health emergencies and to identify the barriers and enablers influencing the effective use of a public health emergency operations center (PHEOC) in public health emergency management.

Methods: A systematic search was conducted in 5 databases and selected grey literature websites.

Results: Forty-two articles, consisting of 28 peer-reviewed studies and 14 grey literature sources matched the inclusion criteria. Results suggest that PHEOCs are used to prepare and respond to a range of public health emergencies, including coronavirus disease (COVID-19). Factors found to influence the use of a PHEOC include the adoption of an incident management system, internal and external communications, data management, workforce capacity, and physical infrastructure.

Conclusions: PHEOCs play an important role in public health emergency management. This review identified several barriers and enablers to using a PHEOC in public health emergency management. Future research should focus on addressing the barriers to using a PHEOC and looking at ways to evaluate the impact of using a PHEOC on public health emergency outcomes.

Public health emergencies can have devastating social, economic, and health consequences, including the loss of many lives in a short period of time.¹ A public health emergency can be defined as “an occurrence, or imminent threat of an illness or health condition that poses a substantial risk of a significant number of human fatalities, injuries or permanent or long term disability.”² Responding to a public health emergency requires strong, collective action at local, national, and international levels, including having a capable health system to prepare, plan, and manage these events.³

Strengthening public health emergency management has been a global priority for decades, notably since the early 2000s when severe acute respiratory syndrome coronavirus (SARS-CoV) spread across multiple countries, resulting in approximately 8000 cases and claiming more than 700 lives.⁴ In 2005, the International Health Regulations were revised with a focus on strengthening a country’s capacity to respond promptly and effectively to public health risks and public health emergencies.⁵ One mechanism for complying with the International Health Regulations is by establishing and/or strengthening a country’s public health emergency operations center, or PHEOC.^{2,5}

A PHEOC is a physical or virtual space dedicated to coordinating the critical aspects of a public health emergency.² A PHEOC is typically activated in response to a public health emergency risk or event (both non-communicable and communicable diseases) and is integral to providing a coordinated response, particularly when routine public health services, systems, and structures are overwhelmed.^{2,6} Within a PHEOC, an incident management system is commonly used, which typically consists of 5 core functions: command, operations, logistics, planning, and administration/finance. These functions work together to implement tasks such as data collection and dissemination, deployment of resources (staff, equipment, and supplies), organizing/allocating funding, and communicating with other agencies and to the public.^{2,7}

Stemming from the challenge of fighting wildfires in the United States,⁸ the incident management system was established in the 1960s and 1970s to enable better coordination of emergencies across different agencies and geographic borders.³ The incorporation of the incident management system into public health emergency management emerged in the early 2000s.³ The United States Centers for Disease Control and Prevention (CDC) was one of the early adopters of the incident management system, establishing an Emergency Operations Center (EOC) within the Division of Emergency Operations in 2003. Shortly after this EOC was established, it responded to SARS-CoV and the Indonesia Tsunami.^{9–11}

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In 2014, the Global Health Security Agenda (GHSA) was founded to help strengthen country capacity to prevent, detect, and respond to infectious disease risk. One of the key GHSA 5-year targets was for every country to have a functioning PHEOC.¹² In the same year, the evolving Ebola virus disease (EVD) crisis in West Africa saw the establishment of PHEOCs in several African countries to respond to this public health emergency.¹³ In 2015, the World Health Organization's (WHO) Emergency Operations Centre Network (EOC-NET) produced specific guidance to support and strengthen countries in using PHEOCs for public health emergencies through the development of the WHO Framework for a Public Health Emergency Operations Center.²

Given the growing support for using a PHEOC in public health emergency management, it is pertinent to understand the role of PHEOCs in recent public health emergencies. This scoping review therefore documents the role of PHEOCs in managing public health emergencies since the West African Ebola virus disease outbreak (2013–2016) and describes the factors that have influenced the effective use of a PHEOC in public health emergency management.

Methods

Scoping review steps outlined by Arksey and O'Malley (2005) and based on the PRISMA-ScR Checklist are described below.^{14,15}

Research Questions

Two key research questions were explored in this review:

1. What role has a PHEOC played in managing public health emergencies/risks?
2. What factors (barriers/enablers) have influenced the effective use of a PHEOC when responding to public health emergencies/risks?

Identification of Relevant Literature

Peer-reviewed databases and selected grey literature websites were searched between November and December 2020. With the assistance of a research librarian, an exploratory search was first carried out in Medline (OVID) for key MeSH terms. A comprehensive search was then conducted in PubMed, Scopus, Web of Science, Cochrane – Systematic Reviews (including special COVID collections) and Google Scholar. Search terms varied depending on the database (Table 1). Selected websites were also searched, including key global health organizations, national government health authorities, and non-government global health websites. **For the list of grey literature websites, see Data Supplement 1.**

Selection of Studies According to the Pre-Established Criteria

Inclusion criteria

The studies included in this review were published between January 2016 and October 31, 2020. This date range was chosen to reflect a critical time for strengthening the use of PHEOCs, as a result of lessons learned from the West African EVD (2013–2016)¹⁶ and the publication of the WHO Framework for a Public Health Emergency Operations Center (2015).²

The studies described research or practice specific to the role of PHEOC in a public health emergency and/or the factors influencing the effective use of a national PHEOC or EOC (these

terms are used interchangeably in the literature). The definition of a public health emergency was drawn from the WHO Framework for a Public Health Emergency Operations Center: “An occurrence, or imminent threat, of an illness or health condition that poses a substantial risk of a significant number of human fatalities, injuries or permanent or long term disability.”² Due to the language of the reviewers, only English language publications were reviewed.

Data extraction and analysis

A title and abstract review occurred within each peer-reviewed database and grey literature source. Full text screening was performed in EndNoteX9. Information was extracted from each paper into Microsoft Excel. Results were discussed between 2 authors and a member of the WHO, EOC-NET secretariat who provided advice and guidance throughout the data extraction and analysis process. Any disagreements were resolved by consensus discussion. Extracted data included:

- Study characteristics (eg, country of origin)
- Public health emergency
- Role of PHEOC in a public health emergency
- Factors (barriers/enablers) influencing use of a PHEOC

For a summary of data extracted for review, see Data Supplement 2.

Results

A total of 42 articles (28 peer reviewed and 14 grey literature publications) matched the inclusion criteria (Figure 1).

Study Characteristics

Twenty-two national PHEOCs were identified in this review. PHEOCs were located in countries across all 6 WHO regions: Africa (n = 9); Eastern Mediterranean (n = 2); Americas (n = 2); South-East Asia (n = 2); Europe (n = 2); and Western Pacific (n = 5).

PHEOCs were used to respond to a range of public health emergencies, including coronavirus disease (COVID-19) (n = 11), EVD (n = 6), polio, cholera, Middle East respiratory syndrome coronavirus (MERS-CoV), dengue fever, enterovirus, novel influenza A virus infections (H1N1, H7N9), rabies, Zika virus, Lassa fever, monkey pox, Chikungunya virus, plague, floods, hurricanes, mass gatherings, and a train derailment. Table 2 summarizes the national PHEOCs included in this review and the public health emergencies they have responded to.

Review Question 1: What Role Has a PHEOC Played in Managing Public Health Emergencies/Risk?

The literature indicated that PHEOCs played a role in both the preparedness and response phase of public health emergencies featured in this review. Eight studies mentioned the role of a PHEOC in the preparedness phase.^{17,19–22,26,43,52} In the preparedness phase, PHEOCs were used to support tasks such as risk mapping,¹⁹ training and exercises,^{17,19,21,22} detection of emerging issues/surveillance,^{26,43,52} and drafting of plans.²⁰ Twelve studies described the role of a PHEOC in the response phase, including assisting with mobilizing financial and human resources,^{17,25,26,30} providing and monitoring technical and strategic coordination,^{18,23,25,30} situational awareness,^{18,23} advice and

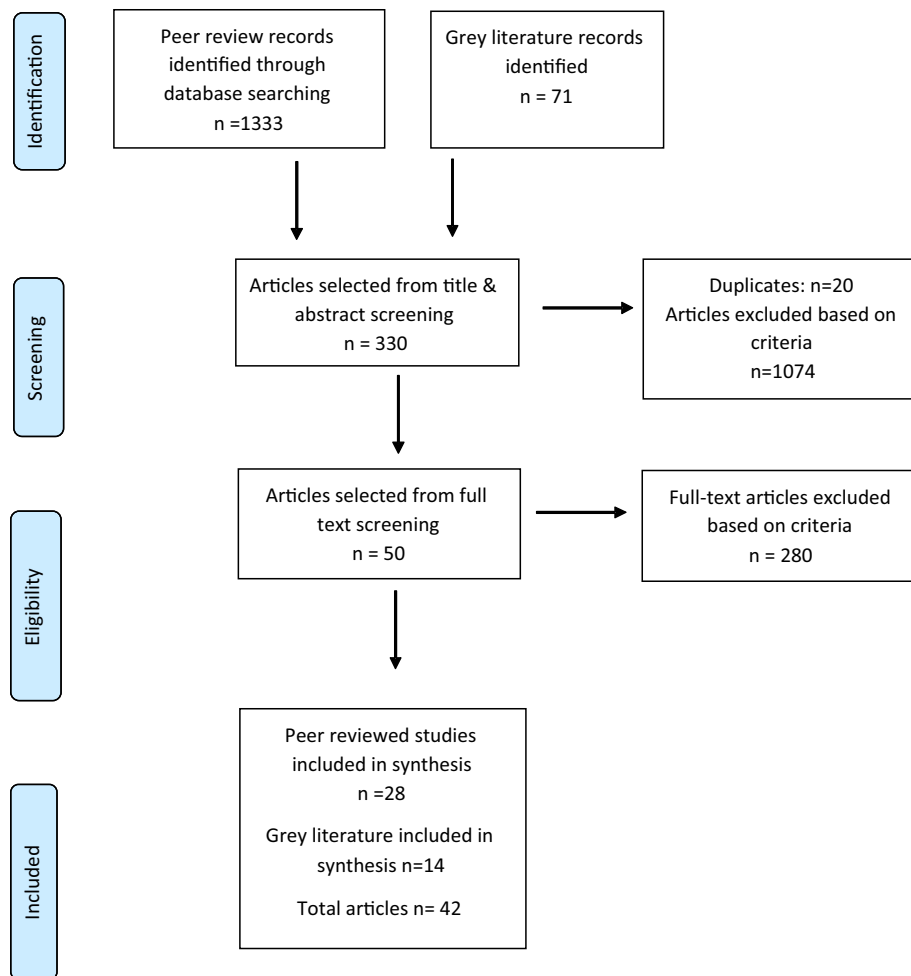


Figure 1. PRISMA flow diagram.

support,^{44,47} guiding field activities,¹⁷ tracking, collecting, and analyzing data,^{21,30,43} information sharing amongst partners and the public,^{21,30,52,53} and implementing response/operational plans.^{20,21}

Review Question 2: What Factors (Barriers and Enablers) Influenced the Effective Use of a PHEOC When Responding to a Public Health Emergency/Risk?

This section outlines the factors (barriers and enablers) found to influence the effective use of a PHEOC when responding to a public health emergency.

Factor 1: Incident management system and coordination

Barriers. Using an incident management system (IMS) posed challenges when running a PHEOC. Two studies noted a lack of understanding of the incident management system structure and its related functions.^{45,54} For example, Kim et al.⁴⁷ found that during a MERS-CoV outbreak in South Korea, there were “varying levels of understanding of an Incident Control System” that made it difficult for the ICS to function as expected.⁴⁷ Brooks et al.²⁶ also noted that several countries experienced challenges related to implementing the IMS when responding to EVD in West Africa in 2014. For example, the EOC in Guinea cited a lack of standardized definitions within the IMS, which led to different interpretations of indicators and roles.²⁶

The agency in charge of coordinating the IMS was also cited as a factor impacting the running of a PHEOC. For example, during the Sierra Leone EVD outbreak (2013–2016), there were different institutions coordinating the IMS throughout the response. This often led to tensions between local agencies and with agencies from abroad.²⁹ Two studies also described the challenge of the IMS coordinator/commander having insufficient mandate to hold others to account or to make decisions without being challenged by other authorities, which made it difficult to progress decisions.^{29,54}

Enablers. Seven studies identified the importance of using an incident management system to enable clear coordination and to optimize the efficiency of a PHEOC.^{19,28,29,40,41,45,47} An incident management system was found to assist with prompt decision making, helped reduce duplication, and encouraged the development of plans to clarify PHEOC functions, roles, and responsibilities.^{18,26,28,30,45,47} Having 1 unified command with support functions also helped integrate the incident management system with the public health functions.⁴⁷

Factor 2: Plans, policies/procedures, and legal authority

Barriers. Three studies cited having an inadequate planning framework to assist with preparing and responding to a public health emergency.^{29,30,54} In addition, when responding to an EVD outbreak, the Nigerian national PHEOC did not have any formal

Table 1. Search terms

Emergency Center		Management		Public health emergency
emergency cent*	AND	system	AND	public health emergency
OR		OR		OR
health emergency cent		management		disaster
OR		OR		OR
health emergency operation cent*		preparedness		event
OR		OR		OR
public health emergency operation cent*		planning		hazard
OR		OR		OR
control operation cent*		response		Pandemic
OR		OR		OR
disaster management cent*		recovery		public health risk
OR		OR		OR
situation room		role		health risk
OR				OR
crisis management cent*				health emergency
OR				OR
strategic health operation cent*				corona*
OR				OR
crisis room				novel coronavirus
OR				OR
crises cent*				Wuhan coronavirus
OR				OR
nazionale dall arme				Ebola virus disease
OR				
command				
OR				
incident management				

agreements within the teams working in the IMS, which led to problems of ownership, accountability, and challenges with setting working limits.⁵⁴

Enablers. Several studies noted the importance of having clear public health emergency plans, policies and procedures, and a legal mandate to operate the PHEOC to enable the smooth running of a PHEOC.^{19,21,26,47} This included a plan with clearly articulated criteria for activating a PHEOC and tailoring the plan to a country's existing legislative framework. Having a legally binding plan was also suggested to create a strong foundation for seeking additional funds, resources, and support in the event of a public health emergency.^{19,21,26,47} Long-term planning of human, technical, and financial resources and planning for how the PHEOC would be used during “peace time” was also important, particularly in consideration of sustaining the PHEOC beyond a public health emergency response.^{17,53}

Factor 3: PHEOC partnerships, communication

Barriers. Communication within and external to the PHEOC was noted by several studies as having an impact on the effective running of a PHEOC.^{22,28,49,55} For example, during the MERS-CoV outbreak in South Korea (2015), there was no crisis information sharing system, which resulted in a lack of communication between the different levels of government and across agencies. Olu et al.²⁸ also cited a lack of data sharing across stakeholders and within internal government departments, making it hard to ascertain situational awareness and implement an appropriate response.²⁸ Information sharing between the PHEOC and the public was also problematic during the MERS-CoV outbreak in South Korea, with inconsistent messaging and communication lacking transparency, resulting in community mistrust.⁴⁹

Enablers. “At nearly every level, personalities and personal relationships appeared to be key to the functioning of the PHEOC.”²² Five studies discussed the importance of clear communication between the PHEOC and external agencies, including the sharing of tools, resources, and information amongst partners to enable buy-in, mutual ownership, political leverage, and seamless collaboration.^{18,21–23,28} Having an official spokesperson to engage and share information with regional and international organizations was important to enhance interagency communication.⁴⁰ Regular meetings with partners, including developing a “cooperative agreement” to support innovative and collaborative response activities, were cited as an important aspect of enhancing communication and cooperation.²² Three studies noted the importance of strong internal communication and cooperation within a PHEOC to enable strategic decision-making, to support efficient mobilization of resources, and to ensure timely dissemination of risk communication messages.^{22,29,47} Kim et al.⁴⁷ also noted that having 1 person in charge enabled a clear communication mechanism to reduce conflict over critical issues, such as when to release risk communication messages to an affected community.⁴⁷

Factor 4: Information/data management

Barriers. Many studies found managing data and information within a PHEOC to be a challenge.^{20,40,44,45} The “fragmented” nature of data streams, including surveillance data collected through multiple sources, made it hard for the timely detection of outbreaks and for accurate situational analysis.²¹ Several studies highlighted issues relating to accessing up-to-date, comprehensive information detailing the availability and tracking of resources and assets.^{28–30} Another key barrier to data coordination was having different data collection guidelines and reporting formats across different agencies, making it hard for the PHEOC to collate this information in a timely manner.^{28,29}

Table 2. Selected national PHEOCs and public health emergencies

Country	Agency leading PHEOC	PHEOC established/activated	Public health emergency*
WHO African region			
Uganda ¹⁷	Ministry of health (supported by the WHO)	2018 (activated)	EVD
Democratic Republic of Congo ¹⁸	Ministry of health and multi-sectoral technical secretariat	2019/2020 (activated)	COVID-19
Senegal ^{19,20}	Ministry of health	2014 (established)	EVD, chikungunya outbreak, Hajj stampede
Cameroon ²¹	Ministry of health	2015 (established)	Outbreaks of Lassa fever, Zika virus, cholera, measles, monkeypox, avian influenza, preventively activated wild poliovirus, train derailment
Guinea ²²	CDC & Public Health Agency of Canada	2014 (established)	EVD
Nigeria ^{23,24}	Ministry of health and the WHO	2013, 2014 (established)	Polio, EVD
Central African Republic ²⁵	Lead unclear	2016 (established)	Cholera
Liberia ^{26,27}	Ministry of health supported by CDC	2014 (established)	EVD, measles
Sierra Leone ^{26,28,29}	Several different leads - ministry of health, ministry of defense supported by CDC	2014 (established)	EVD
WHO Eastern Mediterranean region			
Jordan ³⁰	National Centre for Security and Crises Management (lead agency unknown)	2015 (established)	COVID-19
Saudi Arabia ^{31,32}	Ministry of health	2015, 2019 (activated)	COVID-19, mass gathering - Mina stampede
WHO region of the Americas			
United States ^{21,33-35}	United States Centers for Disease Control and Prevention	2003 (established)	60+ domestic and international threats, including foodborne disease outbreaks, hurricanes, H1N1, Haiti cholera outbreak, MERS, EVD, zika virus infection
Pan American Health Organization (PAHO) ^{36,37}	PAHO	2006 (established)	Various PHEs (unspecified) COVID-19
WHO South-East Asia region			
Nepal ³⁸	Deputy Prime Minister and Defense Minister (agency not specified)	2020 (activated)	COVID-19
Thailand ^{39,40}	Department of Disease Control, Ministry of Public Health	2020 (activated)	COVID-19
WHO European region			
Ireland ⁴¹	National Public Health Emergency Team	2020 (activated)	COVID-19
Turkey ⁴²	Ministry of health	2020 (activated)	COVID-19
WHO Western Pacific region			
China ⁴³	Chinese Center of Disease Control and Prevention	2016 (established)	COVID-19, H7N9 avian infectious disease outbreak, earthquake, plague (Madagascar), flood, vaccine, polio virus
Taiwan ⁴⁴⁻⁴⁶	Ministry of health	2005 (established)	COVID-19, dengue fever, enterovirus, influenza A virus infections (H1N1, H7N9), Rabies, Zika virus infection
Republic of Korea ⁴⁷⁻⁴⁹	Korea Disease Control and Prevention Agency (formally KCDC)	2016	MERS-CoV, COVID-19
Vietnam ^{21,50}	Ministry of health	2013 (established)	Ebola Virus Disease and Middle East Respiratory Syndrome, and emergence of Zika virus infection
Philippines ⁵¹	Ministry of health	1992 (established)	Various PHEs (unspecified)

Enablers. Having access to appropriate technology within a PHEOC was found to enhance the timely detection, collection, and interpretation of data essential to an efficient public health emergency response.^{18,23} “Investing early” in the most appropriate technology to collect and manage information, including a

database with information on previous public health emergencies and lessons learnt, was suggested as an important part of preparing for a public health emergency.^{27,30} One study noted the importance of having a national inventory system to ensure the prompt mobilization and deployment of resources in the event of a public

health emergency.²⁸ Another study suggested consideration of innovations such as artificial-intelligence-based information and communication technology to explore the potential to enhance surveillance and outbreak forecasting. “Successful innovation along with local adaptations and experience have to be quickly and widely shared with global society to overcome common challenges.”⁴⁹

Factor 5: Workforce capacity and training

Barriers. Many PHEOCs, particularly in low resource settings, found building and sustaining a PHEOC workforce to be a challenge. The constant turnover of staff and the continuity of operations for staff who moved from other departments often led to gaps in the implementation of tasks within the PHEOC and in other public health programs. Having a small workforce made it harder to upscale in the event of a public health emergency.^{21,26,28,56}

Enablers. Conversely, building and sustaining a competent workforce through recruitment, training, and retention of qualified and skilled staff enabled the successful running of a PHEOC. Six studies mentioned the importance of training PHEOC staff in the “practical elements of working in a PHEOC,” including the principles of incident management system, writing action plans, conflict resolution, communication, and logistics management. Along with these, upskilling staff in the technical aspects of a public health emergency such as epidemiology, including analyzing, interpreting, and presenting data, was also important.^{19,20,28,43,45,53} One study suggested on-the-job training for coordination leaders to ensure a “better understanding of the coordination mechanism and enhance their coordination capacity” during a public health emergency.²⁸ Previous experience working in public health emergency response was suggested to enhance efficiency in responding to new public health emergencies.³⁹

Factor 6: Physical infrastructure, location, and resources

Barriers. Several barriers related to the physical layout and the infrastructure within a PHEOC were found to hinder effective PHEOC operations. These barriers included the PHEOC having inadequate or inappropriate office space, lack of access to the Internet, and lack of access to proper communication equipment.^{26,28}

Enablers. Conversely, the location and design of the PHEOC were found to help promote smooth PHEOC operations. Locating the PHEOC close to or within the ministry of health was deemed important for ease of operations, particularly for staff working dual roles. Using an “open plan” and ensuring space for multidisciplinary teams to meet and share information were found to enhance communication and coordination. In addition, ideally, locating the PHEOC away from potential hazards and having power backup (eg, generator) and paper copies of key documents were suggested to assist continuity of operations in the event of a natural disaster or power failure.⁵² Ultimately, having a permanent PHEOC that can be used during outbreak and non-outbreak periods for routine duties, such as surveillance, was suggested to help sustain resources, infrastructure, and the workforce required to analyze and interpret incoming health information and to assist with a quick transition to response mode in the event of a public health emergency.⁴³

Discussion

This review highlighted the role of national PHEOCs in responding to recent public health emergencies and identified the barriers and enablers influencing the effective running of a PHEOC in a public health emergency. Some of the barriers experienced by countries using a PHEOC in public health emergency management included having poor information and data management systems, a lack of infrastructure, and workforce capacity issues. These challenges are congruent with existing public health and broader health care issues experienced by countries, particularly in low-resource settings.^{10,57–59}

Understanding the incident management system, including the different incident management functions, was also a barrier identified in this review.^{29,45,47} Strengthening incident management system training in the preparedness phase of public health emergency management, as well as conducting on-the-job training during a public health emergency could assist in addressing this issue.²⁸ Since the formation of the Global Health Security Agenda, the CDC has prioritized support for countries in emergency management training,⁹ including the implementation of a public health emergency management fellowship program.⁶⁰ The WHO has also developed a range of online training courses through the OpenWHO knowledge transfer platform, including the Incident Management System (Tier 1 and Tier 2), Standard Operating Procedures for Emergencies, and Ready 4 Response Training.⁶¹ The WHO has also produced specific guidance on training and exercises through the Handbook for Developing a Public Health Emergency Operations Centre Part C: Training and Exercises.⁶² Assessing training needs and utilizing the existing training platforms, such as those mentioned above, could help strengthen this area. Beyond this review, it would also be valuable to investigate factors that influence the use and potential adaptation of the traditional incident management functions in a PHEOC to optimize the effectiveness of using an IMS when responding to public health emergencies.

Enablers to support the effective use of a PHEOC in public health emergency management included adopting an incident management system, having strong government support and legal authority to establish a PHEOC, skilled and trained staff, and efficient information management systems. These enablers align with current best practice in establishing and operating an PHEOC.^{2,63} For example, the WHO Framework for a PHEOC recommends that governments, ministries, or departments establish, support, or advise PHEOCs at all levels (local, provincial/state, and national) to ensure that the PHEOC²:

- Uses an incident management system
- Has sufficient skilled staff who are trained in the IMS
- Has strong government support
- Has legal authority
- Has effective information management systems
- Is sufficiently funded
- Has sufficient infrastructure²

Importantly, having clear legal authority to establish and operate a PHEOC and embedding these legalities into PHEOC plans can provide a strong foundation for activating and gaining support for using a PHEOC.² Bousso¹⁹ also suggests engaging authorities in dialogue to explain the purpose of a PHEOC when initially establishing a PHEOC, as an important early step in gaining support, and prioritizing funding and resources for establishing a permanent PHEOC.¹⁹ Guidance on how to establish

a PHEOC legal framework has recently been developed by the WHO regional office of Africa, to strengthen advocacy and capacity in this area.⁶⁴ These suggestions can be applied to PHEOCs at local, state/provincial, and national levels.

Although this review identified the barriers and enablers that influenced the use of a PHEOC, none of the included studies measured the impact these factors have had on public health emergency outcomes. Ma et al.⁵⁹ highlights a dearth of evidence from countries in evaluating the effectiveness of using a PHEOC in public health emergency preparedness and response.⁵⁹ Demonstrating the effectiveness of using a PHEOC in public health emergency management is important in validating current “best practice” guidance, as well as in advocating for the use of a PHEOC at national, state/provincial, and local levels. Countries could consider incorporating performance metrics to track implementation and assess effectiveness of interventions. For example, Mobula et al.¹⁸ suggest having “a comprehensive monitoring framework that looks at inputs, outputs, outcomes, and impacts, with key performance indicators to guide the implementation of multi-sectorial operations in real time.”¹⁸ Developing and applying outcomes-based indicators focused on critical timing and actions and measuring how these impact a public health emergency response could be an important consideration for countries in demonstrating the effectiveness of a PHEOC.

Limitations

While this review was comprehensive, we acknowledge that some publications may have inevitably been missed, including those published in languages other than English. Our interpretation of the WHO public health emergency definition may also have meant that we did not capture the plethora of non-communicable disease events that a PHEOC may have responded to. We also acknowledge we may not have captured every national PHEOC that exists.

As one author extracted primary data from the peer-reviewed articles, this may have also introduced some bias. To reduce this bias, during the peer-review extraction and analysis phase, the author consulted with the second author and a broader advisory team consisting of the WHO secretariat on the selected articles, and discussed any ambiguous cases.

Conclusions

Using a PHEOC to respond to public health emergencies has become more common in the past 2 decades. The featured studies have highlighted the public health emergencies that PHEOCs have responded to and the barriers and enablers found to influence the effective use of a PHEOC during these events. Many of the factors found to support the effective use of a PHEOC are congruent with current best practice guidelines. While organizations such as the World Health Organization and the United States Center for Disease Control and Prevention provide support and guidance to countries in establishing and strengthening the PHEOCs, many challenges remain. Further research is required to address the barriers identified in this review to optimize the use of a PHEOC in public health emergency management in the future. In addition, evaluating the effectiveness of using a PHEOC in public health emergency management will not only assist with helping validate the “best practice” guidance that currently exists, but also will be a powerful advocacy tool for strengthening the evidence for using a PHEOC in public health emergency management in the future.

Supplementary material. To view supplementary material for this article, please visit <https://doi.org/10.1017/dmp.2023.50>

Data availability statement. All data collected and analyzed for this scoping review are included in this manuscript.

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Conflict(s) of interest. None.

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