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Strategies and challenges for maintaining the continuity of essential health services during a pandemic: a scoping review

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Abstract

Background The coronavirus disease 2019 (COVID-19) pandemic has had a significant impact on health systems worldwide, resulting in disruptions to essential health service delivery, such as routine immunizations, maternal and child health, and treatment for communicable and noncommunicable diseases. These services have been disrupted due to the diversion of resources towards the COVID-19 response. Therefore, the objective of this scoping review was to identify the strategies and challenges associated with maintaining the continuity of essential health services during a pandemic.

Methods This scoping review study was conducted in 2023 using the proposed Arksey and O'Malley framework. We conducted searches on PubMed, Scopus, ProQuest, and Web of Science using relevant keywords. Additionally, we searched Google Scholar, hand-searched reference lists of included studies, and reviewed organizational reports, websites, and other sources of information. Content analysis was employed to summarize the themes from the selected articles.

Results Our search of major databases yielded 3,732 results. After the screening process, 47 articles were included in the scoping review. The extracted interventions were classified into six groups based on the building blocks of the World Health Organization health system: leadership and governance, access to essential medicines, health systems financing, the health workforce, health service delivery, and health information systems.

Conclusions The implementation of effective strategies and interventions can help ensure the provision of essential health services during a pandemic. These strategies include leveraging technology for remote care, ensuring the safety of healthcare workers and patients, strengthening supply chains, and establishing flexible and adaptive healthcare systems.

Keywords Essential health services, Healthcare systems, COVID-19, Pandemic, Continuity of care

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Background

The COVID-19 pandemic has had a profound impact on global health systems, disrupting the delivery of essential health services and exacerbating existing healthcare disparities. These disruptions have been attributed to various factors, including overwhelmed health systems, a reduced health workforce, and fear of infection among patients and healthcare providers [1, 2].

In response to the pandemic, many countries have implemented measures such as lockdowns, social distancing, and travel restrictions to slow the spread of the virus. While these measures have been effective at reducing transmission rates, they have also led to the disruption of routine healthcare services, including maternal and child health, immunization, and chronic disease management. These disruptions could have long-term adverse effects on health outcomes [3, 4].

The maintenance of essential health services (EHSs) during infectious disease pandemics is critical for mitigating the impact of the pandemic on population health. To address the impact of the COVID-19 pandemic on essential health service delivery, various interventions have been proposed and implemented. These interventions include the use of telemedicine, community-based care, task shifting, and strengthening health system resilience [5]. Although these interventions have shown promising results, their effectiveness in maintaining essential health service delivery during the pandemic has not been fully evaluated.

This paper reviews the literature on interventions and challenges associated with the maintenance of essential health service delivery during infectious disease pandemics such as COVID-19. This review will focus on interventions that have been proposed and implemented to mitigate the impact of the COVID-19 pandemic on essential health service delivery. Based on our review, we identify best practices, experiences, and recommendations for the maintenance of essential health services during infectious disease pandemics.

The findings of this paper can inform policymakers, healthcare providers, and public health practitioners about strategies that can be employed to ensure the continuity of essential health services during infectious disease pandemics. The insights gained from this review may also contribute to the development of more resilient healthcare systems that can withstand future crises.

Methods

This study was conducted based on the framework developed by Arksey and O'Malley. The framework consists of six stages: (a) identifying the research question; (b) identifying relevant studies or search strategy; (c) selecting the study; (d) charting the data; (e) collating, summarizing, and reporting the data; and (f) consulting [6].

Stage 1: identifying the research question

The objective of this study was to identify existing evidence and document experiences related to the delivery of essential health services during infectious disease pandemics such as COVID-19. The main question of the current study is 'What are the strategies and challenges for maintaining continuity of essential health services during a pandemic?' The sub questions include the following:

- What interventions and strategies have been employed to provide essential health services during the COVID-19 pandemic?
- What are the challenges encountered in maintaining essential health services during the pandemic?

Stage 2: identifying relevant studies

We classified key terms into three main domains: COVID-19, health services, and maintenance. These terms were primarily drawn from Medical Subject Heading (MeSH), initial literature review, and expert opinions on the topic. The terms were finalized through a pilot search. The full search strategies are available in Table S1 (Additional file 1).

We searched relevant electronic databases, including Medline (via PubMed), Scopus, ProQuest (Coronavirus Research Database), and Web of Science, from late December 2019 to February 27, 2023. Additionally, we carefully reviewed the references of the articles found, citation lists of relevant studies, gray literature (Gray.net), published reports on the maintenance of essential health service delivery, preprint databases, the website of the World Health Organization (WHO), and other relevant sources of evidence.

Stage 3: study selection

After all the search results were gathered, the results were entered into EndNoteX8 software, and duplicate results were removed, after which the title/abstracts were screened by two investigators (NK and KG). Subsequently, the full texts of the relevant studies were carefully reviewed in an iterative manner to determine eligibility. Any inconsistencies in the inclusion/exclusion decisions between the investigators were discussed until a consensus was reached. If the two screening tools could not reach a consensus, a third reviewer (MF) was consulted for arbitration.

Inclusion criteria

Documents were included for data extraction and analysis if they met all of the following criteria:

1. Studies that describe the implementation of interventions to ensure the continuity of essential health services.

2. Studies that have examined countries' experiences with essential health service delivery during the COVID-19 pandemic.
3. We limited the study to those written in the English language.

Exclusion criteria

Studies were excluded from our literature review based on the following criteria:

1. Studies that discuss nonessential health services such as osteoporosis.
2. Studies that lacked a strategy to ensure the continuity of essential health services.
3. Studies targeting only special groups of people, for example, homeless people and immigrants.

Stage 4: charting the data

The investigators extracted the data using a data extraction table, and key themes and additional findings were identified through a review of the summary table and the extracted data (NK and KG). The data charting form was designed in Microsoft Excel 2010 and piloted by two investigators using three articles (NK and KG).

All the data were extracted and entered into the designed form. The data extraction form included study characteristics such as author, country, study design, population description, service continuity strategy, challenges/barriers, and other relevant information. Two researchers (NK and KG) independently extracted the relevant information from the included articles. Any ambiguities were resolved through discussions with the research team. The complete and detailed data extraction sheet is available in Table S2 (Additional file 2).

Stage 5: collating, summarizing, and reporting the data

The method of content analysis was independently implemented for data analysis by two investigators. The data analysis process consisted of five steps: (1) Familiarizing with the text of the articles, (2) Identifying categories, (3) Placing articles in specified categories, (4) The categorization was reviewed based on the results, and (5) The reliability of the results was ensured through consensus.

After the extraction and reporting of the results, a comprehensive analysis was provided in the discussion section based on the results and perspectives of the research team.

Stage 6: consultation

During the final phase of the study, we actively involved key stakeholders to obtain valuable insights and validate the obtained findings.

Results

Our search strategies in major databases yielded 3,732 results, which decreased to 1,857 articles after eliminating duplicates. Among these, 117 met the inclusion criteria. Additionally, 1,266 documents were identified through other methods, 28 of which met the inclusion criteria. We excluded 98 papers from the scoping review for the following reasons: discussing nonessential health services ($n = 8$), lacking a service continuity strategy ($n = 35$), discussing challenges related to essential health service strategies ($n = 38$), focusing on a specific small population ($n = 3$), being in other languages ($n = 4$), and not being peer reviewed ($n = 10$). Through a precise and rigorous review of the full texts of the relevant studies, we identified 47 articles that met the previously mentioned eligibility criteria and were eligible for inclusion in the systematic review [1, 5, 7–50].

The PRISMA 2020 flow diagram, which displays the selection and screening process, along with detailed information on the search results, is presented in Fig. 1.

Findings regarding the types of interventions and modifications implemented within the health system to ensure the continuity of essential health services were categorized based on the WHO building blocks of a health system (Fig. 2). The WHO building blocks encompass leadership and governance, access to essential medicines, health systems financing, the health workforce, health service delivery, and health information systems [51]. Definitions and guidelines for classifying interventions are provided in Appendix 1 (Additional file 3).

Leadership and governance

Interventions related to leadership and governance for maintaining essential health services include the establishment of a national task force [20, 30], the development of protocols and guidelines [5, 34, 35], service prioritization [5, 10], the provision of resources, the development of communication strategies, and the establishment of a monitoring structure.

Establish a national task force

A national task force plays a crucial role in providing leadership and coordination for pandemic response and ensuring the continuity of essential health services. The task force should consist of Ministry of Health (MoH) officers, representatives from District Local Governments, nationwide public health authorities, health improvement partner organizations such as UNICEF and the WHO, and other relevant organizations. Responsibilities of the taskforce include developing and implementing policies and guidelines for delivering essential health services, coordinating resource allocation, and responding to outbreaks [20, 30].

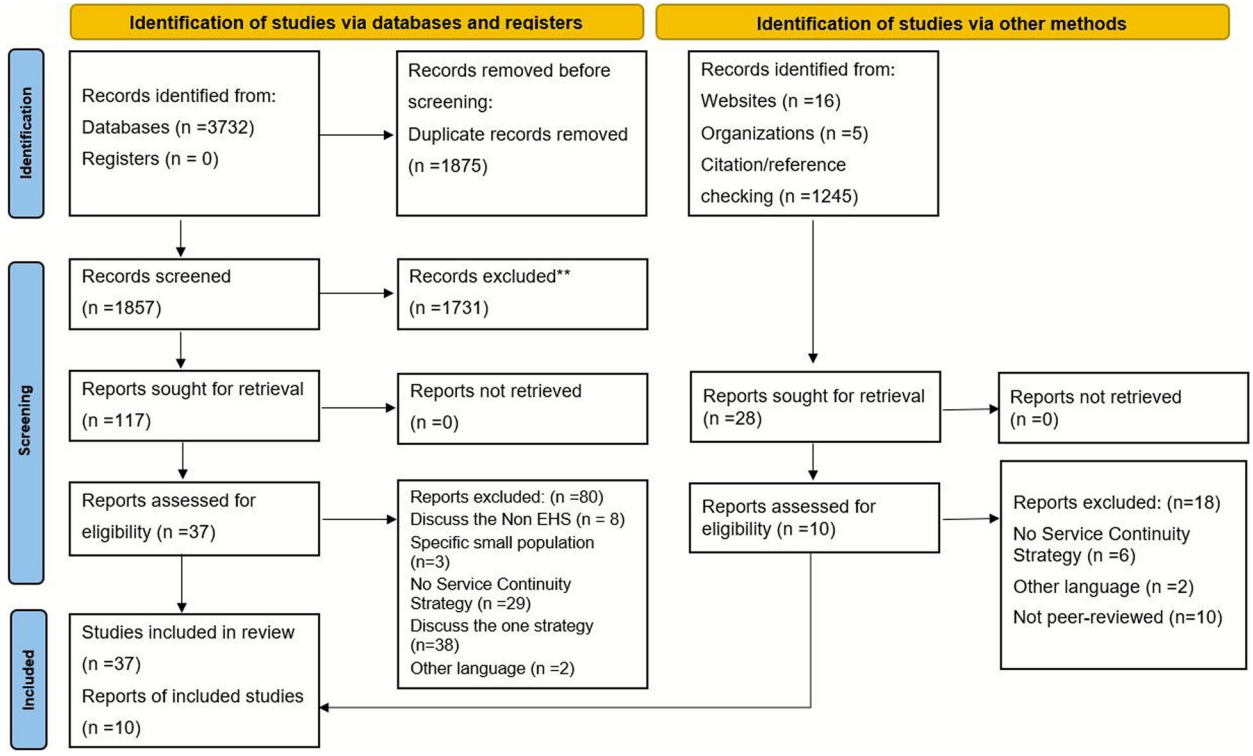

Fig. 1 PRISMA-based flow diagram

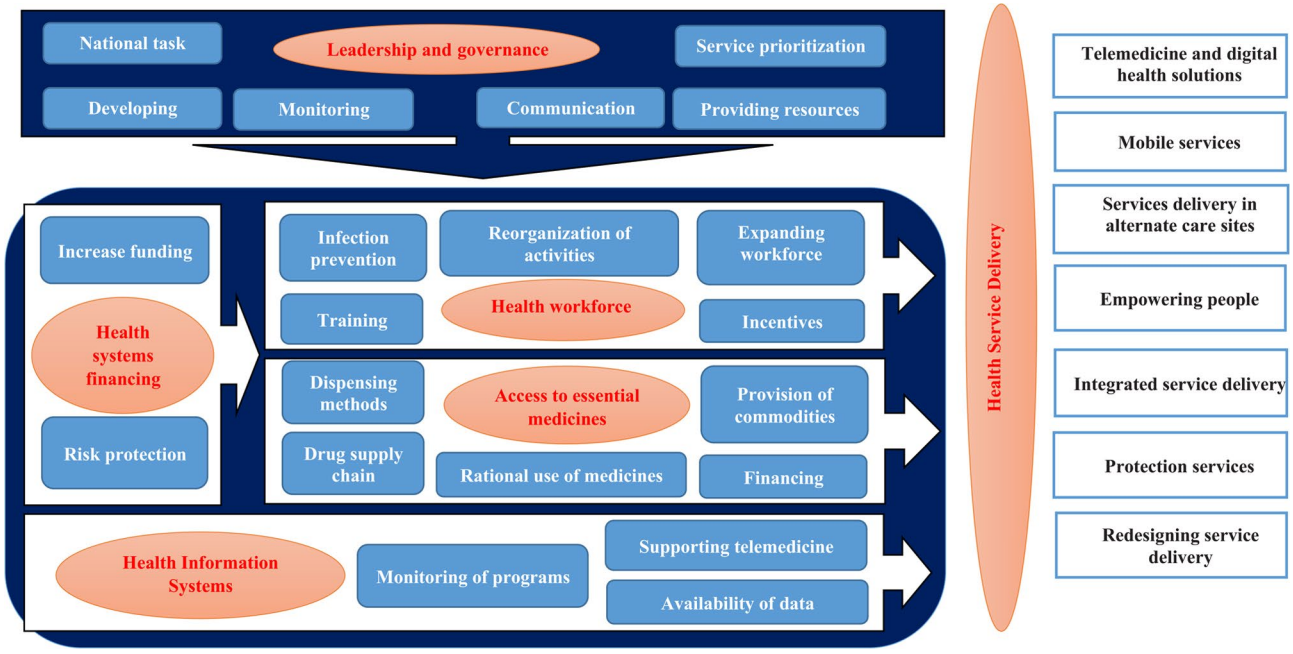

Fig. 2 Classification of interventions to maintain essential health services by WHO health system building blocks

Developing protocols and guidelines

During an epidemic, it is vital to develop and disseminate guidelines for epidemic management and the maintenance of essential health services. The MoH should formulate these guidelines and protocols, ensuring their implementation by district local governments and monitoring compliance.

This intervention involves modifying protocols, standardizing outpatient activities, establishing overarching policies or guidelines for ensuring the continuity of

essential services during a pandemic, adapting service delivery structures, and implementing pandemic safety protocols [5, 34, 35].

Service prioritization

First, the prioritization of service requests is crucial for addressing the most urgent and important needs. Various triage approaches and prioritization strategies for essential health services are implemented to optimize resource allocation, redirect services, and manage scarcity [5, 10, 37].

Providing resources

Healthcare resources encompass the materials, personnel, facilities, funds, and other elements necessary for delivering health services [52]. Enhancing infrastructure, augmenting human resources, and improving resource availability are essential during a crisis. Interventions to increase human resources in the health sector involve engaging nonhealth workers from other government departments and the private sector and partnering with nongovernmental organizations (NGOs) [29, 40, 43].

Developing communication strategies

Effective communication strategies ensure that healthcare providers and the public are well informed about the pandemic response. These strategies should be evidence-based and tailored to different audiences. They should provide information on the delivery of essential health services and offer guidance on infection prevention and control measures [5, 16].

Establish a monitoring structure

A monitoring structure should be responsible for overseeing the pandemic response, ensuring the delivery of essential health services, and addressing any gaps in the response [5, 49, 50].

Access to essential medicines

Interventions aimed at maintaining essential health services in terms of access to essential medicines include supply chain organization and management, novel dispensing approaches for medicines, infection prevention and control of commodities, promotion of rational use of medicines, and addressing affordability and financing.

Supply chain organization and management

Supply chain management involves organizing and overseeing activities related to the supply chain for all essential medicines and equipment across all healthcare levels. Essential interventions for organizing and managing the drug supply chain include substituting unavailable medications [7], emergency orders and inter warehouse transfers of essential products [30]; allowing pharmacists to substitute dose strengths or forms of medicines without prior approval from the doctor when the prescribed medicine is unavailable at the time of dispensing [28]; implementing restrictions on the quantity of medicines that can be purchased to prevent unnecessary stockpiling; and ensuring the ongoing supply of medicines without the need for a new prescription from the doctor [28].

Novel dispensing approaches for medicines

Innovative approaches for dispensing medicines during the COVID-19 pandemic include multi-month dispensing [23, 48], establishing "fast track" pharmacies [23], facilitating home delivery of medication [28, 34] and extending the length of prescriptions [22, 29, 39] to ensure access to essential medicines.

Infection prevention and control of commodities

Infection prevention and control (IPC) is a crucial component of reducing the spread of infections and improving health outcomes. The availability of personal protective equipment (PPE) plays a vital role in ensuring the continuity of essential health services [5, 20, 50]. Encouraging and supporting the local production of PPE through universities, technical colleges, and local industries is important for ensuring a steady supply of infection prevention and control products [27, 43].

Promotion of the rational use of medicines

The promotion of rational use of medicines is essential for ensuring appropriate utilization of essential medicines. This can be achieved through the development of evidence-based treatment guidelines, training healthcare providers, and educating patients about the proper use of medicines [53].

Addressing affordability and financing

Ensuring access to essential medicines also involves addressing issues of affordability and financing. Governments can employ mechanisms such as health insurance and subsidies to make essential medicines more affordable, particularly for vulnerable populations [53].

Health system financing

Interventions related to financial resources include increasing funding for healthcare and providing financial risk protection.

Increased funding for healthcare

Governments can enhance funding for healthcare to ensure the provision of essential health services during the pandemic. This can be achieved through various measures, such as maintaining regular government funding [5, 30, 49], prioritizing the allocation of foreign currency to the health sector [27], securing supplementary

funding from governments and international agencies to support service continuity [30, 43], establishing funding for telehealth services (including telephone and videoconferencing services) in primary care settings [15], and reallocating budgetary resources [10].

Financial risk protection

Financial protection refers to the extent to which health systems shield individuals from the financial risks associated with illness. Direct payments for healthcare do not lead to financial hardship or threaten individuals' living standards. Health financing policies play a crucial role in ensuring financial protection [54].

During the COVID-19 pandemic, governments implemented financial protection policies that included the removal of user fees [42, 46], the implementation of measures to protect individuals from financial risks in the face of potential health and economic crises [33], the provision of cash transfers to vulnerable populations to access care, the establishment of agreements with private health facilities to offer essential health services supported by public funds [1, 41, 42] and the elimination of financial barriers to access through measures such as vouchers and free services/supplies [5, 34].

Health workforce

Interventions to ensure the continuity of essential health services include providing financial and nonfinancial incentives, developing and implementing infection prevention and control measures, conducting staff training, expanding the health workforce, and reorganizing activities.

Provision of financial and nonfinancial incentives

Health systems utilized financial and nonfinancial incentives to motivate their employees to perform better at delivering health services during the COVID-19 pandemic. Incentives included showing appreciation to the health workforce, providing paid sick leave and overtime pay [1, 41, 42], offering special insurance packages [50], increasing hazard allowances [16, 32], ensuring job security [26, 32], providing accommodations and transportation close to facilities [32, 50], offering psychological support [26, 34, 50] and supplying free medicines and supplies [19].

Development and implementation of infection prevention and control measures

To guarantee the safety of healthcare workers and patients, it is crucial to develop and implement infection prevention and control measures. This approach entails ensuring the proper use of personal protective equipment [8, 12, 25], implementing infection control procedures, establishing guidelines and protocols for health worker safety [30], creating settings for the quarantine of health workers [43] and providing a safe environment for both health workers and users [49].

Staff training

To ensure that healthcare workers possess the necessary skills and knowledge to provide essential health services during the pandemic, it is essential to provide training and education [25, 27, 49]. Various methods, such as online e-learning platforms and virtual continuing medical education, were utilized to train individuals on infection prevention and control, as well as on the management of COVID-19 cases [21, 30, 34].

Expand of the health workforce

To address potential shortages of healthcare workers during the pandemic, it may be necessary to expand the health workforce [5, 25, 26]. This can be achieved by establishing pathways for accelerated training and early certification, hiring new health personnel [37, 42], redeploying staff [25, 30], converting part-time health workers to full-time positions, utilizing senior health workforce students and retired employees, and engaging community health workers [25, 29, 43].

Reorganization of activities

Many countries have reported reorganizing healthcare services through various initiatives in response to the diverse infrastructure, logistics, and service capacities of healthcare facilities. The reorganization of services at the onset of the COVID-19 pandemic included redistributing health worker tasks and optimizing roles, task shifting to redistribute healthcare workloads, and improving communication between health workers and patients [36, 39, 42].

Health service delivery

Interventions to maintain and ensure the continuity of essential health services in relation to service delivery include telemedicine, mobile services, service delivery at alternate care sites, empowering people, integrated service delivery, protection services, redesigning and flexibility in service delivery.

Implementation of telemedicine and digital health solutions

Telemedicine involves the use of technologies such as telephones, WhatsApp, webinars, video chats, email, M-health, e-pharmacies, and virtual clinics to provide healthcare services remotely [19, 26–29]. It has been widely adopted during the pandemic for offering virtual consultations, monitoring chronic conditions, and providing mental health services, among other purposes [10, 25, 49].

Mobile services

Mobile clinics have been utilized to access underserved and remote communities with limited access to health services [15, 39]. They have been deployed in the form of vans and buses [15, 26] and set up tents to provide testing, vaccination, and cancer screening services [11].

Service delivery at alternate care sites

Alternate care sites can be utilized within or outside the health systems as locations are converted to provide healthcare services during crises [30, 37, 42]. At the peak of the COVID-19 epidemic, alternative care sites such as schools, pharmacies, and specialized practices were used for vaccinating children and adolescents, while banks were used for vaccinating older adults [18, 38].

Empowering people

Empowerment refers to people having power and control over their own lives and receiving the support that is right for them. Various methods have been employed during the COVID-19 pandemic, such as promoting self-care [44, 45], self-management of chronic diseases [10, 30], incorporating health topics into radio and TV talk shows [31, 33] and conducting public awareness campaigns to empower individuals [49, 50].

Integrated service delivery

Health systems have integrated essential health services with COVID-19 services to ensure the continuity of care [42, 50]. For instance, COVID-19 testing and vaccination have been integrated with routine immunization services, and HIV, hypertension, and diabetes prevention and treatment services have been integrated [31, 42].

Protection services

Strategies such as separating health service facilities from units providing treatment to sick or infected individuals [31, 50]; regularly disinfecting facilities, rooms, and equipment [25, 49]; implementing a "No mask, no service" policy [24, 50]; establishing handwashing stations; improving ventilation [50]; maintaining physical distance [49]; managing appointments; and reducing waiting times at health facilities to avoid congestion during peak hours can help prevent the spread of infectious diseases and protect healthcare providers [23, 31, 49].

Redesigning and flexibility in service delivery

Health systems have adopted approaches to redesigning and flexibly delivering services [12, 37], such as extending operating hours [8, 25, 42], risk stratification and triage [5, 42, 46], implementing catch-up campaigns for missed appointments, home-based care and drive-through clinics to ensure that patients can safely access essential services [26, 37, 42].

Health information systems

Interventions in health information systems to maintain essential health services involve monitoring program progress, supporting telemedicine and digital health solutions, and ensuring the availability of essential data.

Monitoring program progress

Strengthening online, web-based information systems; providing data reporting tools; reinforcing continuous and complete reporting of data on essential health services; and regularly managing and monitoring data on the continuity of essential health services are essential for monitoring program progress and ensuring the provision of essential health services. Community outreach can also be conducted to inform individuals about service disruptions and changes, thereby monitoring the progress of the program [34, 43, 50].

Support telemedicine and digital health solutions

Health information systems can support the implementation of telemedicine and digital health solutions, which include remote consultations, tele-monitoring, and mobile health applications [5].

Ensure the availability of essential data

Ensuring the availability of essential data, including data on COVID-19 cases, essential health services, and the availability of the health workforce, is crucial for delivering essential health services during the pandemic [5].

Common challenges and interventions for the continuity of EHS Numerous challenges to the continued delivery of EHS have been reported during the COVID-19 pandemic. Table 1 presents the most significant barriers and challenges faced in ensuring the continuity of EHS during this period.

Discussion

This scoping review identified key strategies and challenges adopted by countries worldwide to maintain the continuity of essential health services within their healthcare systems during the COVID-19 pandemic. The pandemic has posed unprecedented challenges for healthcare systems and has significantly impacted the delivery of essential health services. Even countries with strong health systems have been affected by the new challenges posed by COVID-19, requiring them to implement several interventions to ensure the provision of essential health services while dealing with a novel communicable disease.

Governments have implemented various adaptations, adjustments, and innovations in models of care delivery to ensure the continuity of care across different components of the health system. Effective leadership and

Table 1 Common challenges and interventions for the continuity of essential health services

Service Continuity Strategy	Challenges/barriers	Facilitators/Advantages
Implement telemedicine and digital health solutions	■ Breakdown of the relationship between patients and the health professions ■ Low quality of information provided by patients ■ Organizational and bureaucratic barriers ■ Challenges in the use of telehealth among economically disadvantaged patients [11] ■ Lack of access to mobile phones ■ Inaccurate capture of patient information [12] ■ Difficulties accessing telehealth platforms or web-based services [23] ■ Technology illiteracy ■ Aversion to telehealth ■ Inadequate internet connectivity or lack of access to devices like smartphones and laptops, particularly among underresourced populations. ■ language and cognitive barriers ■ Privacy and safety concerns ■ lack of access to home monitoring medical devices ■ Reluctance to provide virtual care. ■ Practical limitations in examining patients remotely. ■ Financial revenue loss due to reduce in-person consultations [25] ■ Absence of national policies for telehealthv [26] ■ Limited interest and acceptance of telehealth ■ lack of digital literacy [28] ■ Unavailability of budgets in the health system ■ No internet access ■ Providers paying out of pocket for online services ■ Scarce guidance on providing telemedicine services [8] ■ Limited access to the internet, technology, or knowledge of how to navigate technology among the older adult population [9]	■ access to specialist physicians who are often not physically available at a given time ■ Reduction of challenges through technological advancements and the accumulation of experience by healthcare professionals ■ The need for proper budget allocation and instructions, particularly for the elderly and individuals residing in rural areas [11] ■ Provision of training, motivation, psychological support, and personal protective equipment (PPE) [12] ■ Assistance provided to physicians in the decision-making process. ■ Utilization of fewer clinical resources. ■ Reduction of exposure risk to patients. ■ Assistance in reaching rural and underresourced areas [17] ■ Easing of regulations governing telehealth licensing. ■ Ensuring reimbursement requirements for healthcare providers. ■ Other facilitators include technical and organizational factors such as the presence of existing telehealth infrastructure (e.g., internet access, digital platforms, and devices). ■ Training of providers and patients in the use of telehealth ■ Implementation of organizational funding models. ■ Provider incentives for telehealth adoption (e.g. pay for performance) [25] ■ facilitating doctor–patient communication through telehealth services [28] ■ The increasing popularity of the internet and the widespread use of smartphones, as well as the emergence of fifth-generation networks [44]
Mobile services such as using vans and buses	■ Mechanical issues, such as the need to return the van for repairs to the manufacturer. ■ Insufficient battery storage leading to running out of electricity. ■ Remote access to client medical records ■ Obtaining necessary council permits to park the mobile clinic in a public space. ■ Ensuring the presence of appropriate utilities (e.g., electricity supply) and amenities (e.g., toilets) near the mobile clinic. ■ Lack of medical equipment in several clinics ■ Ensuring adequate sound proofing for consultations ■ Identifying the most suitable approach to managing potential risks, including procuring medical equipment that fits the physical space of the mobile clinic (e.g., electrocardiograph machine, defibrillator) [15]	■ Having sufficient health workforce ■ Adequate funding [15]

Table 1 (continued)

Service Continuity Strategy	Challenges/barriers	Facilitators/Advantages
Services delivery in alternate care sites	■ Aligning appointment times with school hours for school-based clinics [15] ■ Lost revenue due to an overabundance of unused doses ■ Significant financial burden resulting from vaccine storage and administration costs and insufficient insurance reimbursement Staff reluctance to assume the role of vaccinator ■ Parents' reluctance to have their child vaccinated in alternative settings. ■ Lack of access to accurate vaccine records [18]	■ Developing quality standards for vaccination in alternative settings ■ Paying attention to the importance of sufficient funding and reimbursement for vaccine supply, storage, administration, and counselling. ■ Ensuring access to vaccine records [18]
Establish a national task force	■ Conflicting demands within the member institutions ■ Lack of independent funding source or financing mechanisms [20]	■ Effective leadership and commitment [20]
Innovative pharmaceutical dispensing methods	■ The need for additional human, financial, or technical resources, which can act as a barrier to implementation or require significant time to scale up in certain settings. ■ The necessity to review and potentially modify or develop national guidelines and policies [23]. ■ Lack of medication procurement coverage by insurance [33]	
Home delivery of medication	■ Incorrect patient addresses [36]	
Appointment-based systems in health facilities	■ Difficulties in implementing time-based appointment systems [23]	
Promote self-care	■ The absence of protocols or clinical practice guideline ■ Lack of information received from professionals [44]	

governance are fundamental for maintaining EHS during pandemics. Various countries adopted comprehensive governance models involving task force establishment, protocol development, resource allocation, service prioritization, communication strategies, and monitoring frameworks. These interconnected interventions have proven critical for pandemic resilience, forming a model that emphasizes coordination, flexibility and evidence-based decision-making core elements in building healthcare systems capable of withstanding public health crises.

For example, Uganda established a national task force comprising Ministry of Health officials, public health authorities, and international partners, such as WHO and UNICEF, to coordinate resources, develop guidelines, and respond to outbreaks in a structured manner [20, 30]. Similarly, India implemented both centralized and state-level task forces to create pandemic response protocols. Local governance structures were instrumental in adapting these guidelines to meet specific regional needs, ensuring continuity in essential services despite the unique challenges faced in different areas [34, 5, 35].

Iran implemented enhanced measures for the meticulous care and ongoing monitoring of vulnerable populations, such as foreigners, pregnant women, the elderly, and individuals in diverse professions. These efforts include reviewing service packages for all age groups and developing specific COVID-19 service and care packages tailored to these target groups [55] Brazil focused on clear, evidence-based communication strategies directed at both healthcare providers and the public. These strategies were critical to ensure compliance with infection prevention measures and maintaining EHS during the pandemic [5].

The establishment of national task forces played a pivotal role in coordinating leadership and response efforts, with task forces typically including experts from various sectors who oversee EHS delivery, set priorities, monitor service continuity, allocate resources, and manage outbreak responses. Defining clear roles within these task forces and ensuring effective communication among members enhanced the resilience and adaptability of health systems. However, the disruptions observed in EHS during COVID-19 underscore the need for dedicated coordination structures specifically aimed at maintaining these services [56, 57]. Lastly, implementing monitoring mechanisms proved critical for continuity, enabling systems to assess real-time service needs and make necessary adjustments. However, monitoring was not always integrated into standard operating procedures, indicating a gap that future pandemic preparedness plans should address [35, 37, 58].

Access to essential medicines is crucial for health system resilience, especially during emergencies. Strong supply chains, supported by coordinated efforts among

suppliers, manufacturers, and healthcare providers, are key to ensuring medicine availability. Effective strategies include implementing robust supply chain management practices and using technology and data analytics for monitoring disruptions [59].

In low- and middle-income countries (LMICs), local production of medicines can improve availability, supported by government incentives, regulatory improvements, and reduced import tariffs. Additionally, multi-month prescriptions and local distribution hubs, as seen in countries like South Africa, help mitigate access barriers in LMICs facing import dependencies [53, 59]. Also, Bangladesh fostered PPE production through university-industry partnerships, while Mexico and Uganda maintained emergency stockpiles to navigate supply disruptions. These adaptable, resilient supply chains play a critical role in health system preparedness and continuity [30, 37, 43].

Allocating funds has been a significant financing strategy employed by countries to support the continuity of essential health services during the COVID-19 pandemic. However, increasing public funding for healthcare requires political will and may face challenges due to competing funding priorities. Governments should advocate for increased public funding for essential health services during the pandemic and engage with decision makers to prioritize healthcare funding [5].

In response to the pandemic, several countries implemented diverse financing strategies to support EHS continuity. For instant, Ghana increased healthcare funding and removed user fees, ensuring financial protection and access to EHS [42]. The Philippines reallocated budgets to support telehealth services, enabling remote care and addressing immediate and future needs [15]. Kenya provided cash transfers to vulnerable populations and collaborated with private providers to support EHS delivery through public funds [42].

Additionally, exploring innovative financing mechanisms such as social impact bonds, blended finance, and health impact funds can help mobilize private sector investment in healthcare. These strategies create collaborative models that distribute financial responsibility and supplement government resources, enhancing health system resilience [60].

Among the building blocks of the health system, modifications to standard practices were related mainly to the health workforce and health service delivery. To address potential shortages of healthcare workers during the pandemic, expanding the workforce became essential. This was achieved through strategies like redeploying staff from nonessential services, hiring additional personnel, and engaging community health workers. Pakistan, for instance, mobilized community health workers and senior medical students through task-shifting to meet workforce demands during peak periods, ensuring the continuity of essential services [25, 43]. Optimizing roles and responsibilities, including task shifting when appropriate, was crucial for utilizing healthcare workers to their full potential [5].

Enhancing human resources should be a priority in responding to public health crises. Beyond increasing workforce numbers, providing financial and nonfinancial incentives is essential to motivate healthcare workers. For example, the United Kingdom offered financial incentives such as hazard pay and paid sick leave, alongside non-financial support like mental health resources and accommodations close to healthcare facilities, to sustain morale [1, 42]. While high-income countries (HICs) can often provide such benefits, LMICs frequently encounter budget limitations [29]. Task-shifting, as demonstrated in Pakistan, has been an effective strategy for addressing workforce shortages, though it may sometimes lead to increased burnout [25, 43].

Infection control measures were equally critical for maintaining service continuity. Nigeria implemented protocols for infection prevention, trained healthcare workers on PPE usage, and established guidelines to ensure both worker protection and continuous service delivery [12]. Studies indicate that well-supported and supervised community health workers can maintain essential health services effectively during crises [19]. Prioritizing the health and safety of healthcare workers is fundamental to effective public health crisis response [30].

Modifications were made to service delivery to maintain essential health services. These modifications included telemedicine, mobile services, empowering people, integrated service delivery, protection services, and flexibility in service delivery. Telemedicine and digital health became a critical tool in mitigating service disruptions, particularly in chronic disease management and mental health [5]. In countries like the United States and India, telemedicine platforms quickly scaled up to provide virtual consultations and maintain access to care [9, 21, 39]. Kenya's adoption of telemedicine, despite infrastructure challenges, also highlights adaptability in resource-limited settings [31]. While digital infrastructure allowed high-income countries to adopt telemedicine rapidly, low- and middle-income countries (LMICs) faced barriers such as limited internet access and digital literacy. Countries that provided digital training for both healthcare providers and patients saw increased utilization of telemedicine services. This underscores the importance of digital literacy as a complementary intervention to telemedicine, particularly in resource-limited settings. However, telemedicine alone may not reach all underserved populations, especially where internet infrastructure is insufficient [25]. Empowering communities to manage aspects of their health, such as HIV self-testing and chronic disease self-management emerged as a significant strategy. Countries with established

community health programs could leverage these frameworks to expand self-care initiatives more effectively. Self-management was particularly valuable where face-to-face healthcare access was limited. These findings highlight the value of strengthening community health systems as a foundation for future resilience [61].

To ensure the delivery of essential health services during the pandemic, it is important to prioritize these services and allocate resources accordingly. Service delivery models may need to be adapted, requiring the development of new protocols and procedures and the allocation of additional resources as needed. This may involve implementing triage systems, providing services in alternative locations, and offering home-based care [5].

Mobile clinics were extensively deployed to reach remote and underserved communities, offering testing, vaccinations, and other vital services. While successful in various healthcare systems, the effectiveness of mobile clinics largely depended on logistical support and sufficient funding. High-income countries benefited from stronger transportation infrastructure, whereas low- and middle-income countries (LMICs) faced challenges like high fuel costs and maintenance issues. The success of mobile clinics highlights the importance of resource flexibility, especially in transportation and mobile unit maintenance, for sustainable outreach [15, 43]. South Africa's achievements with mobile clinics could serve as a model for other LMICs aiming to expand healthcare access in underserved regions [26].

Ensuring access to essential health services for vulnerable populations during the pandemic requires targeted support. This includes addressing specific access barriers for people with disabilities, refugees and migrants, and those living in poverty, ensuring that these populations can receive the necessary healthcare during crises [5].

The health information system, another crucial building block of the health system, requires strengthening to effectively support public health needs. Health information systems play a key role in gathering, compiling, and analysing health data to manage population health and reduce healthcare costs [62]. For example, Iran established the Health Observatory Center to analyze and aggregate data related to the COVID-19 pandemic and vaccination, evaluate the situation by city and province, and report for evidence-based policy [55]. Thailand enhanced its health information infrastructure by implementing online data collection tools, enabling real-time reporting on essential health services to quickly identify and respond to service gaps [34]. To support remote healthcare delivery, Rwanda utilized a national information system that facilitated telemedicine and digital health, allowing for remote consultations, COVID-19 case tracking, and monitoring of EHS continuity, which was crucial for maintaining service access during the pandemic. Germany also ensured consistent data availability by providing regular updates on COVID-19 case counts and essential service metrics, enabling healthcare providers to monitor and effectively respond to disruptions [5].

Developing protocols and procedures for timely data collection, along with ensuring the availability, accuracy, and security of data, remains essential. These country-specific strategies demonstrate how enhanced health information systems can support resilience and responsiveness in healthcare, especially during crises [5].

Based on our findings, policymakers can adopt the following strategies to ensure the continuity of essential health services (EHS) during infectious disease pandemics. These recommendations are informed by the experiences and approaches implemented by various countries during the COVID-19 pandemic and are aligned with the principles of One Health and Universal Health Coverage (UHC):

1. Strengthen Community Health Capacity: Empowering community health workers (CHWs) and expanding community-based care allow for broader and more resilient service delivery. By investing in CHWs, policymakers can ensure that healthcare reaches underserved populations, promoting a proactive approach to managing health risks even during crises. CHWs can be mobilized for tasks such as health education, distribution of essential medicines, and home-based care, relieving pressure on healthcare facilities.
2. Enhance Digital Health Infrastructure: Investing in telemedicine and digital health systems is crucial for maintaining EHS, particularly in rural and remote areas where healthcare access may be limited during epidemics. Expanding digital infrastructure facilitates remote consultations, follow-up care, and health monitoring, reducing the risk of service interruptions. Policymakers should prioritize digital literacy initiatives to ensure that both healthcare providers and the public can utilize these technologies effectively.
3. Build Flexible and Resilient Supply Chains: To ensure the steady availability of essential medicines and equipment, establishing adaptable, localized supply chains is essential. This includes strategies like multi-month prescriptions, emergency stockpiling, and partnerships with local manufacturers. These approaches reduce dependence on global supply chains and improve resilience against disruptions, particularly in low- and middle-income countries (LMICs).
4. Support and Protect the Health Workforce: Ensuring a well-supported and protected health workforce is vital for service continuity. Policymakers should consider providing financial incentives, hazard

pay, and non-financial support, including mental health resources and adequate rest periods, to sustain morale and prevent burnout. Flexibility in task delegation, including task-shifting and role optimization, can also help manage workforce shortages effectively.

5. Establish Strong Governance and Coordination Structures: Effective governance, including national and regional task forces, is critical for managing EHS during epidemics. Policymakers should establish clear protocols and robust coordination frameworks to streamline decision-making, prioritize resources, and monitor service delivery. Defining specific roles and responsibilities within these structures can enhance accountability and responsiveness.
6. Promote Public Communication and Community Engagement: Transparent communication with the public is essential for maintaining trust and encouraging compliance with health guidelines. Policymakers should develop targeted communication strategies to provide accurate information on service availability, preventive measures, and self-care practices. Community engagement fosters public participation and strengthens the response to public health crises.

Ultimately, the aim of this research was to identify practical solutions and draw from experience to assist healthcare providers and systems in their ongoing delivery of essential health services during the pandemic and beyond. However, further studies are needed to determine the feasibility of implementing these interventions without compromising the quality of care. Additionally, conducting evaluations to assess the effectiveness of these approaches would provide valuable insights for future planning and decision-making. Future research should also focus on assessing the economic viability of these interventions, particularly in low- and middle-income countries (LMICs) facing budget constraints, to help policymakers allocate resources effectively. Notably, the literature is sparse on the impact and adaptation of essential health service strategies in low-income settings. Research specifically targeting LMICs, especially low-income countries, is essential to close this gap and develop tailored approaches.

Strengths and limitations

This study demonstrates a broad scope by reviewing responses from both high- and low-income countries, providing valuable insights applicable across diverse healthcare systems. The use of the WHO building blocks framework enhances the structure of findings, facilitating a systematic analysis of interventions and challenges within health systems. The practical insights offered are especially beneficial for policymakers aiming to enhance essential health services for future pandemics, supporting informed decision-making and preparedness across various health systems.

While this study provides a broad overview of experiences, strategies, and interventions aimed at maintaining essential health services during infectious disease pandemics such as COVID-19. However, it does not evaluate the effectiveness of these strategies, as this falls outside the scope of this research. Additionally, critical challenges remain, including ensuring equitable access to services, maintaining quality of care, and addressing the barriers and benefits of the interventions presented.

Conclusion

This study has provided strategies for ensuring the continuity of essential health services during the infectious disease pandemic within the health system. The pandemic has exposed existing weaknesses in healthcare systems and highlighted the need for improved organization of primary healthcare to ensure the provision of essential services in a pandemic setting. The experiences and strategies shared in this study have enabled countries to develop national plans for maintaining essential health services and meeting the health needs of their populations, even in the face of unprecedented challenges.

Establishing coordinating committees at different levels of the health system is crucial for maintaining health services. It is also essential to allocate more investments to the health system to ensure the continuation of essential health services during a crisis. Implementing interventions such as self-management practices and medication dispensing for longer periods, as well as leveraging technology for training and service delivery, can also support the maintenance of services. Finally, by modifying protocols and standardizing activities, the capacity of the health workforce can be increased to effectively manage and maintain essential health services.

Overall, this study provides valuable insights and recommendations for healthcare providers and policymakers to navigate and sustain essential health services during infectious disease pandemics. By implementing these strategies and investing in the health system, countries can better respond to future crises and ensure the continuous delivery of vital healthcare to their populations.

Abbreviations

WHO	World Health Organization
EHS	Essential Health Services
HIV	Human immunodeficiency virus
PPE	Personal protective equipment
NGOs	Non-Governmental Organizations
LMICs	Low- and middle-income countries
HICs	High income countries

Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

Supplementary Material 3.

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Authors' contributions
JS.T. and N.K contributed to the conception and interpretation of the study and wrote the manuscript. K.G and N.K contributed to the design of the research questions, database searches, data extraction and analysis. M.F and K.G contributed to the editing and revision of the article. JS.T contributed to the design, interpretation, revision and preparation of the final version of the manuscript. All the authors have read and approved the submitted and revised final version of the manuscript.

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Data availability
Data is provided within the manuscript and supplementary information files.

Declarations

Ethics approval and consent to participate
This study is part of a larger study conducted for a Ph.D. thesis that was approved by the Medical Ethics Committee at Tabriz University of Medical Sciences (Ethics approval no: IR.TBZMED.REC.1401.667).

Consent for publication
This section is not applicable.

Competing interests
The authors declare no competing interests.

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