

# Evaluation of dedicated COVID-19 hospitals in the pandemic response in Iraq: pandemic preparation within a recovering healthcare infrastructure

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## ABSTRACT

The purpose of this study is to evaluate Iraq's health facility preparedness for the surge of hospitalised cases associated with the ongoing COVID-19 pandemic. In this article, we review pandemic preparedness at both general and tertiary hospitals throughout all districts of Iraq. COVID-19 pandemic preparedness, for the purpose of this review, is defined as: (1) staff to patient ratio, (2) personal protective equipment (PPE) to staff ratio, (3) infection control measures training and compliance and (4) laboratory and surveillance capacity. Despite the designation of facilities as COVID-19 referral hospitals, we did not find any increased preparedness with regard to staffing and PPE allocation. COVID-19 designated hospital reported an increased mean number of respiratory therapists as well as sufficient intensive care unit staff, but this did not reach significant levels. Non-COVID-19 facilities tended to have higher mean numbers of registered nurses, cleaning staff and laboratory staff, whereas the COVID-19 facilities were allocated additional N-95 masks (554.54 vs 147.76), gowns (226.72 vs 104.14) and boot coverings (170.48 vs 86.8) per 10 staff, but none of these differences were statistically significant. Though COVID-19 facilities were able to make increased requisitions for PPE supplies, all facility types reported unfulfilled requisitions, which is more likely a reflection of global storage rather than Iraq's preparedness for the pandemic. Incorporating future pandemic preparedness into health system strengthening efforts across facilities, including supplies, staffing and training acquisition, retention and training, are critical to Iraq's future success in mitigating the ongoing impact of the ongoing COVID-19 pandemic.

## INTRODUCTION

Pandemic preparation in many countries involved public health mitigation efforts centred around prioritised resource allocation in the health system. Among the modalities employed was the expansion of dedicated infection control units to city or township-based hospitals with supplemental units

## SUMMARY BOX

- ⇒ Prior to this study, there were no published studies on pandemic preparedness for the country of Iraq.
- ⇒ This study was necessary to develop an action and monitoring plan for Iraq's responsiveness to the evolving 2020–2021 coronavirus pandemic.
- ⇒ This study provides a descriptive analysis of pandemic response in which select facilities were designated for increased resources to absorb the increase in COVID-19 patients.
- ⇒ Despite the hospital COVID-19 designation status, few differences were noted nationwide across facilities, a reflection of the global challenges of healthcare supplies and the pre-existing challenge of healthcare worker shortages in Iraq.

dedicated to COVID-19 care. The trifecta of resource allocation and healthcare worker training with stringent infection control measures was meant to curb the impact of the pandemic on the healthcare system and the population.<sup>1–18</sup>

Iraq's Ministry of Health and the United Nations Children's Fund (UNICEF) initiated COVID-19 aversion strategies on 24 January 2020, using the WHO technical guidance. The WHO and Iraq's Ministry of Health also developed a comprehensive response plan to shore up Iraq's readiness for the potential impact of COVID-19.<sup>19–21</sup> The response included the designation of COVID-19 facilities per governorate with facilities notified in January and February of 2020 of their COVID-19 designation status. On the 24th of February 2020, the first case of COVID-19 was identified in Iraq, indicating the beginning of the pandemic. While the initial outbreak consisted of a small clusters of cases, 3 weeks later, the government implemented a

nationwide lockdown in an effort to minimise the spread of the virus.<sup>21 22</sup>

Iraq's COVID-19 response plan occurred with the backdrop of recovery from decades-long conflicts and debilitated healthcare infrastructure. Directly after the second Gulf War in 2003, 12% of Iraq's hospitals and 33% of Iraq's primary healthcare centres were looted or damaged. Recovery efforts occurred throughout the start of the 21st century but were hindered by continuing sectarian violence and the eventual invasion of Islamic State of Iraq and Syria in 2014. Iraq's Ministry of Health continues to suffer inequities in resource distribution in terms of trained human capital and critical laboratory equipment necessary for disease detection and treatment. In 2019, healthcare costs shifted from a government-funded healthcare system to a pay-per-service system furthering reducing equitable healthcare access across Iraq's health districts.<sup>23</sup>

On 9 March 2020, an onsite assessment by a WHO team, in coordination with Iraq's Ministry of Health, completed an assessment of Iraq's ability to detect, identify and manage suspected and confirmed coronavirus cases. At this time, a decision was made to create designated facilities for COVID-19 management in conjunction with nationwide training across health facilities on proper PPE and infection prevention and control (IPC) procedures. This plan involved a nationwide, directorate level implemented strategy for early identification of COVID-19 patients with a referral to specialised facilities. The intent of this plan was to standardise therapeutic approaches to COVID-19 patients and enforce stringent patient-contact requirements as relates to training, personal protective equipment (PPE) and infection prevention and control procedures.<sup>19</sup>

These efforts were a natural extension of an extensive influenza pandemic response that was facilitated by the WHO in October 2019. Pandemic Influenza Preparedness included selecting sentinel site surveillance, increasing laboratory capacity for identifying influenza subtype and shoring up the specimen transport system for centralised laboratory processing as needed. Comprehensive training and assessment occurred throughout the Fall and Winter of 2019 as the coronavirus threat began to emerge in China.<sup>24</sup> Recommendations for influenza pandemic preparedness served to strengthen Iraq's COVID-19 preparedness plan as a thorough analysis of facility capacity had very recently been completed.

In order to assess health facility and healthcare worker readiness for the COVID-19 pandemic and to identify areas of remediation to decrease potential iatrogenic COVID-19 spread, Iraq's Ministry of Health, UNICEF and WHO Iraq undertook a comprehensive nationwide study to determine areas of health systems' strength and areas of opportunity for COVID-19 response. This study is an exploratory analysis of Iraq's health facility capacity and responsiveness to the COVID-19 pandemic. The objectives of this study are to assess the hospital systems in Iraq's COVID-19 readiness after implementation of Iraq's

preparedness plan based on (1) the estimated total staff allocation between COVID-19 and non-COVID-19 designated facilities, (2) the estimated total PPE allocation in different COVID-19 and non-COVID-19 facilities, (3) the IPC training protocols and procedures in different public health facilities of Iraq and (4) the facility-based isolation and triaging procedures for suspected and confirmed COVID-19 patients. Results of this study were used to develop a dynamic, continuous assessment plan of Iraq's COVID-19 health facility responsiveness.

### DESIGNATION OF COVID-19 HEALTH FACILITIES IN IRAQ

Iraq has a total of 429 hospitals of which 286 hospitals are tertiary, general or specialty hospitals and 143 are private hospitals. A total of 97 isolation wards within general and tertiary hospitals were identified 1 month before the first identified COVID-19 case in Iraq. The Ministry of Health and Environment (MOHE) assigned 26 referral Hospitals with isolation wards for COVID-19 patients, with one hospital designated per governorate. Throughout March and April, additional hospitals were designated as COVID-19 hospitals, resulting in a total of 97 designated COVID-19 hospitals. Hospitals were designated as COVID-19 facilities if they had an established COVID-19 unit and could serve as a referral hospital for COVID-19 patients. Each hospital in the country, regardless of COVID-19 designation, was advised to have designated quarantine facilities. Private hospitals were excluded from COVID-19 designation and facility assessment due to a smaller patient capacity and lack of PCR testing, with those facilities being centralised at government hospitals (table 1).

A multistage, stratified sampling design was done to obtain one COVID-19 designated hospitals from each of the 19 governorates matched to one non-COVID-19 hospitals from each of those governorates. Then, two districts were selected (randomly) from each governorate to choose one tertiary hospital (irrespective of their COVID-19 status) per district. Since the Medical City in Baghdad is a different entity and does not fall under any governorate, one COVID-19 designated hospital and one non-COVID-19 teaching hospital was taken from among the teaching hospitals in Medical City. The total sample

**Table 1** Health facility sampling

Health system level	Facility type	Sampled facilities
COVID-designated hospitals	General hospitals	19 (61%)
	Tertiary hospitals	12 (39%)
	Total	31
Non-COVID hospitals	General hospitals	32 (68%)
	Tertiary hospitals	15 (32%)
	Total	47
number (%)		

size included 78 hospitals that included 31 COVID-19 hospitals and 47 non-COVID-19 hospitals, including both general and tertiary hospitals (table 1). Further details on methods and design may be found in online supplemental annex 1.

At the primary healthcare level, each primary health clinic had been oriented to screen or identify COVID-19 suspected patients and refer them to designated hospitals. Facilitate coordination and referral occurred between Directorates of Health/Hospitals/Quarantine Centres and Department of Labour and Social Affairs to support children who are affected by COVID-19. Facilities were not standard across governorates, particularly those in the conflict recovery districts. Each COVID-19 designated facility was a tertiary hospital, which included an intensive care unit and a specialist medicine unit, and dedicated general medicine teams. The total number of hospitals per governorate was based on the population in the governorate as well as the healthcare workforce within each hospital. Additional consideration was given for governorates with increasing infection rates as the pandemic evolved after the first detected case in February 2020. The timeline between planning, implementation and analysis of results was a total of 6 months, which was approximately 4 months after the first patient case in Iraq.

### ANALYSIS OF COVID-19 FACILITY PREPAREDNESS

Prior to the survey site visit, each hospital administrator chose healthcare workers, administrative staff, maintenance and facilities and other staff categories to respond to the relevant section of the survey as well as to provide answers regarding PPE availability and IPC training and implementation. Among healthcare workers sampled,

there was a 100% responsiveness to participate in the survey. There was no difference between COVID-19 and non-COVID-19 facilities across staffing (per 100 patients) and supplies (per 10 staff members). Across all categories of healthcare workers and support personnel, there were no differences in staffing in a 24-hour period per 100 patient beds with a less than a 15% difference in the mean staff per 100 patients between COVID-19 designated and non-COVID-19 facilities. COVID-19 hospitals did display trends towards additional respiratory therapists, but this was not consistent across governorates. Non-COVID-19 facilities had higher mean numbers of registered nurses, cleaning staff and laboratory staff, but this did not reach a statistical difference. Iraq's COVID-19 facilities were allocated additional N-95 masks (554.54 vs 147.76), gowns (226.72 vs 104.14) and boot coverings (170.48 vs 86.8) per 10 staff, but none of these differences were statistically different. Other than additional supplies allocated per facility in preparation for the pandemic, facilities did not forecast additional staff per 24-hour period to prepare for potential pandemic capacity surges, thus explaining the lack of difference in staffing capacity (table 2).

To better understand the variability of supplies allocated per facility type, an additional analysis was conducted around the proportion of supply requisitions that were fulfilled in the first 2 months of the pandemic. Each hospital in Iraq processes supply requisitions through the central governorate stores at the beginning of each monthly inventory period. In preparation for COVID-19, hospital facilities entered supply requisitions in the first quarter of 2020 in March 2020. Supply requisitions for COVID-19 hospitals were completed with input from WHO and UNICEF guidance during the summary intervention period. A supply facility manager at each hospital

**Table 2** Hospital readiness based on staffing per 100 patient beds and supplies per 10 hospital staff

	COVID-19 hospitals (n=31)	Non-COVID-19 hospitals (n=47)
Staff per 100 patients	Mean (95% CI)	Mean (95% CI)
Physicians	23.86 (16.47 to 31.24)	22.76 (18.48 to 27.04)
Physician assistants	18.05 (12.14 to 23.96)	18.93 (11.95 to 25.9)
Registered nurses/nurse assistants/paramedics	53.17 (34.72 to 71.61)	63.85 (45.48 to 82.21)
Pharmacists and technicians	15.13 (9.67 to 20.59)	18.14 (14.31 to 21.98)
Radiology staff	3.63 (2.46 to 4.81)	5.99 (3.93 to 8.05)
Respiratory therapists	0.97 (0 to 1.98)	0.08 (0 to 0.17)
Cleaning staff	16.45 (10.41 to 22.5)	21.41 (15.54 to 27.28)
Laboratory staff	19.95 (11.33 to 28.57)	24.05 (18.73 to 29.37)
Supplies per 10 staff		
Gloves	478.76 (213.42 to 744.1)	468.03 (202.57 to 733.5)
N-95 masks	554.54 (0 to 1347.52)	147.76 (90.96 to 204.55)
Face shields	25.9 (12.38 to 39.41)	17 (7.5 to 26.51)
Gowns	226.72 (45.22 to 408.21)	104.14 (54.22 to 154.05)
Aprons	14.93 (0 to 37.39)	10.36 (3.81 to 16.91)
Boot coverings	170.48 (36.78 to 304.18)	86.8 (35.8 to 137.81)

**Table 3** Total PPE forecasted and supplied per 100 staff members assigned to facility

	COVID-19 hospitals			Non-COVID-19 hospitals		
	Forecasted mean (SD)	Supplied mean (SD)	Portion fulfilled (%)	Forecasted mean (SD)	Supplied mean (SD)	Portion fulfilled (%)
Face masks	6569 (1793)	2488 (761)	38	2890 (769)	606 (152)	21
N-95 masks	660 (201)	332 (164)	50	343 (166)	41 (10)	12
Face shields	444 (200)	222 (164)	50	126 (36)	46 (26)	37
Gloves	8815 (2457)	6271 (2468)	71	7082 (1566)	1570 (421)	22
Water apron	531 (291)	113 (60)	21	616 (214)	69 (34)	11
Disposable gown	1561 (319)	1586 (358)	101	969 (219)	526 (138)	54
Boot/shoe covers	3820 (1279)	1798 (662)	47	1457 (416)	428 (118)	29

PPE, personal protective equipment.

provided supply requisitions and supply intake inventory levels for the March–April 2020 period. Requisitions and inventory received were reconciled with the portion of requests that were fulfilled indicated across facilities (table 3). In preparation for potential COVID-19 surges, the COVID-19 hospital had greater requisitions for face masks, N-95 masks, face shields, gloves and boot/shoe cover per 100 staff members. Though the mean portion forecasted and filled was higher in COVID-19 facilities, it was not consistent across governorates in Iraq. Only disposable gowns were fulfilled at close to, or greater than the mean requested quota across Iraq's hospitals. This results demonstrate comparable amounts of PPE were provided across facilities for all patients, regardless of COVID-19 designation. Thus, differentiating between COVID-19 and non-COVID-19 facility type became unnecessary as standard PPE precautions were being implemented for all patients, regardless of diagnosis, at the point of care throughout Iraq's hospital system.

In conjunction with extensive facility preparedness based on inventory quota, measures were taken across facilities to ensure training and compliance with personal protective equipment and infection control procedures. Facilities were assessed based on adherence to recommended modifications to reduce the transmissibility of coronavirus among patients, healthcare staff and patient visitors. Modifiable and nonmodifiable factors were reviewed, such as security protection with appropriate fencing, patient flow through triage and assessment areas, capacity restrictions across rooms in the facilities and handwashing and sanitising material for healthcare workers, patients and visitors. Issues such as fences in facilities were dependent largely on the placement of the hospital in secure sections of the Iraqi governorate as opposed to concerns for COVID-19 restrictions. Across COVID-19 designated and non-COVID-19 designated facilities, the majority of hospitals had enacted IPC measures with accompanying training (83.875% vs 85.11%). Exterior security and patient flow were generally well marked and clear for both facility types. Once inside the healthcare facility, both COVID-19 designated

and non-designated hospitals reported fewer than 60% of patient rooms with visitor restrictions (58.06% vs 53.19%). Both facility types reported less than 30% of facilities had sufficient spacing in triage and waiting rooms.

The facility's availability of water and hand sanitising at every point of care also was consistent across COVID-19 and non-COVID-19 designated facilities. Standard operating procedures (SOP) around IPC existed in each facility prior to the COVID-19 preparedness period but were revised and updated in early 2020 across all facilities, regardless of COVID-19 designation. Reports on water and hand sanitiser availability was higher in COVID-19 facilities, but this did not reach statistical significance compared with the non-COVID facilities. In recovery districts, there are segments of Iraq's hospital system that remain in different levels of functional disrepair. In the governorates of Anbar, Ninewa and Salaheddin, there are hospitals which remain nonfunctional. Several hospital facilities within the recovered governorates (Anbar, Salaheddin, Kirkuk and Ninewa) were in varying levels of functional status which also could explain the variability in water availability in hospitals.

At both COVID-19 and non-COVID-19 facilities, hospitals did not surpass an 80% positive response of preparedness for critical infection control procedures such as patient isolation, visitor restrictions and patient flow. Across all facility types, healthcare workers in direct contact with patients reported insufficient PPE. This issue is reflective of global shortages as opposed to the specifics of Iraq's health system's infrastructure. PPE availability was reported as subpar in all hospitals, especially among those in COVID-19 hospitals.

Another core aspect of nationwide COVID-19 preparedness was trained staffing and surveillance abilities. Staffing estimates were based on all staff, per staff category, assigned to the hospital facility on the day of the survey assigned over 24 hours. Hospitals reported understaffing, which was consistent with trends postconflict as Iraq experienced an exodus of trained medical personnel. There was no difference between COVID-19

**Table 4** COVID-19 facility level assessment on adherence to infection prevention and control standard operating procedure recommendations

	COVID-19 hospitals (n=31)		Non-COVID-19 hospitals (n=47)	
	n (%)	95% CI	n (%)	95% CI
<b>Infection prevention and control measures</b>				
Facility has SOP and protection measures	26 (83.87)	68.2% to 93.57%	40 (85.11)	72.97% to 93.08%
Facility is fenced with restricted access	30 (96.77)	85.9% to 99.65%	43 (91.49)	81.02% to 97.06%
The entrance and exit of the facility are clearly identified with personnel stationed to control flow of patients	30 (96.77)	85.9% to 99.65%	46 (97.87)	90.48% to 99.77%
The patient flow is clearly signed	22 (70.97)	53.66% to 84.56%	35 (74.47)	60.81% to 85.22%
Access to caregivers' rooms is restricted to one caregiver per patient	18 (58.06)	40.62% to 74.08%	25 (53.19)	39.09% to 66.91%
Minimum of 1-metre distance between all patients in the waiting area	8 (25.81)	13.03% to 42.87%	13 (27.66)	16.48% to 41.5%
Presence of a triage area to screen visitors	19 (61.29)	43.77% to 76.81%	23 (48.94)	35.07% to 62.93%
<b>Personal protective equipment (PPE) and hand sanitising availability</b>				
Sufficient water available at all times	26 (83.8)	68.2% to 93.5%	35 (74.4)	60.8% to 85.2%
Hand sanitiser is available for staff use at all times	26 (83.8)	68.2% to 93.5%	35 (74.4)	60.8% to 85.2%
Appropriate PPE is available for all staff	24 (77.4)	60.7% to 89.2%	26 (55.3)	41.1% to 68.8%
Appropriate PPE for all staff involved in direct patient care	23 (74.1)	57.1% to 86.9%	38 (80.8)	67.9% to 90%
Appropriate (PPE) for cleaning and disinfection staff	19 (61.2)	43.7% to 76.8%	28 (59.5)	45.3% to 72.6%
Appropriate (PPE) for all waste management staff	19 (61.2)	43.7% to 76.8%	28 (59.5)	45.3% to 72.6%
SOP, standard operating procedures.				

and non-COVID-19 facilities, largely a reflection of facilities retaining personnel for assumed normal operations. Additional intensivists in critical care units were found in COVID-19 facilities, but this did not reach a statistical difference.

Testing capacity serves as the cornerstone of COVID-19 treatment, referral, contact tracing and containment. Within Iraq, regardless of location, the standard turn-around time for COVID-19 tests was 24 hours within the early part of the pandemic. Contact tracing and patient isolation were immediately implemented once a positive case was identified. The testing turn-around time and public health response was consistent across governorates and facility type. As all hospitals would be dedicated as necessary surveillance sites, laboratory capacity across Iraq's hospitals reported sufficient supplies for testing, serum collection and specimen collection and storage. Though reports were sufficient for testing, the majority of hospitals, both COVID-19 and non-COVID-19 designated, indicated a need for increased testing facilities in the health systems (table 4).

## LESSONS LEARNT

At the onset of the COVID-19 pandemic, Iraq's Ministry of Health developed a comprehensive containment and mitigation plan to optimise patient care and minimise risk to healthcare workers, thus minimising iatrogenic spread. This plan involved a nationwide, directorate level strategy for early identification of COVID-19 patients with a referral to specialised facilities. The intent of this plan was to standardise patient care approaches to COVID-19 patients and enforce stringent patient-contact requirements as relates to training, personal protective equipment and IPC procedures. The main impact of this planning resulted in nominal differences across facility designation, which is attributable to the rapidly changing demands of the pandemic between the planning, implementation and assessment phase of this study. It is also attributable to limits in resource acquisition and distribution on an international, national and subnational level.

Resource requisition in the form of PPE and testing capacity occurred prior to the appearance of the first case of COVID-19 in Iraq. Though COVID-19 facilities were able to request more supplies than their non-COVID-19 counterparts, the majority of these requests were left unmet, leaving the COVID-19 and non-COVID-19 facilities short of necessary PPE. This may be

reflective of global shortages of PPE. Freight limitations in the beginning of 2020 put additional constraints on supply provided by the Ministry of Health, so it was so challenging to provide the needed PPE for the assigned facilities for COVID-19 response. Supplies were distributed based on the availability rather than the need for prioritisation for COVID-19 caseloads and facility type, leaving many facilities with unfulfilled PPE equipment at the time. Global distribution constraints further compounded Iraq's internal distribution challenges as revealed in a 2019 bottleneck analysis of the distribution pipeline.<sup>21</sup>

Across Iraq, healthcare facilities were appropriately prepared for patient flow and restricted movement with regard to the exterior portions of the facility. Within the facility, IPC operational procedures were not consistently available. As this study was conducted 2 months after the first positive COVID-19 case was identified in Iraq, Iraqi facilities had sufficient lead time to train and implement all necessary procedures. Implementation is tied to resource availability. For staff allocation, Iraqi healthcare workers were appropriately assigned across all facilities as per recommendations of professional organisations in the Western Hemisphere. Articles prepandemic do not have standardised recommendations, but examples exist for intensivist–patient ratios to not exceed 1:13, critical-care nurse–patient ratios to not exceed 1:2, general ward nurse–patient ratios at 1:6 and pharmacist–patient ratios from 1:20 to 1:50.<sup>25–27</sup>

Several key lessons were learnt in both determining COVID-19 preparedness and designation of facilities. Considerable consideration must be allotted to adjust projected need based on actual need. Needs of health systems requires modelling sufficient fluidity or adjustable variables based on input from neighbouring health systems. As this analysis occurred in the early months of the pandemic, modelling Iraq's projected need from the emerging needs of neighbours, such as Iraq which early witnessed a COVID-19 surge, would assist in health system preparedness. This study had limited lead time between Iraq's comprehensive plan, training, implementation and analysis. Iraq was able to benefit from the prepandemic planning in preparation for a projected increase in influenza cases. In 2019, a pandemic influenza surveillance system across hospitals had begun, with parity across facilities. Additional studies would reflect Iraq's health system capacity for adaptive processes to the pandemic response. In addition, the data presented were mostly a descriptive analysis. Additional analysis would include predictors of COVID-19 readiness across facilities outside of a cross-sectional design. The true impact of this pandemic response on clinical outcomes was not evaluated in this study. This is a primary limitation of this paper. Without a baseline comparison, which is not applicable given the pandemic impact across nations, it is difficult to assess if the preparedness efforts impacted patient outcomes. This study, coupled with the ongoing field epidemiologic efforts of Iraq's Ministry of Health

continues to provide direction to Iraq's evolving response to the ever changing course of the pandemic.

This analysis has revealed the need for emergency stockpiling of resources that will become standard across health facilities worldwide. The additional lead time of the surveillance system strengthening provided an important lesson learnt that a minimum 6-month analysis and preparedness period is needed on an annual cycle for potential pandemics. The study also revealed the need for continuous baseline capacity assessments in non-pandemic circumstances. Iraq's infrastructure still lacks the necessary plasticity for rapid adaptation given its current limitations although continuous improvement since the most recent conflict.

Iraq's inventory allocation system based on reacquisitions received require standard metrics of per patient served or per staff to standardise the responses for inventory on hand. In addition, for the staff–bed ratio, the assumption was this was the necessary staff for a 24-hour assignment, but it is unclear if that was consistently communicated across facilities. Facility assessment metrics require sufficient fluidity to permit facilities to self-designate as COVID-19 facilities based on district and governorate needs, as occurred throughout the country. This could explain the lack of difference across hospital types. Given that facilities with increased lag-time may have been able to have more positive results than their late-entry counterparts.

This study was designed without consideration for baseline capacities across Iraq's hospitals. Forty years of war, sanctions, sectarian violence and foreign invasions have left the delivery of Iraq's health services variable across and within governorates. This study did demonstrate the tremendous adaptive potential of Iraq's healthcare workforce. Iraq's healthcare workforce has decades of experience of inconsistent supply chains and disruption due to internal and regional instability. The ability to maintain comparable levels of healthcare delivery despite designation status of COVID-19 facility or otherwise demonstrates Iraq can serve as a model for a workforce that adapts and continues to provide care within health system constraints. A comprehensive, nationwide preparedness plan for an unknown pandemic was designed, implemented and studied for the effectiveness of implementation within the unique infrastructure of Iraq's recovering healthcare system but never implemented.

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