ABSTRACT

Introduction Health systems resilience is the ability to prepare, manage and learn from a sudden and unpredictable extreme change that impacts health systems. Health systems globally have recently been affected by a number of catastrophic events, including natural disasters and infectious disease epidemics. Understanding health systems resilience has never been more essential until emerging global pandemics. Therefore, the application of resilience-enhancing strategies needs to be assessed to identify the management gaps and give valuable recommendations from the lessons learnt from the global pandemic.

Methods The systematic review will be reported using the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA-P) protocols guideline. Reporting data on World Health Organization (WHO) health system building blocks and systematic searches on resilience enhancing strategies for the management of Public Health Emergencies of International Concerns (PHEIC) after the establishment of International Health Regulations (IHR) in 2007 will be included. The search will be conducted in PubMed, Scopus, Web of Science and Google Scholar.

Ethics and dissemination Ethics approval and safety considerations are not applicable. Pre-print of the protocol is available online, and the screening of the articles will be done using Rayyan software in a transparent manner. The findings will be presented at conferences and the final review’s findings will be published in a peer-reviewed international journal and will be disseminated to global communities for the application of successful management strategies for the management of future pandemics.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The systematic review will be reported using the Preferred Reporting Items for Systematic review and meta-analysis protocols guideline.
⇒ We intend to include all studies in English.
⇒ Resilience-enhancing strategies published in peer-reviewed journals for the management of PHEIC after establishment of IHR will be analysed.
⇒ Collaboration between Asia-Pacific researchers with different backgrounds.
⇒ May not be possible to conduct a meta-analysis due to nature of the selected scope of the research and inclusion of qualitative studies.

INTRODUCTION

Health systems resilience is defined as ‘the ability to prepare, manage and learn from a sudden and unpredictable extreme change which impacts on health systems’.1 It focuses on the health system preparedness and response to an emergency and coping capacity for changes following a crisis in view of absorbing, adapting and transforming.1,2 However, the focus of the health system resilience was broadened with the improving number of literatures around health systems resilience, which extends to focus on vulnerability, system strains and everyday resilience.3 Understanding health system resilience has never been more essential until emerging global pandemics. Health systems globally have recently been affected by a number of catastrophic events, including natural disasters, infectious disease epidemics such as Ebola outbreak, novel COVID-19 pandemic. Due to the new emergence and rapid transmission of the COVID-19 since late 2019, global health
systems are severely affected. As stated by the WHO, all
the organisations, institutions, resources and people whose
primary purpose is to improve health is included in the
health system. Moreover, efforts to influence determinants
of health and direct health-improvement activities are consid-
ered as the component of the health system. A health system
delivers preventive, promotive, curative and rehabilitative
interventions combined with public health actions and the
pyramid of healthcare facilities that provide personal health-
care by multi-stakeholders. A health system needs human
resources, health finances, information, supplies, transport,
communications, overall guidance and direction to provide
a quality service. Each area of the health system needs to
be strengthened to address the key constraints. Therefore,
the WHO described six building blocks of the health
system framework which include health service delivery,
health workforce, health information systems, access to
essential medicines/vaccines, health financing, leadership
and governance. These building blocks are targeted
to achieve impacts, including improved health outcomes,
income and financial risk protection, responsiveness,
and efficiency, which contribute to strengthening health
systems to provide sustainable quality, efficient and effective
health services. Furthermore, the need for understanding
of governing of health systems is highlighted following cata-
strophic events occurring over the last decade. The majority
of low and middle-income countries were highly affected
by the emergence of infectious diseases (eg, Ebola, COVID-
19) and armed conflicts. Moreover, managing the crises,
national responses across the globe were varied, some focus
on the transmission of diseases and prevention of deaths.
Importantly, the countries having established good health
systems also struggled to cope with the exponentially accel-
erating number of cases. With the exponential increase of
pandemics, the International Health Regulations (IHR) was
established in 2007 for governing the global health security.
The IHR declared Public Health Emergencies of Interna-
tional Concern (PHEIC). Six events of PHEIC were docu-
tmented between 2007 and 2020, including ‘H1N1 influenza
pandemic (2009), Ebola (West African outbreak 2013–2015,
outbreak in Democratic Republic of Congo 2018–2020),
poliomyelitis (2014 to present), Zika (2016) and COVID-19
(2020 to present)’. Among them Poliomyelitis is the
longest PHEIC, and Zika was the first PHEIC for arboviral
disease. Even though the public health impact of the event
was considered serious and associated with a potential for
international spread, several other emerging diseases were
not declared as PHEIC. Further, Monkey pox is declared
as a PHEIC by WHO on 23 July 2022 due to clear risk of
further international spread. Moreover, response measures
following a crisis, improving surge capacity and planning for
further action to minimise vulnerability can be identified
when assessing the health systems’ resilience. The purpose
of assessing resilience and its interpretation depends on
multiple contextual factors that need to be evaluated for
better understanding. The well-assessed areas can be used
as a starting point and encourage policymakers to adopt an
appropriate strategy in a particular country. Furthermore,
policymakers need to regularly review their health systems
to assess their resilience. In addition, the application of
resilience-enhancing strategies is new. The concept has
become relevant and more researched with societal response
to health emergencies during the past two decades.

Justification (rationale)
Health system resilience is key to coping with catastrophic
events, such as the economic crisis and COVID-19 pandemic.
However, there is confusion about the meaning of resilience,
strengthening it and assessing it. Furthermore, health system
resilience research has reached a crucial point; health system
interventions have only partly been followed by empirical
research and concrete applications. Therefore, the appli-
cation of resilience-enhancing strategies with existing frame-
works needs to be assessed to identify the management gaps
and give valuable recommendations from the lessons learnt
from the global pandemic. Importantly, improving resilience
could help the health system respond to a pandemic like
COVID-19. However, most of the research has so far remained
primarily theoretical. Therefore, applied research towards a
cohesive set of goals needs to be identified and promoted
to develop and implement strategies to strengthen systems.
Furthermore, strengthening health system resilience can be
addressed during the pandemic and future disasters if the
issues are correctly addressed during research and interpre-
tation of findings. Therefore, there is a need to analyse
the implementation of resilience-enhancing strategies to
draw lessons from health systems that have proved more
successful at dealing with the past crisis and offer evidence
on best practices for health systems under strain. Moreover,
it will invariably help improve the level of preparedness and
response to similar public health emergencies in the future.

Objectives
The objectives of this systematic review are:
1. To identify and describe the implemented health
system resilience-enhancing strategies for managing
PHEIC globally (including national, regional and
global levels).
2. To identify success, and challenges, and provide rec-
ommendations towards successful management of
PHEIC in future pandemics.

Review question
What are the success strategies, and challenges toward
health system resilience for managing PHEIC globally?

METHODS AND ANALYSIS
Type and method of review and reporting
Health systems resilience: A systematic review
The systematic review will be reported using the
Preferred Reporting Items for Systematic review and
Meta-analysis Protocols guideline (PRISMA-P) (refer
online supplemental file 1).

Study period
30 March 2022 to 30 November 2022.

Anticipated or actual start date for the review
15 July 2022.

Anticipated or completion date
30 November 2022.

Eligibility criteria
Inclusion criteria
We intend to include all studies in English with qualitative design that can be included under one or more six building blocks of health systems that adhered to resilience-enhancing strategies for the management of PHEIC after the establishment of IHR in 2007. All qualitative studies in peer-review journals will be included. Also, reference checking of detected peer-review studies and hand searching of related journals will be conducted and relevant studies will be included after assessing quality.

Exclusion criteria
Empirical studies that did not mention health system resilience strategies for pandemic/epidemic management, editorials, letter to editor, and conference proceedings will be excluded.

Source of information and search strategies
WHO’s six building blocks of health systems\(^3\) were included as the keywords. Boolean operators (‘AND’ or “OR”) and asterisk search operators will be applied. The complete search strategies for all databases are presented in a table. To avoid duplication and for citation purposes, references will be collected from each database and stored in EndNote desktop V.20. The search will be restricted to the peer-reviewed literature related to the management of declared PHEIC after 2007 according to the IHR for global health security.\(^6\) Screening, reference checking of detected studies and hand searching of related journals were conducted from 30 May to 15 July 2022. Electronic databases (PUBMED, EMBASE, SCOPUS, Web of Science) and Google scholar search engine, which were published in peer-reviewed journals after declaration of PHEIC will be used to describe the related management strategies and lesson learnt. The relevant keywords under the main three themes listed in Table 1 will be used to create a comprehensive search strategy. The search terms will be filtered by a combination of different key words, Medical Subject Headings (MeSH), Emtree terms, SCOPUS and WOS search strategies as in the online supplemental file 2.

Table 1 The applicable keywords and/or phrases under the main three themes

<table>
<thead>
<tr>
<th>Theme 1</th>
<th>Theme 2</th>
<th>Theme 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health system building blocks,(^3)</td>
<td>Resilience,(^1)</td>
<td>Pandemic/PHEIC,(^6)</td>
</tr>
<tr>
<td>“Service delivery” OR “Health Resource” OR “Health workforce” OR “Health information system” OR “Health Product” OR “Vaccine” OR “Medicine” OR “Diagnostic” OR “Health Financing” OR “Health Leadership” OR “Health Governance”</td>
<td>AND Resilien* OR Robust OR Anti-fragil* OR Adaptab* OR Transformat* OR Preserv*</td>
<td>“Public Health Emergencies of International Concerns” OR “PHEIC” OR Pandemic OR Outbreak OR Epidemic OR COVID-19 OR Ebola OR H1N1 OR “Influenza Pandemic” OR Zika OR Poliomyelitis OR “Monkey pox”</td>
</tr>
</tbody>
</table>

Condition and domain being studies
Global implementation of health system resilience strategic analysis combined with PHEIC management will be studied to provide recommendation for future pandemic preparedness.

Population
Global studies managing PHEIC which describe health system resilience strategies will be taken as the study population.

Intervention(s)/exposure(s)
Global health system resilience-enhancing strategies for the management of pandemics that were declared as PHEIC will be included to identify success and challenges and provide recommendations towards successful management of public health emergencies.

Context
National, regional and global health system resilience-enhancing strategies for the management of PHEIC and implementation will be assessed.

Main outcome(s)
Application of resilience-enhancing strategies for the improvement of managing PHEIC in all six areas of the health system,\(^3\) (including governance/leadership, healthcare financing, healthcare service delivery, health workforce, health information system and access to medicine/vaccine) towards better management of pandemic.

Additional outcome(s)
Success and challenges towards the management of PHEIC will be identified in view of constructing recommendations for the management of future pandemic situations. The impact of strong health system resilience-enhancing strategies on reducing morbidity and mortality due to proper management of pandemic will be described.

Data management
Data extraction
The initial search was performed by reviewers using predetermined search terms and strategies from chosen
databases. After the removal of the duplicates, the titles, abstracts and keywords were screened for relevance and eligibility criteria. The two reviewers will then extract the data from the studies selected for inclusion using a predesignated extraction form. We will use a Microsoft Excel spreadsheet format for data extraction. It will be done by two research team members (RMNUR and NP) independently to reduce the bias. We also conduct a double check-up and verification of the extracted information by the supervisory senior author (YA). The data extraction form consists of the details about the title of the study, author, publication year, study question/objectives, study setting/country, study design, analysis methods, exposure/main results (strategic area of six building blocks), challenges/weaknesses, success and study limitations (refer online supplemental file 3). Two reviewers (RMNUR and RBK/AE/NP/GDS) will be independently coded and tabulated on the findings. Adapting from the WHO Six Building blocks, we use the six key areas of the health system, as a guiding theme for the reporting of findings.

Risk of bias (quality) assessment
All retrieved studies were initially imported into the Rayyan software to assist in removing duplicates. After removing the duplicates, it was shared among collaborators for independent screening of articles by title and abstract based on eligibility criteria. A three-stage screening process will be used to eliminate non-relevant articles at the stage of title, abstract and full-text screening. The studies that would have the two or more reviewers agreed on will be subjected to a full-text review. The two reviewers will independently review the full text of all eligible studies that meet the inclusion criteria and will be retained for the final synthesis (RMNUR and NP). All eligible retrieved articles will undergo a quality assessment process during the synthesis of results and will be done by four independent reviewers (YA, RMNUR, RBK, AE). The two independent reviewers (RMNUR and NP) will use the Joanna Briggs Institute’s critical appraisal checklist for the qualitative research assessment. When there will be a disagreement between the two reviewers, the senior team member (YA) and senior collaborators (CA, MSDW, TKT) will be engaged and a discussion along with the two reviewers will be made to resolve the differences.

Strategies for data synthesis
Double check-up and verification of the extracted information will be done by the senior reviewers (YA, CA, MSDW, TKT). Two team members (RMNUR and NP/GS) will be independently coded and tabulated the findings on the thematic areas (six core areas of the WHO health system) of the review and will map out common codes, concepts and categories. Adapting from the WHO framework, we use the six core areas of the health system, as a guiding theme for the reporting of findings. The key findings will be collated under those core areas of the health system including Governance/leadership, Healthcare financing, Healthcare service delivery, Heath workforce, Health information system and access to medicine/vaccine. The investigators initially discussed the analytical themes/framework independently and then collectively as a group to minimise the bias. Thus, the senior authors (YA, CA, MSDW, TKT) cross-validate and resolve any discrepancies. The four main team members (RMNUR, CA, RBK, AE) will also be regrouped as successes, challenges and strategies to realise the management of the pandemic. All the reviewers will initially generate the analytical themes independently and then collectively as a group to minimise the bias. This framework offers a detailed list of likely factors that could contribute to the possible strategies for the attainment of six building blocks for enhancing the health system for pandemic management. The senior team members (CA, YA, MSDW, TKT) built on the five team members’ work by categorising and synthesising applicable and emergent codes into final relevant themes, cross-validate all synthesised findings, and resolving any discrepancies. Meta aggregation of the data will be done.

Analysis of subgroups or subsets
The successes and challenges of health system resilience strategies on the management of pandemics Public Health Emergencies of International Concerns with regard to the context of achieving impacts, including improved health outcomes, equity, social and financial risk protection, responsiveness and efficiency, which contribute to strengthening health systems to provide sustainable quality, efficient and effective health services will be assessed.

Patient and public involvement
None.

DISCUSSION
Health systems resilience is key to coping with catastrophic events, such as the economic crisis and COVID-19 pandemic. The mapping of available literature towards the application of resilience-enhancing strategies with existing frameworks needs to be assessed to identify the successful strategies, management gaps and give valuable recommendations from the lessons learnt from the global pandemic to improve the level of preparedness and response to similar public health emergencies in the future.

Language
English.

Country
Australia and Sri Lanka.

Stage of review
Review ongoing.
ETHICS AND DISSEMINATION

Ethics approval and consent to participate: Not applicable.

Databases that require an institutional license will be accessed through the library at Postgraduate Institute of Medicine (PGIM), University of Colombo Sri Lanka and The University of Queensland Australia.

DISSEMINATION

Pre-print of the protocol is available on https://www.medrxiv.org/content/10.1101/2022.06.14.22276386v4

The screening of the articles was done using Rayyan software in a transparent manner. All included and excluded articles are on the system with reasons.

The findings will be presented at conferences at The University of Queensland in Australia, PGIM, University of Colombo Sri Lanka and other locations around the world.

Finally, the review’s findings will be published in a peer-reviewed international journal and will be disseminated to global communities for the application of successful management strategies for the management of future pandemics.

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