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Building Resilient Healthcare Systems: The Role of Multidisciplinary Healthcare Professionals in Crisis Management and Patient Protection

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ABSTRACT:

Background: Pandemics, mass casualty incidents, natural disasters, cyberattacks, and supply chain failures repeatedly test the ability of health systems to protect patients while continuing to deliver essential care. The COVID-19 pandemic showed that resilience depends less on buildings and equipment than on the people who adapt, coordinate, and make decisions under pressure.

Objective: To examine how multidisciplinary healthcare professionals contribute to health system resilience across the crisis management cycle, how they protect patients during crises, and how their own wellbeing can be protected, with particular reference to Saudi Arabia.

Methods: A narrative integrative review of international and Saudi literature, organized around health system resilience theory, resilience engineering, the disaster management cycle, and high-reliability organizing.

Results: Physicians, nurses, paramedics, pharmacists, laboratory professionals, infection prevention specialists, health administrators, health information and digital health staff, and security personnel each fulfil distinct crisis roles. Resilience emerges from their ability to anticipate, monitor, respond, and learn together. Saudi Arabia's experience with MERS-CoV, COVID-19, and the annual Hajj illustrates how investment in surveillance, coordination, digital platforms, and workforce preparedness can strengthen response.

Conclusion: The proposed ANCHOR Framework (Anticipate, Network, Coordinate, Harness surge capacity, Operate safely under pressure, Recover and learn) offers a practical structure for building multidisciplinary crisis resilience consistent with Vision 2030 and the Health Sector Transformation Program.

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1. INTRODUCTION

1.1 Background

Health systems exist to protect people, yet they are themselves vulnerable to shocks. Over the past two decades, health systems worldwide have faced pandemics of influenza and coronavirus disease, outbreaks of Ebola and Middle East respiratory syndrome coronavirus (MERS-CoV), earthquakes, floods, heatwaves, armed conflict, terrorist attacks, and a rising wave of cyberattacks on hospitals. Each of these events threatens patient safety in two ways: directly, by creating sudden surges of need, and indirectly, by disrupting the routine services, such as chronic disease care, maternal health, and vaccination, on which populations depend.

The concept of **health system resilience** gained prominence after the 2014–2016 Ebola epidemic in West Africa, which exposed how weak systems collapse under pressure and how the collapse of routine care can cause as much harm as the outbreak itself (Kruk et al., 2015). The COVID-19 pandemic made this lesson universal. A comparative analysis of 28 countries found that effective responses depended on governance, coordination, community engagement, health workforce capacity, and the ability to maintain essential services, and that no country was fully prepared (Haldane et al., 2021). The World Health Organization's Health Emergency and Disaster Risk Management Framework and the Sendai Framework for Disaster Risk Reduction now call for an all-hazards, whole-of-society approach that strengthens health systems before crises occur (United Nations Office for Disaster Risk Reduction [UNDRR], 2015; World Health Organization [WHO], 2019).

At the heart of resilience are health professionals. Plans, stockpiles, and facilities matter, but it is people who recognize emerging threats, reorganize services overnight, care for patients in improvised settings, and make difficult decisions under uncertainty. Crises also expose professionals to infection, violence, moral distress, and exhaustion. Building resilient systems therefore requires understanding both what multidisciplinary professionals contribute and what they need.

1.2 Problem Statement

Much of the resilience literature focuses on national policy, financing, and infrastructure, while the specific contributions of different professions are discussed separately or not at all. Physicians and nurses receive most attention; the crisis roles of paramedics, pharmacists, laboratory professionals, infection prevention specialists, administrators, health information staff, and security personnel are less often analyzed. Little work examines how these groups coordinate across the phases of a crisis, or how their actions translate into patient protection. In Saudi Arabia, the experience of MERS-CoV, COVID-19, and the management of mass gatherings offers valuable lessons, but these have not been synthesized from a multidisciplinary workforce perspective.

1.3 Aim and Objectives

This paper aims to examine the role of multidisciplinary healthcare professionals in building resilient health systems, managing crises, and protecting patients. Its objectives are to:

- Clarify the main concepts and theories of health system resilience and crisis management.
- Describe the roles of key professional groups across the phases of the crisis management cycle.
- Analyze how patients and professionals can be protected during crises.
- Draw lessons from the Saudi experience and propose the ANCHOR Framework for multidisciplinary resilience.

2. CONCEPTUAL AND THEORETICAL FOUNDATIONS

2.1 Health System Resilience

Kruk et al. (2015) defined health system resilience as the capacity of health actors, institutions, and populations to prepare for and effectively respond to crises, to maintain core functions when a crisis hits, and, informed by lessons learned, to reorganize if conditions require it. They proposed that resilient systems are aware, diverse, self-regulating, integrated, and adaptive. Blanchet et al. (2017) added that resilience depends on the capacity to manage knowledge, uncertainty, interdependence, and legitimacy, emphasizing governance as a core element. A policy brief from the European Observatory distinguished four stages

of the shock cycle, preparedness, shock onset and alert, impact and management, and recovery and learning, and identified strategies for each, many of which depend on workforce flexibility (Thomas et al., 2020).

Resilience is commonly described as having three capacities: **absorptive** capacity, the ability to withstand a shock using existing resources; **adaptive** capacity, the ability to adjust by reallocating resources and changing processes; and **transformative** capacity, the ability to make lasting structural changes after the crisis. Each depends on people: absorptive capacity on trained staff and reserves, adaptive capacity on flexible roles and good coordination, and transformative capacity on learning and leadership.

2.2 Resilience Engineering and Safety-II

Resilience engineering, developed in high-risk industries and applied to healthcare, studies how systems succeed under varying conditions rather than only why they fail (Hollnagel et al., 2013). Hollnagel identified four core abilities of a resilient system: to **respond** to what happens, to **monitor** what is critical, to **anticipate** future developments, and to **learn** from experience. The Safety-II perspective argues that safety comes from the ability of people to adjust their work to changing conditions, so that most things go right, and that organizations should study everyday adaptation as well as failure (Hollnagel, 2014; Braithwaite et al., 2015). In crises, this perspective is particularly relevant, because protocols written for normal conditions often do not fit, and safe care depends on skilled, informed, and coordinated adaptation by frontline teams.

2.3 The Disaster Management Cycle

Crisis management is commonly organized into four phases: mitigation and prevention, preparedness, response, and recovery. The WHO Health Emergency and Disaster Risk Management Framework extends this into an all-hazards approach emphasizing risk assessment, community engagement, and the integration of emergency management into routine health system functions (WHO, 2019). At the facility level, the WHO Hospital Safety Index assesses the structural, non-structural, and functional safety of hospitals, including the preparedness of staff and emergency plans (WHO, 2015). Incident command systems, adapted for hospitals, provide a standardized structure of roles and communication that allows multidisciplinary teams to coordinate rapidly.

2.4 High-Reliability Organizing

High-reliability organizations, such as aircraft carriers and nuclear power plants, sustain safe performance in hazardous conditions through five principles: preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise (Weick & Sutcliffe, 2015). Deference to expertise is especially relevant to multidisciplinary crisis management: in a fast-moving situation, decisions should migrate to the person with the most relevant knowledge, whether that is an infection prevention nurse, a laboratory scientist, or a paramedic at the scene, regardless of rank. This principle requires psychological safety, the shared belief that it is safe to speak up (Edmondson, 1999).

Table 1. Key theoretical perspectives on resilience and their implications for the workforce

Perspective	**Core idea**	**Implication for multidisciplinary professionals**
Health system resilience (Kruk et al., 2015)	Prepare, maintain core functions, and reorganize after shocks	Workforce reserves, flexible roles, and protection of essential services
Resilience engineering / Safety-II (Hollnagel, 2014)	Respond, monitor, anticipate, and learn; safety comes from successful adaptation	Empower frontline teams to adapt safely; learn from what goes right
Disaster management cycle / Health EDRM (WHO, 2019)	Mitigation, preparedness, response, recovery; all-hazards approach	Defined roles for each profession in each phase; regular drills

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Perspective	Core idea	Implication for multidisciplinary professionals
High-reliability organizing (Weick & Sutcliffe, 2015)	Preoccupation with failure; deference to expertise	Flatten hierarchy in crisis; listen to the professional closest to the problem
Psychological safety (Edmondson, 1999)	Shared belief that speaking up is safe	Early warning signals from any profession are heard and acted upon

3. METHODOLOGY

This paper adopts a narrative integrative review design, suitable for synthesizing diverse evidence, including empirical studies, systematic reviews, policy frameworks, and case reports, into a conceptual model. Sources were identified through PubMed, Scopus, and Google Scholar, and from WHO, UNDRR, and Saudi government publications, using terms related to health system resilience, crisis and disaster management, emergency preparedness, the health workforce, and patient safety. Priority was given to systematic reviews, multi-country analyses, international frameworks, and studies from Saudi Arabia and the Gulf region. Findings were synthesized thematically using the theoretical perspectives in Section 2. The limitations of this approach are discussed in Section 10.

4. ROLES OF MULTIDISCIPLINARY PROFESSIONALS ACROSS THE CRISIS CYCLE

Resilience depends on the combined contributions of many professions. Table 2 summarizes the roles of key groups across the four phases of the crisis management cycle; the subsections that follow discuss each group in more detail.

Table 2. Roles of professional groups across the crisis management cycle

Profession	Prevention and preparedness	Response	Recovery and learning
Physicians and clinical leaders	Clinical protocols; surge planning; training	Triage; critical care; crisis standards of care decisions	Restoring deferred care; clinical review
Nurses	Competency for surge roles; drills	Bedside care in expanded units; monitoring; patient education	Staff support; addressing backlog of chronic care
Paramedics and EMS	Mass casualty plans; inter-agency exercises	Scene triage; transport; distribution of patients across hospitals	After-action review; equipment restoration
Pharmacists	Stockpiles; supply chain risk assessment	Allocation of scarce medicines; substitution; vaccination	Supply chain redesign; pharmacovigilance
Laboratory professionals	Diagnostic readiness; biosafety	Surge testing; surveillance data; quality under pressure	Genomic surveillance; capacity building
Infection prevention and control	IPC programs; PPE training; isolation capacity	Outbreak control; cohorting; staff protection	Updating IPC policy; transmission review

Profession	Prevention and preparedness	Response	Recovery and learning
Health administrators	Risk assessment; plans; incident command structure	Coordination; resource allocation; communication	Financial and service recovery; organizational learning
Health information and digital staff	Data systems; downtime procedures; cybersecurity	Real-time dashboards; telemedicine; contact tracing	Data analysis for lessons learned
Security personnel	Access control plans; site risk assessment	Crowd control; protection of staff and supplies	Incident review; updating security plans

4.1 Physicians and Clinical Leaders

Physicians lead clinical decision-making in crises, from triage and resuscitation to critical care and the management of novel diseases. They develop and adapt clinical protocols as evidence emerges, a role that was critical in the early months of COVID-19. When demand exceeds capacity, physicians and clinical ethics committees must apply crisis standards of care, shifting from individual-focused care toward maximizing benefit for the population. Ethical analysis has proposed principles for such allocation, including maximizing benefits, prioritizing frontline workers, and avoiding allocation on a first-come, first-served basis (Emanuel et al., 2020). Emergency physicians have also outlined principles for allocating scarce resources in disasters, emphasizing transparent, consistent, and proportional approaches (Hick et al., 2012).

4.2 Nurses

Nurses form the largest component of the surge workforce. During crises they staff expanded intensive care and isolation units, deliver vaccination campaigns, monitor patients at home and in field facilities, and provide much of the communication with patients and families. Because nurse staffing is strongly associated with patient outcomes in normal times (Aiken et al., 2002), surge staffing models must protect safety, for example by pairing experienced critical care nurses with redeployed staff in team-based models rather than simply increasing patient-to-nurse ratios. Nurses also play a leading role in infection prevention at the bedside and in the early recognition of deterioration.

4.3 Paramedics and Emergency Medical Services

Paramedics are often the first health professionals at the scene of mass casualty incidents. Their roles include scene safety, field triage, initial treatment, and distribution of patients across hospitals to avoid overwhelming the nearest facility. A national expert review proposed core criteria for mass casualty triage, emphasizing simple, rapid assessment and life-saving interventions (Lerner et al., 2008). During pandemics, EMS systems also manage high call volumes, transport infectious patients safely, and may provide treat-in-place or referral alternatives to reduce pressure on emergency departments. Coordination between EMS, hospitals, and command centers is essential.

4.4 Pharmacists

Pharmacists protect patients by maintaining the supply of essential medicines when supply chains are disrupted, managing stockpiles, identifying therapeutic alternatives, and ensuring safe use of medicines under emergency conditions. During COVID-19, pharmacists in many countries expanded their roles to include vaccination, home delivery of medicines, and extended prescription refills to maintain continuity of chronic disease treatment. They also contribute to pharmacovigilance for new or repurposed therapies used under emergency authorization.

4.5 Laboratory Professionals

Laboratories are the early warning system of the health sector. Laboratory professionals detect novel pathogens, provide the testing that guides isolation and treatment, and generate surveillance data for public health decisions. In a crisis they must rapidly scale testing capacity, validate new assays, and maintain quality and biosafety under great pressure. The experience of COVID-

19 showed the importance of laboratory networks that can share capacity across facilities and of genomic surveillance to track variants.

4.6 Infection Prevention and Control Specialists

Infection prevention and control (IPC) is central to protecting both patients and staff in infectious disease emergencies. The WHO guidelines on the core components of IPC programs emphasize dedicated IPC teams, education, surveillance, multimodal strategies, and adequate staffing and infrastructure (WHO, 2016). The hospital outbreak of MERS-CoV in Saudi Arabia, in which person-to-person transmission occurred within healthcare facilities, demonstrated how gaps in IPC can amplify outbreaks and endanger patients and staff (Assiri et al., 2013). IPC specialists advise on cohorting, personal protective equipment, environmental cleaning, and safe patient flow.

4.7 Health Administrators

Health administrators translate plans into coordinated action. They establish incident command structures, allocate beds, staff, and supplies, manage communication with staff, patients, and authorities, and maintain financial and operational continuity. Effective crisis leadership combines clear direction with flexibility, decentralizes decisions to those with expertise, and maintains transparent communication. Administrators are also responsible for recovery planning, including restoring postponed services and capturing organizational lessons.

4.8 Health Information, Digital Health, and Security Personnel

Health information and digital professionals provide the data infrastructure for crisis response: real-time dashboards of bed occupancy and supplies, case reporting, contact tracing, and telemedicine. During COVID-19, telemedicine allowed many patients to continue receiving care while reducing exposure (Hollander & Carr, 2020). At the same time, crises create opportunities for cyberattacks: ransomware attacks on healthcare delivery organizations increased markedly between 2016 and 2021 (Neprash et al., 2022), and when systems go offline, clinicians lose access to critical information (Argaw et al., 2020). Digital teams must therefore maintain downtime procedures and cybersecurity. Security personnel protect facilities from overcrowding, violence, and theft of scarce supplies, control access to isolation areas, and support evacuation.

5. PROTECTING PATIENTS DURING CRISES

5.1 Maintaining Essential Services

One of the clearest lessons of recent crises is that disruption of routine care can cause substantial indirect harm. During the Ebola epidemic, reduced use of routine services contributed to excess deaths from other causes (Kruk et al., 2015). During COVID-19, many countries reported postponed surgeries, missed cancer screening, reduced childhood vaccination, and poorer control of chronic diseases. Resilient systems identify essential services in advance, protect dedicated pathways for non-crisis patients, and use alternatives such as telemedicine, home delivery of medicines, and community-based care to maintain continuity.

5.2 Safe Care Under Pressure

Crises increase the risk of error through fatigue, unfamiliar roles, new equipment, rapidly changing protocols, and communication barriers created by protective equipment. Multidisciplinary teams can reduce these risks through brief daily huddles, structured handover, clear role assignment, standardized order sets, and simple checklists. Teamwork research shows that shared mental models, closed-loop communication, and mutual monitoring are core mechanisms of safe performance (Rosen et al., 2018), and tools such as TeamSTEPPS can be adapted rapidly for redeployed teams (King et al., 2008).

5.3 Ethics, Equity, and Communication

Crises raise difficult ethical questions about the allocation of ventilators, intensive care beds, medicines, and vaccines. Transparent, pre-agreed criteria applied consistently by multidisciplinary teams, rather than by individual clinicians at the bedside, protect patients from arbitrary decisions and protect clinicians from moral injury (Emanuel et al., 2020). Vulnerable groups, including older adults, people with disabilities, migrant workers, and those with chronic diseases, require specific attention. Clear, consistent, and culturally appropriate communication with patients and the public builds trust and adherence to protective measures.

5.4 Risk Communication and Community Engagement

Patients are protected not only inside healthcare facilities but also in the community, where public behavior determines the spread of infection and the demand placed on services. Risk communication, the real-time exchange of information and advice between experts, officials, and the public, is therefore a core crisis function. Multidisciplinary professionals contribute in different ways: physicians and public health specialists explain risks and protective measures; nurses and health educators translate guidance into practical advice for individuals and families; pharmacists answer questions about medicines and vaccines in community settings; and digital health teams distribute information through applications and messaging platforms. The 28-country analysis of the COVID-19 response identified community engagement and trusted communication as features of more effective responses (Haldane et al., 2021).

Effective risk communication is timely, consistent, transparent about uncertainty, and adapted to the languages and cultural contexts of the population. In Saudi Arabia, where a large share of residents are expatriate workers speaking many languages, and where millions of international pilgrims arrive each year, multilingual communication through multiple channels is especially important. Professionals also play a role in countering misinformation, which can undermine adherence to protective measures and vaccination. Involving community leaders, religious scholars, and employers in communication extends the reach of health messages and builds the public trust on which crisis measures depend.

6. PROTECTING THE PROTECTORS: WORKFORCE WELLBEING

A resilient system cannot be built on an exhausted workforce. Studies during COVID-19 found high rates of depression, anxiety, insomnia, and distress among healthcare workers, particularly among nurses, women, and frontline staff (Lai et al., 2020). A systematic review and meta-analysis reported a substantial pooled prevalence of anxiety, depression, and insomnia among healthcare workers during the early pandemic (Pappa et al., 2020). Shanafelt et al. (2020) identified key sources of anxiety, including access to protective equipment, fear of infecting family, lack of access to testing, and uncertainty about organizational support, and summarized what professionals need from their organizations in five requests: hear me, protect me, prepare me, support me, and care for me.

Protecting the workforce involves physical protection (adequate PPE, vaccination, safe staffing), psychological support (peer support, access to confidential mental health services, psychological first aid), practical support (childcare, accommodation, transport), and moral support (transparent communication, recognition, and involvement in decisions) (Walton et al., 2020). Workforce protection is also patient protection: burnout and fatigue increase the risk of errors, and staff illness reduces capacity at the moment it is most needed.

Resilience is not the capacity of professionals to endure anything; it is the capacity of the system to ensure they do not have to.

7. LESSONS FROM THE SAUDI EXPERIENCE

7.1 MERS-CoV

Saudi Arabia's experience with MERS-CoV, first identified in 2012, was a formative test of its health system. Hospital outbreaks showed that the virus could spread within healthcare facilities, affecting patients, visitors, and healthcare workers (Assiri et al., 2013). The response led to major investments in IPC programs, triage and isolation capacity, laboratory diagnostics, and surveillance, and to the establishment of stronger public health institutions.

7.2 COVID-19

These investments shaped Saudi Arabia's COVID-19 response. Algaissi et al. (2020) described how the Kingdom built on its MERS experience, implementing early public health measures, expanding laboratory testing, establishing dedicated facilities, and coordinating across government agencies. Digital tools played a central role: applications such as Tawakkalna, Tabaud, Sehhaty, and Mawid supported contact tracing, appointment booking, vaccination, and access to care, and virtual services expanded rapidly (Hassounah et al., 2020). The Saudi experience illustrates how multidisciplinary professionals, including IPC specialists, laboratory scientists, digital health teams, administrators, and frontline clinicians, can combine with strong governance and technology to enhance resilience.

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7.3 Mass Gatherings: Hajj and Umrah

Each year Saudi Arabia hosts the Hajj, one of the largest mass gatherings in the world, bringing together millions of pilgrims from many countries in a limited area over a short period. Mass gatherings create risks of infectious disease transmission, heat-related illness, injuries, and exacerbation of chronic conditions (Memish et al., 2019). Saudi Arabia has developed extensive expertise in mass gathering medicine, including infectious disease surveillance and control, vaccination requirements, field hospitals, and coordinated emergency medical services (Memish et al., 2014). The Hajj thus functions as a recurring, large-scale exercise in multidisciplinary crisis preparedness, involving the Ministry of Health, the Saudi Red Crescent Authority, public health authorities, security agencies, and thousands of health professionals.

7.4 Vision 2030 and Future Resilience

Vision 2030 and the Health Sector Transformation Program provide a platform for strengthening resilience further. Health clusters can plan surge capacity and staff deployment across hospitals and primary care, the new Model of Care emphasizes prevention and population health, and digital transformation expands virtual care and data-driven management (Ministry of Health, 2017; Health Sector Transformation Program, 2021). Regulatory and professional bodies, including CBAHI, the Saudi Commission for Health Specialties (SCFHS), the Saudi Patient Safety Center, and the Saudi Food and Drug Authority, can embed crisis readiness into accreditation standards, professional training, safety programs, and supply chain oversight.

8. THE ANCHOR FRAMEWORK

Integrating the theories and evidence reviewed, this paper proposes the **ANCHOR Framework** for multidisciplinary crisis resilience. Its six components follow the logic of the crisis cycle and Hollnagel's four abilities, while emphasizing the role of interprofessional teams. Like an anchor that holds a vessel steady in a storm, the framework aims to keep patient protection secure while the system adapts.

Table 3. The ANCHOR Framework for multidisciplinary crisis resilience

Component	Description	Lead professions	Example indicators
A – Anticipate	All-hazards risk assessment, horizon scanning, and surveillance to detect threats early	Public health; laboratory; IPC; administrators	Updated hazard vulnerability analysis; surveillance alert response time
N – Network	Pre-established relationships within and across organizations, sectors, and regions	Administrators; EMS; all professions	Mutual aid agreements; inter-agency exercises completed
C – Coordinate	Clear command structures, shared situational awareness, and structured communication	Administrators; physicians; nurses; health information	Incident command activation time; dashboard availability
H – Harness surge capacity	Flexible deployment of staff, space, supplies, and digital services	Nurses; pharmacists; laboratory; digital health	Surge bed capacity; cross-trained staff; stock days
O – Operate safely under pressure	Protect patients and staff through safety practices, ethics, and wellbeing support	All clinical professions; IPC; security	Adverse events; staff infections; wellbeing service uptake

Component	Description	Lead professions	Example indicators
R – Recover and learn	Restore essential services, review performance, and implement lasting improvements	Administrators; quality and patient safety teams	After-action reviews; backlog recovery; implemented recommendations

8.1 Applying the Framework

The ANCHOR Framework can be applied at three levels. At the **system level**, health clusters and national bodies can use it to assess preparedness and allocate investment across the six components. At the **organizational level**, hospitals and primary care networks can use it to structure emergency plans, ensuring that each component has named multidisciplinary owners and indicators. At the **team level**, unit leaders can use it to guide drills and debriefs. The framework emphasizes that each component requires more than one profession: anticipation depends on laboratory and IPC data as much as on public health leaders, and safe operation under pressure depends as much on security and pharmacy as on physicians and nurses.

8.2 Measuring Multidisciplinary Resilience

Resilience is difficult to measure because it becomes visible mainly when a shock occurs. Nevertheless, organizations can track indicators of resilience capacity before crises and indicators of performance during and after them. Capacity indicators include the proportion of staff trained in emergency roles, the frequency and quality of interprofessional exercises, surge bed and staffing plans, stock levels of critical supplies, the maturity of cybersecurity controls, and the availability of staff support services. Performance indicators include time to activate incident command, maintenance of essential services during the crisis, adverse events and staff infections, and the speed of recovery of postponed care. Process indicators, such as the completion of after-action reviews and the implementation of their recommendations, capture the learning component that distinguishes transformative from merely absorptive resilience.

Assessment tools such as the WHO Hospital Safety Index provide a structured starting point for facility-level evaluation (WHO, 2015). Mapping each indicator to the ANCHOR component it represents, and to the professions responsible for it, helps ensure that measurement reflects the multidisciplinary nature of resilience rather than focusing only on beds and equipment. Integrating selected indicators into CBAHI accreditation and health cluster performance frameworks would give them lasting organizational weight.

9. RECOMMENDATIONS

Table 4. Recommendations for building multidisciplinary crisis resilience

Area	Recommendation
Governance	Establish multidisciplinary emergency management committees in every health cluster and facility, with defined incident command roles for each profession
Preparedness and training	Conduct regular all-hazards, interprofessional simulation exercises, including mass casualty, pandemic, and cyberattack scenarios; integrate crisis competencies into SCFHS continuing professional development
Surge workforce	Maintain registries of cross-trained staff; develop team-based surge staffing models that pair specialists with redeployed staff
Supply chain	Strengthen pharmaceutical and equipment stockpiles, local manufacturing, and real-time inventory monitoring

Area	Recommendation
Digital resilience	Expand telemedicine capacity; maintain tested downtime procedures; meet national cybersecurity controls
Patient protection	Define essential services in advance; develop transparent crisis standards of care; plan for vulnerable populations
Workforce wellbeing	Provide PPE, vaccination, peer support, and confidential mental health services; monitor fatigue and burnout
Learning	Conduct structured after-action reviews involving all professions; track implementation of lessons learned through accreditation

10. LIMITATIONS AND FUTURE RESEARCH

As a narrative review, this paper did not follow a systematic search protocol or formally appraise study quality, and relevant studies may have been omitted. Much of the evidence on workforce roles in crises is descriptive, drawn from case reports and expert opinion rather than controlled studies. The literature on some professions, including security personnel and health information staff, is limited. The ANCHOR Framework is conceptual and requires empirical validation. Future research should develop and test resilience indicators for multidisciplinary teams, evaluate the effect of interprofessional crisis training on patient outcomes, and examine the long-term impact of crises on the Saudi health workforce.

11. CONCLUSION

Resilient health systems are built by people. Physicians, nurses, paramedics, pharmacists, laboratory professionals, infection prevention specialists, administrators, health information and digital staff, and security personnel each contribute distinct capabilities across the crisis management cycle, and resilience emerges from their ability to anticipate, coordinate, adapt, and learn together. Protecting patients during crises requires maintaining essential services, practicing safe care under pressure, and allocating resources fairly; it also requires protecting the professionals who provide that care. Saudi Arabia's experience with MERS-CoV, COVID-19, and the Hajj demonstrates both the challenges and the achievements possible when multidisciplinary teams are supported by strong governance and technology. The ANCHOR Framework offers a practical structure for building on this experience, so that the Saudi health system remains steady, adaptable, and protective of patients in the face of future crises.

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