Original Research

Evaluating Nursing Staff Perception of Hospital Readiness for Continuity of Essential Health Care Services and Surge Capacity in Line With COVID-19

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Abstract

Objective: To evaluate nursing staff' perception of hospital readiness for continuity of essential health care services and surge capacity in line with COVID-19.

Methods: A total of 300 nurses were recruited from one hospital in Saudi Arabia. They completed self-administered, online questionnaires. The questionnaire assessed participants' socio-demographic data and their perceptions regarding hospital readiness for continuity of essential health care services and surge capacity in line with COVID-19.

Results: The findings revealed that nursing staff had a moderate mean score regarding hospital readiness for continuity of health care services (3.89 ± 0.61) and an average mean value regarding surge capacity of 3.83 ± 0.63. Also, the value of $R2$ of surge capacity in healthcare can predict 82.9% of the variance in hospital readiness for continuity of health care services in terms of surge capacity.

Conclusion: Hospital administrators could propose hospital regulations and protocols for the management of confirmed and suspected COVID-19 patients in addition to designing a continuing education program for health professionals at all levels related to prevention, control, and management of COVID-19 suspected and confirmed patients.

At the end of last year, a new type of coronavirus was discovered in Wuhan, Hubei Province, China, leading to an increase in the number of diseases and deaths worldwide.[1] The World Health Organization (WHO) "worries that have been declared a global pandemic" are discovered and released by the Ministry of Health every day, and hospital resources and services have been greatly affected by this global pandemic in a short period of time.[2] Saudi Arabian hospitals and other health facilities play a key role in the national and local responses to the COVID-19 pandemic.[3] The current research proposal focuses on evaluating how these hospitals and facilities work on a global scale. The COVID-19 pandemic experience can recommend procedures and guidelines that can be applied to the management of other emergencies.

When health services and patient needs exceed existing resources, health systems need scalability. Established institutions have developed common definitions for capacity building. For example, the Centers for Disease Control and Prevention (CDC) pointed out that the enhanced potential is "the ability to obtain additional resources when needed in an emergency."[4] Similarly, the Agency for Health Research and Quality defines scalability as the ability of the "health system" to respond to bioterrorism or other major public health emergencies or disasters.[5]

Continuity of care refers to the quality of care over time. The American Academy of Family Physicians "defines continuity of care" as the process by which patients and doctors cooperate in daily care management to achieve high-quality, affordable care goals. According to this definition, continuity of care refers to the relationship between an individual patient and the doctor over time. Continuity is understood to mean that it goes beyond the interpersonal aspects of nursing, including issues of quality and economic efficiency. This definition is also related to respite care, but the focus here is on the degree of coordination and coherence between different service providers and between different employees.[6] Compared with other quality of care models that usually consider the evaluation of care at a specific point in time, the concept of care continuity adds a longitudinal element.[7]

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As the definition of the American Academy of Family Physicians suggests, continuity of care can include accessibility, effectiveness, and effectiveness issues. Fairness is an important moral value to ensure that all patient groups receive satisfactory continuous care. However, the continuity of care specifically refers to the patient-centered quality aspect described by the Institute of Medicine as: respectful care tailored to the patient's personal preferences, needs, and values, and based on the values of the patient for all clinical decisions.[8,9]

However, specifically, emergency response capabilities consist of 3 main components: medical professionals, materials (equipment, medicine, and consumables), and structure (physical structure and management infrastructure, such as incident management systems or incident management systems [IMS]).[10–13] When the demand for patient care exceeds existing resources, new COVID-19 pandemic events should focus on improving patient care capabilities.[14]

By adding these 3 main components of COVID-19 growth (people, materials, and structure), the quality of patient care will also be improved. Additionally, additional staff may be required to take care of the patient individually or in groups; patient care may require additional equipment, such as medical and surgical aids, ventilators, and drugs; additional space may be required to accommodate the patient; and most importantly, a structure needs to be created immediately to effectively adjust resources as needed. This framework, IMS, should use a common and standardized language to connect all systems at the local, regional, state, and government levels.[14] In the case of COVID-19, external resources may not be available in a timely manner or only to a limited extent. Therefore, local health-related material planners must rely on regional will, mutual support, and effective means of communication and dissemination of information. In the current COVID-19 incident, the communication and transportation infrastructure remain intact, so, if necessary, resources can be easily obtained from external sources. In other cases, all the resources available to you from time to time are local.[15] In addition to emergency overvoltage, there is a lot of discussion about daily overvoltage, which is a problem with KSA's chronically overcrowded emergency room (ER). Broadly speaking, both the daily growth and the sudden increase in disasters can be regarded as an imbalance between resources and demand, and the variability of the 2 scenarios seems to have predictable fluctuations. However, between the daily wave and the disaster wave, the differences seem to outweigh the similarities. From the individual's maximum result to the overall result, this will raise ethical issues. In addition, receiving care that deviates from the standard of daily life can be problematic. It may also become important during the wave of natural disasters.[16]

The main issues to be addressed in the COVID-19 surge scenario include psychosocial considerations, integration of voluntary services, the need for expertise and tools, the impact of health care providers and victims on mental health, and areas that may require legislation. In situations where demand exceeds resources, an appropriate standard of care is required. Although this article describes the main components of the amplification system, more research is needed to develop repeatable standards and quantify the science of surge.[11]

Hospitals are subject to various regulatory requirements, including internal policies and procedures and external taxes. A lot of attention has been paid to the objective measurement of satisfaction and results, but "scalability" is difficult to define, measure, and quantify. Conceptual definition and specificity make it difficult for hospitals to define how to define and communicate scalability to meet the sudden influx of patient needs. For discussion purposes, hospital scalability is defined as the components required to handle sudden and unexpected increases in the number of patients beyond the current capacity. There is a variety of models that can be used to measure hospital responsiveness. Hospitals should aim to "improve the health system's ability to respond to public health emergencies."[11,16]

Hospitals' management generally knows the resources required for each of the above categories to care for a specific number of patients; people recognize that there are some exceptions, mainly related to specific biological threats. Otherwise, one of the problems with emergency response capabilities is determining how many resources the hospital can add to its facilities, and how long it will take to achieve this growth. The number of people seeking help continues to increase. The hospital is currently unable to further improve its response capabilities and medical services.[17]

Hospitals can use stored medical supplies and equipment to initially expand patient care capabilities. However, due to many institutions' implementing timely inventory strategies, on-site resource storage is limited. Although this strategy is cost-effective in daily life, it is problematic. Therefore, the hospital's ability to maintain scalability depends on the additional services provided by the provider, other hospitals, and, ultimately, government reserves. The speed of this development will depend on the amount of care the hospital is trying to get—as well as what types of mutual assistance agreements exist between institutions, how quickly suppliers can deliver after unplanned requests, and the degree of obligations of suppliers to multiple institutions in the same area (if there is no regional coordination, how many hospitals can use the same source of equipment to release production capacity) and the speed of inventory movement. It is currently not possible to obtain data from the hospital department, the number of additional materials and equipment required for inspection, and the time required to obtain these resources.[18]

One of the most important components of responsiveness is the ability to implement an incident management system when a major impact event occurs. Studies have shown that the obstacle to the response to many incidents is not a lack of resources, but a lack of management systems that adapt resources to current needs. There are few studies on the effectiveness of a well-designed hospital accident management system in the event of natural disasters.[19]

Objectives

The aim of this study is to evaluate nursing staff perception of hospital readiness for the continuity of essential health care services and surge capacity in line with COVID-19. Specific objectives include (1) assessing the hospital as a critical component of the health system that contributes to the continuity of essential health services required by the community and surge capacity, while at the same time providing health services to patients affected by an epidemic or other emergency; and (2) evaluating the hospital's ability to manage a sudden or rapidly progressive surge in demand for hospital services created by an emergency.

Materials and Methods

Research Design and Sampling

This is a descriptive correlational study conducted in a university hospital in Saudi Arabia following the WHO and CDC guidelines

of a pandemic outbreak. In the current study, regression analysis was used to examine the hospital's readiness for basic care continuity and the scalability of care according to COVID-19. A representative sample of staff nurses who were available at the time of data collection (N = 300) was included to assess the nurses' perception regarding continuity of care and surge capacity. The sample size of the nurses was estimated using Epi-info 7 based on a 1% variance, 99% confidence, and 0.80 power at a 0.5 significance level. The exclusion criteria were newly hired nurses with less than 6 months of professional experience.

Measurement

Tool 1: Continuity of essential health care services questionnaire

This tool was developed by the researchers based on the WHO hospital preparedness standards[20] to ensure that the hospital as a critical component of the health system contributes to the continuity of essential health services required by the community, while at the same time provides health services to patients affected by an epidemic or other emergency. It is a 34-item instrument representing the 5 domains of continuity of essential health care services: general principles (8 items), basic requirements (3 items), preparedness tasks (14 items), response tasks (8 items), and recovery task of the hospital (1 item). The 5-point Likert scale ranged from *Very often* ("5") to *Rarely or never* ("1") used to measure the responses. The higher the score, the higher the continuity of essential health care services within the hospital.

Tool 2: Surge capacity (SC)

This tool was developed by the researchers based on the WHO hospital preparedness standards[20] to enable the hospital to expand its ability to manage a sudden or rapidly progressive surge in demand for hospital services created by an emergency. It is a 20-item instrument representing the 5 domains of continuity of essential health care services: general principles (8 items), basic requirements (3 items), preparedness tasks (14 items), response tasks (8 items), and recovery task of the hospital (1 item). The 5-point Likert scale ranged from *Very often* ("5") to *Rarely or never* ("1") used to measure the responses. The higher the score, the higher the readiness of the hospital for surge capacity during COVID-19.

In addition, the socio-demographic and work-related form was developed by the researchers and included questions related to participants' gender, age, years of experience, highest degree attained, working unit, level of education, nurses' participation during the COVID-19 pandemic, and whether they worked directly with COVID-19 patients.

Validity and Reliability

Since all participants were university graduates with high proficiency in English, the instruments were utilized in their English language. Also, all questionnaires were tested for reliability by evaluating the items' internal consistency using Cronbach's alpha coefficient test. All the tools verified reliability where α = (0.961 and 0.871) for **continuity of health care services questionnaire** and **surge capacity**, respectively. The test-retest reliability was done on 10% of nurses who were not included in the study sample to investigate the questionnaires' stability over time and showed a high positive significant correlation (r ranged from 0.787 to 0.869).

Data Collection

Written approval from hospital management was obtained to collect the required data. The data were collected with the consent of the nursing staff during the agreed rest period. The time required to fill out the questionnaires was 20 minutes. Data collection took over 2 months (from June to August 2020).

Ethical Considerations

Princess Nourah bint Abdulrahman University has received Institutional Review Board (IRB) approval (# 200163). The confidentiality of the data and data protection was maintained, and the written consent of the participants to participate in the research was protected from the data collection. The subjects were guaranteed the right to withdraw from the study at any time.

Data Analysis

The data were fed into the social sciences statistical program, SPSS, version 23 (IBM Corp, Armonk, NY). The frequencies and percentages were used for presenting demographic characteristics; mean and standard deviation (SD) were used to present continuous variables. Pearson correlation coefficient analysis (r) was used to test the nature of the relationship between nursing staff perception of hospital readiness for continuity of essential health care services and surge capacity in line with COVID-19. All statistical analyses were performed using an alpha of 0.05.

Results

Socio-Demographic and Work-Related Characteristics

Female participants comprised 76.6%. Slightly above half of the nursing staff (58.3%) were middle-aged and lying between 30 to less than 40 years old with a mean of 33.24 ± 7.58; 36.7% of nursing staff had more than 10 years of experience with a mean of 9.11 ± 5.47. The majority of nursing staff (84.4%) held a bachelor's degree in Nursing Sciences. They worked in different working units, including emergency unit (24.0%), endoscopy unit (2.3%), ICU (3.3%), labor and delivery unit (1%), NICU (2.7%), operating room (14%), outpatient (20.7%), PICU (1.3%), medical units (20.6%), and surgical units (10%). The majority of nursing staff (93.3%) practiced nursing during the COVID-19 pandemic, and more than two-thirds of them (60.7%) worked directly with COVID-19 patients (Table1).

Nursing Staff Perception Regarding Hospital Readiness for Continuity of Essential Health Care Services in Line with COVID-19

Table 2 revealed a moderate mean score of nursing staff perception regarding hospital readiness for continuity of health care services (3.89 ± 0.61). The highest mean score was associated with the hospital readiness regarding general principles of continuity of health care services (3.95 ± 0.60) followed by response tasks (3.91 ± 0.68), whereas the hospital readiness regarding recovery tasks of continuity of health care services (3.74 ± 0.68) has the lowest score among these dimensions.

Nursing Staff Perception of Surge Capacity in Health Care in Line with COVID-19

Table 3 shows the average mean value of nursing staff perception regarding surge capacity as 3.83 ± 0.63. The highest mean score

Table 1. Socio-demographic and work-related characteristics of the study subjects (n = 300)

Socio-demographic and work-related characteristics	No.	%
Gender		
Male	70	23.3
Female	230	76.7
Age (years)		
20-less than 30	91	30.3
30- less than 40	175	58.3
40 - less than 50	24	8.0
50 and above	10	3.3
Mean ± SD	33.24 ± 7.58	
Years of experience		
< 2	17	5.7
2-< 5	68	22.7
5- <10	105	35.0
>10	110	36.7
Mean ± SD	9.11 ± 5.47	
Highest degree attained		
Diploma in Nursing Sciences	4	1.3
Bachelor in Nursing Sciences	253	84.4
Masters in Nursing Sciences	43	14.3
Working Unit		
Emergency	72	24.0
Endoscopy	7	2.3
ICU	10	3.3
Labor and delivery	3	1.0
NICU	8	2.7
Operating room	42	14.0
Outpatient	62	20.7
PICU	4	1.3
Medical	62	20.6
Surgical	30	10
Have you been practicing nursing during the COVID-19 pandemic?		
No	20	6.7
Yes	280	93.3
Do you work directly with COVID-19 patients?		
No	118	39.3
Yes	182	60.7

Table 2. Nursing staff perception regarding hospital readiness for continuity of essential health care services in line with COVID-19 (n = 300)

Hospital readiness for continuity of essential health care services in line with COVID-19	Mean ± SD
Continuity of essential health care services general principles	3.95 ± 0.60
Continuity of essential health care services basic requirements	3.78 ± 0.70
Continuity of essential health care services hospital preparedness tasks	3.89 ± 0.65
Continuity of essential health care services hospital response tasks	3.91 ± 0.68
Continuity of essential health care services hospital recovery task	3.74 ± 0.68
Overall	**3.89 ± 0.61**

Table 3. Nursing staff perception of surge capacity in health care in line with COVID-19 (n = 300)

Hospital readiness for surge capacity in health care in line with COVID-19	Mean ± SD
Surge capacity general principles	3.86 ± 0.75
Surge capacity basic requirements	3.85 ± 0.67
Surge capacity hospital preparedness tasks	3.83 ± 0.65
Surge capacity hospital response tasks	3.84 ± 0.68
Surge capacity hospital recovery task	3.79 ± 0.75
Overall	**3.83 ± 0.63**

was related to the hospital's ability to manage surge capacity general principles (3.86 ± 0.70), followed by surge capacity basic requirements (3.85 ± 0.67), whereas the lowest mean score was related to the hospital's ability to manage recovery tasks of surge capacity (3.79 ± 0.75).

Correlation and Regression Analysis Between Nursing Staff Perception of Hospital Readiness for Continuity of Essential Services and Surge Capacity in Health Care in Line with COVID- 19

The result illustrated a strong positive significant correlation between nursing staff perception of hospital readiness for continuity of health care services and surge capacity in health care in line with COVID-19 (r = 0.838, $P < 0.001$). The value of R2 of surge capacity in health care can predict 82.9% of the variance in hospital readiness for continuity of health care services in terms of surge capacity general principles (β = 0.154, $P = 0.001$, CI: 0.051–0.202), basic requirements (β = 0.457, $P < 0.001$, CI: 0.316–0.526), and preparedness tasks (β = 0.241, $P < 0.001$, CI: 0.112–0.346). The results showed a statistically significant impact as signposted by the significant regression model analysis (F = 286.025, $P < 0.001$) (Tables 4, 5).

Discussion

The new virus, known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), that causes COVID-19, is spreading rapidly around the world and pushing the health system to its limits. Increased throughput based on COVID-19, the results of this study found that nursing staff had a moderate understanding of the hospital's preparations for continuous medical care, which means that the hospital is following the pandemic guidelines and guidelines set by the WHO and CDC for COVID-19 to ensure the protection of employees, patients, and visitors. In addition, the hospital takes preventive measures to prevent and control the spread of diseases. This finding is in contrast with a study in India,[21] which reported that hospital care was severely affected due to the outbreak of the COVID-19 pandemic and fasting throughout India. In addition, most hospitals have insufficient infrastructure, poor ventilation, non-compliance with infection control precautions, and restrictions on the physical distance between patients to reduce the risk of COVID-19 transmission.[22,23]

Nursing staff reported a high level of hospital readiness for the general principles of continuity of health care followed by response tasks that measured the hospital's readiness to fight COVID-19.[24] These results imply that hospital readiness is based on immediate government action on KSA in response to COVID-19. The

Table 4. Correlation matrix between hospital readiness for continuity of essential services and surge capacity in health care in line with COVID-19

Surge capacity in health care		Hospital readiness for continuity of essential health care services					
		General principles	Basic requirements	Preparedness tasks1	Response tasks	Recovery task	Overall
General principles	r	0.661*	0.636*	0.798*	0.821*	0.803*	0.765*
	p	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*
Basic requirements	r	0.766*	0.765*	0.869*	0.885*	0.887*	0.765*
	p	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*
Preparedness tasks1	r	0.705*	0.782*	0.826*	0.862*	0.846*	0.826*
	p	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*
Response tasks	r	0.681*	0.765*	0.794*	0.838*	0.816*	0.859*
	p	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*
Recovery task	r	0.521*	0.550*	0.640*	0.625*	0.636*	0.798*
	p	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*
Overall	r	0.734*	0.790*	0.859*	0.895*	0.878*	0.838*
	p	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*

*Statistically significant at $P \leq 0.05$; r, Pearson coefficient.

Table 5. Regression analysis of hospital readiness for continuity of essential services and surge capacity in health care in line with COVID-19

Surge capacity in health care domains	Hospital readiness for continuity of essential health care services				Confidence interval
	B	Beta	t	P	UL-LL (B)
General principles	0.127	0.154	3.302*	0.001*	0.051–0.202
Basic requirements	0.421	0.457	7.915*	< 0.001*	0.316–0.526
Preparedness tasks	0.229	0.241	3.854	< 0.001*	0.112–0.346
Response tasks	0.072	0.08	1.338	0.182	−0.034–0.178
Recovery task	0.039	0.048	1.413	0.159	−0.015–0.094

$R = 0.911$ $R^2 = 0.829$, adj. $R^2 = 0.827$, $F = 286.025$*, $P < 0.001$*
F and P, f and P values for the model; R2, coefficient of determination; B, unstandardized coefficients;
Beta, standardized coefficients; t, t-test of significance; CI, confidence interval; LL, lower limit; UL, upper limit.
*Statistically significant at $P \leq 0.05$.

hospital tried successfully and fairly to balance the distribution of scarce hospital resources between routine and emergency needs. Through the collaboration between the hospital and local and national health authorities, hospital administrators have been able to make decisions to balance routine health needs with those of epidemic patients. Additionally, during the COVID-19 epidemic, the hospital used triage criteria in admitting the most critical and curable epidemic patients.[24]

Carenzo et al.[25] (2020) found that improving the overall safety and responsiveness of the entire hospital is the top concern of most hospital administrations. Mills et al.[26] (2020) clarified in their study of the use of scalability in hospitals (The Effectiveness of Response and Mitigation Strategies) that the US government law increased pressure on hospitals to improve preparedness and take appropriate action to take management of the expansion capacity.[26] This confirms the result of this study, in which the highest mean value was related to the ability of the hospital to meet general scalability principles and basic scalability requirements. In addition, the nursing staff realized that the hospital was able to meet the growing need for emergency health services and employed strategies to optimize the use of resources needed to cope with epidemics and other emergencies. In addition, the nurses received frequent training and exercises to improve their performance. These results can also be attributed to the fact that the hospital has developed strategies to expand the area and capacity of the rooms and beds (eg, new rooms or the conversion of ward beds to emergency beds)

and is waiting for additional staff, resources, and associated resources and costs that arise from these top-up measures.[26]

The results of this study showed the lowest average score for the hospital's ability to complete augmentation capacity restoration tasks. The same results were reported by Maryyan[27] (2019), who examined nurses' perceptions of hospital readiness at a large state hospital. They were tied to the hospital's operational performance by providing an emergency capacity and developing plans to expand recovery operations, including involving nurses in policy development and strategic planning efforts. These results could be attributed to the fact that caring for patients with COVID-19 has placed heavy pressure on caregivers.[28] As a result, it was necessary to reorganize the nursing service, hire nurses who worked in other services, reinstate retired professionals, or hire temporary workers.[22,29]

The findings illustrated a strong positive significant correlation between nursing staff's perception of hospital readiness for continuity of health care services and surge capacity in health care in line with COVID-19. Surge capacity in health care can predict 82.9% of the variance in hospital readiness for continuity of health care services. This may be due to an anticipated increase in the workload at the time of the pandemic outbreak. This result was in line with WHO[30] (2020) recommendations to consider strategies regarding augmenting hospital staffing, equipment, and supplies, including redistribution of workforce and services in accordance with the characteristics of the epidemic in the area.

It is important to address the equipment and supplies necessary to maintain high-quality health care, especially for patients with severe COVID-19. In addition, He et al.[31] (2020) revealed that augmentation of medical surge capacity as a basic strategy can be used to achieve an effective disaster response. In disaster response, due to the complexity of disaster medical capacity amplification, it is important to select the appropriate medical capacity strategy accurately according to the actual disaster situation.

Limitation

The study participants included nursing staff only, so the results cannot be generalized to the other population with different experiences and perceptions in the clinical setting, but it can be repeated that the respondents in this study were also restricted to 1 hospital. Due to the COVID-19 pandemic, it is recommended that more research be done on a wider scale.

Conclusion

The results of this study are important for nursing administrators and caregivers to help them identify key aspects of hospital care that need improvement in order to enhance their clinical environment in the prevention, control, management, and containment of COVID-19. These guide hospital administrators to improve hospital regulations and protocols in the treatment of confirmed and suspected COVID-19 patients, as well as develop an educational program for health professionals at all levels related to the prevention, control, and treatment of those with suspected and confirmed COVID-19. They can also help nurses assess the internal environment, including strengths and weaknesses, of hospital readiness for confirmed or suspected COVID-19 patients. The government needs to prioritize and manage the health care capabilities of the country and the quantity and distribution of health care employees, as well as their overall well-being. In terms of boosting essential bed capacity, there has been impressive success. As a result, the capability to safely handle medical waste is typically manageable. Disruption to key health care services needs further attention. Nonetheless, the limitations of boosting health care capacity emphasize the fact that such initiatives may only constitute a portion of the pandemic response equation. An effective pandemic response ultimately necessitates the government's willingness to enhance health care capacity while also flattening the curve.

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