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## Potential Strengths and Weaknesses in Hospital Resilience in the Context of the COVID-19 Pandemic in Brazil: A Case Study

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










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## Potential Strengths and Weaknesses in Hospital Resilience in the Context of the COVID-19 Pandemic in Brazil: A Case Study

Sydia Rosana de Araújo Oliveira <sup>a</sup>, Gisele Cazarin <sup>a</sup>, Aletheia Soares Sampaio <sup>a</sup>, Ana Lúcia Ribeiro de Vasconcelos <sup>a</sup>, Betise Furtado <sup>b</sup>, Stéphanie Gomes de Medeiros <sup>c</sup>, Amanda Correia Paes Zacarias <sup>a</sup>, Andréa Carla Reis Andrade <sup>a</sup>, Karla Myrelle Paz de Sousa <sup>a</sup>, Kate Zinszer <sup>d</sup>, and Valéry Ridde <sup>e</sup>

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### ABSTRACT

The analysis of hospital resilience is essential in understanding how health services prepared for and responded to sudden shocks and unexpected challenges in the COVID-19 health crisis. This study aimed to analyze the resilience of a referral hospital in the state of Pernambuco, Brazil, in the context of the COVID-19 pandemic. The main theoretical approach based on resilience is the system's capacity to maintain essential functions and to absorb, adapt, and transform in the face of unprecedented or unexpected changes. A single case study approach was used to identify the strengths and weaknesses of this response capacity. Data triangulation was employed. Data were collected from April (beginning of case discharges) to October 2020 (decrease in the moving average of cases in 2020). A content analysis was then conducted. Data were analyzed in relation to context, effects, strategies, and impacts in facing the disruptions caused by the pandemic. The results indicated the occurrence of four configurations mostly favorable to hospital resilience during the study period. Among the main strengths were: injection of financial resources; implementation of new hospital protocols; formation of a support network; equipping and continuing education of professionals; and proactive leadership. Weaknesses found in the analysis included: initial insufficiency of personal protective equipment and confirmatory tests; difficulties in restructuring work schedules; increasing illness among professionals; stress generated by constant changes and work overload; sense of discrimination for being a health professional; lack of knowledge about the clinical management of the disease; and the reduction of non-COVID assistance services.

### ARTICLE HISTORY

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### KEYWORDS

COVID-19; emergency response capacity; health assessment; hospital; resilience

## Introduction

A year after the COVID-19 pandemic began, Brazil became the epicenter of the crisis, with over 2,300 deaths daily.<sup>1</sup> The main coping strategies adopted were social distancing and isolation, wearing of masks, individual and collective hygiene actions, and closing of services considered non-essential; these were, however, applied differently across Brazilian states.<sup>2–4</sup> There were also shortages of diagnostic tests and personal protective equipment (PPE), and coping strategies were insufficient and uncoordinated between national, state, and municipal management spheres.<sup>5–7</sup>

The impact of the pandemic caused an overload in hospital care services, queues for beds, and a shortage of supplies for intubation and life-supporting oxygen, all exacerbated by the emergence of new variants,<sup>8,9</sup> the

shortage of qualified human resources,<sup>10</sup> and the slow initial pace of vaccination against COVID-19 in the country.<sup>4</sup>

Hospitals became responsible for supporting hospitalized cases. It was a challenge for these services to continue ensuring the safety of patients and professionals, while having to adapt in the context of numerous controversial policies to fight the pandemic in the country.<sup>11,12</sup>

There has been growing interest in understanding health systems resilience during the COVID-19 pandemic.<sup>13</sup> The application of this concept of resilience in health research is recent, in relation to the system's capacity to maintain essential functions and to absorb (to continue to provide the same level of services using the same level of resources), adapt (to provide the same

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level of services with less resources or different resources), and transform (to transform the functions and structure of the system to respond to a changing environment) in the face of unprecedented and/or unexpected changes.<sup>14,15</sup>

This study analyzed hospital resilience in Pernambuco, in northeast Brazil, during the pandemic. The crisis linked to the COVID-19 pandemic increased inequalities, historically characterized between regions and states, with more complex situations in the North and Northeast requiring strong local action by public health services.<sup>16</sup> Thus, this study identified the strengths and weaknesses of the disruptions that occurred, as well as the processes of absorption, adaptation, and transformation experienced,<sup>17,18</sup> from the perspective of health care professionals in a hospital in Brazil in 2020. The aim was to understand the fundamental role that health professionals played in the resilience of the system.

## Methods

Qualitative evaluative research of the single case study type was conducted.<sup>19</sup> The study is part of the HoSPiCOVID research project.<sup>17</sup> The selected case was a public referral hospital for the care of COVID-19 cases in the state of Pernambuco, Brazil.<sup>19</sup> It is a university hospital of the government of the state of Pernambuco and a reference center for managing infectious diseases, with 400 beds. During the study period, the service had 135 infirmary beds and 68 beds in intensive care units (ICU) for COVID-19; 1,293 suspected cases of COVID-19 were hospitalized, 626 of which were confirmed, and there were 104 deaths, with a mortality rate of 16.6%. Data collection consisted of documentary review, direct observation (n = 3) and semi-structured interviews (n = 18), which enabled a comprehensive understanding and interpretation of the case.<sup>19</sup> We collected data from April 2020, the month when cases increased, to October 2020, when the situation had stabilized. Documents (n = 16) included hospital reports, state and municipal contingency plans, technical notes, decrees, and reports published in the period. We carried out direct observation in three moments during the data collection period, in the services that attended to COVID-19 patients, with the aim of understanding the practical challenges and interactions that were taking place in the service at the pandemic. We created three reports with the information collected during the observations.

Interviewees were intentionally selected<sup>19</sup> from different hospital sectors: nine nurses, six physicians, one physiotherapist, one speech therapist, and one nursing

technician. The theoretical saturation criterion was used for data collection interruption purposes.<sup>20</sup> The researchers and students linked to the project conducted interviews in virtual format. They were previously scheduled, recorded, and later transcribed. A previously tested semi-structured script was used for the interviews. The data were analyzed using MAXQDA Analytics Pro 2020®. After analysis, each participant was sent their transcript to verify whether it reflected their opinions. A content analysis was then conducted. We performed the following steps: description, analysis, and interpretation.<sup>21,22</sup>

Data were organized into configurations and analyzed and interpreted using pre-established conceptual categories important in hospital resilience<sup>17,18</sup>: context and three dimensions of the process: effects, strategies, and impacts, as emerged from the primary data (Figure 1). The categories helped to grasp the interrelationships between effects caused by the pandemic, which could be strengths or weaknesses, and which could be reconfigured in strategies implemented to deal with those effects and, ultimately, the impacts of these strategies on hospital organizational routines.<sup>17</sup> In this sense, the strategies implemented in the hospital reflected the capacities of absorption, adaptation, and transformation in the face of the threats suffered. The study was approved by the National Commission of Ethics in Research (CONEP) (CAE: 30982620.8.0000.0008).

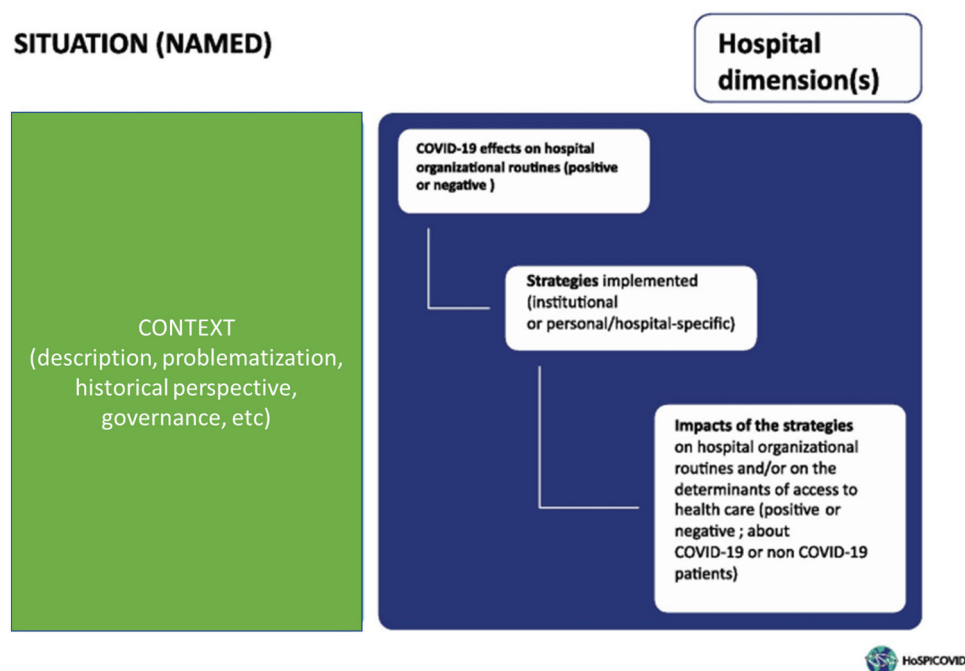
## Results

We interviewed 18 participants. Most participants in this study are female (88.9%) and were over 31 years of age (44.5%). 55.5% had a graduate degree. Regarding the time working in the hospital, 66.8% had five years or more (Table 1). Four configurations, presented below, were identified as outstanding situations in the hospital environment. These configurations were analyzed to identify the strengths and weaknesses of hospital resilience, as well as the strategies developed to act on them. They are described in Table 2.

### **Configuration 1. Infrastructure Reorganization to Increase Patient Care Capacity**

#### **Context**

On February 25, 2020, the hospital received the first suspected state cases of COVID-19, coinciding with the first national case. In that same month, the country declared a Public Health Emergency of National Importance (ESPIN). Five days later (March 17) community transmission was registered.



**Figure 1.** Empirical analysis categories. Source: Ridde et al. (2021).

**Table 1.** Participants in this study according to gender, age group, education, length of experience. Pernambuco—BR, 2022.

	N <sup>o</sup>	%
<b>Gender</b>		
Feminine	16	88,9
Male	2	11,1
<b>Age</b>		
20 to 30 years	4	22,2
31 to 40 years	8	44,5
Over 40 years	6	33,3
<b>Education</b>		
undergraduate	8	44,5
graduate	10	55,5
<b>Length of experience</b>		
1 year or less	3	16,6
2 to 4 years	3	16,6
5 to 6 years	3	16,6
9 to 14 years	3	16,6
More than 15 years	5	33,6

Source: Authors

### Effects

The service had been preparing since January through planning meetings. A crisis committee was created, and the hospital management was committed and active, rapidly mobilizing professionals.

There were reports of communication difficulties between professionals from different sectors. Inadequate infrastructure when cases began to increase led to the hospital's reorganization.

### Strategies

The hospital reorganization was intense. Some sectors were changed into COVID wings in record time. A provisional ICU was set up, and some non-COVID

wards were combined into one ward, in an absorptive process with only replacement of existing beds.

Adaptation strategies were observed with investments by the state government to change the number of COVID beds (68 ICU beds and 133 infirmary beds), with infrastructure improvement. Care for non-COVID patients was decreased and elective surgeries were suspended by state determination.

The scarcity of scientific literature at the time led to intense production of protocols, which required constant revision.

### Impacts

The strategies used optimized patient care and flow. An increase in care provided by professionals was observed, with the adoption of effective measures related to hygiene and circulation in the hospital. However, non-COVID-19 patients had difficulty in continuing care, with negative impacts on their health. The media began reporting on the hospital's actions, which were largely supported by the public.

Professionals were constantly relocated from one sector to another, with the initial changes causing significant stress. They reported having little time for meals and fluid intake, in addition to spending several hours standing.

It was noted that the professionals were not psychologically prepared to deal with a pandemic, and despite the creation of protocols, clinical uncertainty remained due to the unprecedented nature of the disease and its potential for transmission.

**Table 2.** Main effects, strategies, impacts developed during the hospital response and Interview extracts that clarify the configuration. Pernambuco—BR, 2020.

<b>Configuration 1. Infrastructure reorganization to increase patient care capacity</b>	
Effects	Creation of a local crisis management committee; committed and active hospital management. Communication difficulties between professionals from different sectors;
Strategies	Adaptation of COVID beds in record time; reduced attention to non-COVID patients and suspension of elective surgeries; construction and constant review of protocols and the professionals' own practices in the absence of official protocols.
Impacts	Optimization of flow and patient care; adoption of effective measures related to hygiene and circulation in the hospital. Stress; a scenario of clinical uncertainties; difficulty continuing to care for non-COVID patients.
Interview extracts	We had a provisional campaign ICU set up . . . Wards also changed their characteristics; what was general surgery became the COVID ward; what used to be an oncology infirmary became a COVID infirmary . . . most of the hospital's active beds are now dedicated to this context (E15, ICU physician).
<b>Configuration 2. Management of PPE, equipment, and supplies</b>	
Effects	Scarcity of PPEs and misinformation regarding their use; increase in sick leaves due to flu conditions; scarcity and distrust of the diagnostic tests used = .
Strategies	Training on the use of PPE; implementation of a cohort process to optimize PPE use; creation of a PPE supply center; mobilization to raise donations to acquire PPE and inputs through the ComVida volunteer project; adapting the role of the hospital epidemiology nucleus (NEPI) to speed up test results.
Impacts	Optimization of PPE consumption; conducting COVID-19 quick tests to streamline screening; community support and media coverage. Physical discomfort generated by prolonged use and non-adaptation of PPE.
Interview extracts	When the cohort was established, we noticed a sharp drop in PPE consumption, which dropped by 70% at that time, and naturally there were no more absences. However, there was at some point a delay in the arrival of the PPE (E1, infectious disease physician).
<b>Configuration 3. Staff management and risk of contamination of health professionals</b>	
Effects	Absenteeism due to professionals' contamination and illness; the need to train professionals on clinical care protocols; work overload for professionals who remained working; professionals' fear of getting sick and dying.
Strategies	Investment in continuing education; hiring of new professionals; constant reformulation of care protocols; expansion of testing for professionals; separation of professionals by contamination risk areas; application of a death management protocol; restructuring of the occupational medicine service; donation collection.
Impacts	Encouraging teamwork; strengthening of solidarity ties; increased individual resilience; stronger bonds between professionals and patients. Work overload; increased social isolation; inexperience of new hires; withdrawal from the contract by some newcomers due to overload.
Interview extracts	A lot of new people, right? . . . People who have no experience like this . . . We had a lot of difficulty with this, because not even the coordination knew, and suddenly a new one arrived, and had to fit in . . . that then, ended up getting in the way, you know? (E16, pediatric ICU nursing technician).
<b>Configuration 4. Communication with COVID-19 patients and families</b>	
Effects	Professionals' engagement in improving communication with patients' families; social isolation of patients; psychic suffering.
Strategies	Implementation of technology-based solutions for communication; attracting donations of technological devices to promote remote communication; multidisciplinary team working to minimize the isolation and social distancing of patients, especially pediatric patients.
Impacts	Technology minimizing the effects of isolation; fostering rapprochement between patients and their social network; Failures in communication with families; discomfort among professionals around the communication of deaths.
Interview extracts	Doctors deliver daily bulletins passing on information to families about what has happened . . . Patients who are hospitalized for three days do not actually make a video call . . . The psychology and social work group have also been making these video calls with the families (E1, physician, DIP Screening).

Source: The authors.

## **Configuration 2. Management of PPE, Equipment, and Supplies**

### **Context**

The hospital had equipment, PPE, and supplies of good quality and quantity before the onset of the pandemic. However, as the pandemic progressed, case numbers increased, and there was more professionals working on COVID-19 cases, there was difficulty in purchasing new PPE and an initial shortage of resources. Due to supply and demand issues, PPE prices, and other related inputs are higher, there were delivery delays and purchasing difficulties. RT-PCR tests were performed at the hospital.

### **Effects**

With the increase in contamination and difficulty acquiring PPE and supplies, the state government published a clinical protocol with recommendations regarding the use of PPE according to the function/sector of activity in the various health services.

Disinformation regarding the use of PPE was evident among some health workers who were not carrying out care activities.

High professional turnover due to sick leave was reported, likely related to COVID-19 before the widespread availability and timeliness of RT-PCR or antigen test results. Professionals distrusted test results, due to the possibility that samples had been collected after the recommended period, as well as to the low specificity of the rapid tests used at this time.

### **Strategies**

Aiming to reduce the consequences of the shortage of PPE and misinformation, the hospital infection control committee (CCIH) played a strong role by being responsible for measurement and classification PPE. Training focused on the importance of all hospital professionals' using PPE by all workers in the hospital. The hospital created a Server Care Center to support

professionals suspected of being infected, which provided priority testing and protocols for work activities and return to work. The hospital epidemiology nucleus (NEPI) worked to improve the timeliness of RT-PCR test results. These actions were absorbed by the service.

We also identified transforming processes in the study, as can be seen below. PPE distribution was modified as a function of the level of risk of contamination in the work area. A cohort process was also instituted, wherein a unit would serve only one purpose, and professionals began using the same PPE for a longer period. A centralized PPE supply center was created. Each professional on the team was assigned exclusive functions, which determined their circulation path within the hospital.

To mobilize resources, the hospital organized a project in collaboration with volunteers in the community, called the ComVida project. The project aimed to support professionals by raising donations of PPE, equipment, and inputs, in addition to distributing meals and motivational messages, being an important catalyst in the creation of an inter-organizational solidarity network.

### **Impacts**

Over time, the shortage of PPE and supplies was mitigated. The hospital cohort strategy showed significant results in optimizing PPE consumption, reducing waste and contamination. The efforts expended on acquiring tests improved their accessibility. It is worth highlighting the community support arising from the Comvida project, with a strong positive impact of hospital activities on the population, as well as media support for the project's activities, resulting in more donations to the hospital and consequently a large volume of PPE, equipment, and supplies.

Professionals reported physical discomfort due to prolonged use and non-adaptation of PPE to different biotypes (e.g. overweight or very tall). There were also difficulties when working with PPE, such as reduced visibility through a face shield.

## **Configuration 3. Staff Management and Risk of Contamination of Health Professionals**

### **Context**

In April 2020, the number of contaminated health professionals increased, as a result, the state's epidemiological bulletins began to highlight this epidemiological information. Student internships were temporarily suspended due to contamination risk. During this phase, there were shortages of PPE and material resources for

treatment of cases and restrictions on tests for health professionals.

### **Effects**

The high contamination risk brought an increase in the number of sick leaves due to contamination of health professionals. In March, sick leaves were for seven days, but this was extended to 14 days for both confirmed and suspected cases in April, as it became clear that early returns to work led to more contaminations. The reduction in human resources resulted in excessive workload for others. There was a push to hire new professionals to work with COVID-19 patients, mainly intensivists.

Professionals' fear of getting sick, dying, or infecting family members and their need to maintain physical distancing were constant. Their mental and emotional health was further aggravated when colleagues and/or people close to them got sick or died from the disease.

### **Strategies**

There was an effort to hire new professionals to work with COVID-19 patients, mainly intensivists. It was observed the call in the public tender of several professionals in the health area, in addition to hiring by other means due to the health emergency, in an adaptive process.

There were intense changes in patient follow-up protocols and in hospital work processes with training sessions on the application of these new protocols. Several absorption strategies were adopted, including the strict control of the flow of people, the regulation and monitoring of visits, and the prohibition of companions. All professionals were separated by contamination risk area. Clinical and Body handling protocols were also implemented. There was a reinforcement in self-care and hygiene measures. There was a daily re-creation of the work schedule of health professionals, due to the various leaves, while investment was made in expanding the testing. The occupational medicine service was restructured to expand access to confirmatory tests.

We also observed transformative strategies. The "ComVida" project worked to motivate professionals through the distribution of meals and motivational messages to support frontline professionals. Meals were distributed every day of the week, in two shifts, to all sectors of the hospital.

### **Impacts**

Positive changes in relationships were perceived, encouraging teamwork and solidarity between professionals and volunteers, in addition to increasing individual resilience. The permanent education program

promoted by the hospital became part of regular activities. The absence of companions for patients resulted in an increase in the bond between professionals and patients, in addition to solidarity between health professionals.

The risk of illness and the number of sick professionals led to work overload and increased social isolation. Professionals reported that the training brought an overload, especially for more experienced professionals who needed to supervise the work of newly hired employees. Some new hires did not adapt to the intense routine and gave up their positions. There were reports of having to deal with their fears and stresses and still having to welcome team members.

#### **Configuration 4. Communication with COVID-19 Patients and Families**

##### **Context**

The worsening of the situation and the implementation of follow-up protocols meant that only companions of elderly patients and children admitted to the hospital with COVID-19 could access the hospital premises, at defined times.

##### **Effects**

The social distancing and isolation of COVID-19 patients were measures taken to contend with the high transmission of the disease. These measures had weaknesses: psychological repercussions, particularly for children.

The need to maintain communication between hospitalized patients and their families and their social support network, in addition to the regular provision of information about their clinical status, required both mobilization of the professionals involved in COVID-19 care and innovative communication practices.

##### **Strategies**

Transformation strategies were observed to facilitate communication between patients and their social network, a network of allies was created. Professionals transmitted clinical updates to families, mainly regarding critically ill patients unable to communicate, through daily telephone calls. Within the ComVida project, teams of volunteers were set up to provide various forms of assistance, including electronic devices, to support less seriously ill patients' direct communication with families. Hospital sectors began to provide care via telemarketing whenever possible to prevent non-COVID patients from going to the hospital and to reduce the discontinuity of care resulting from the replacement of beds.

A multi-professional team, led by psychology and social work professionals, worked with patients regarding issues of anxiety, social distancing, and fear. Establishing absorption strategies in the service.

##### **Impacts**

Technology was an important mediator in minimizing the effects of isolation. Health professionals became very close to some patients. The closeness between patients and their social network was promoted, to ease isolation, especially for pediatric patients with COVID in the ICU, where visiting time was restricted and it was not possible to follow up when there was a significant increase in cases.

However, the technology also created difficulties. Conflict with family members who questioned the hospital's communication processes, as there were failures in communication with some receiving updates and others not. Professionals reported that it was unsettling to report deaths to family members via the technology rather than in-person.

##### **Discussion**

The results of the present study provide evidence of resilient hospital response to COVID-19 in this specific hospital. Absorption capacity was related to the reorganization of services and modification of protocols, as well as to continuing education initiatives and collaborative work. These strategies were adopted with no change in the resources involved. Adaptation happened through the decrease in care for non-COVID patients, the suspension of elective surgeries, and hiring additional professionals for the service.<sup>14</sup> The adaptation process allowed both an increase and a decrease in some resources, allowing a change in organizational processes but with differences in relation to what it had previously.<sup>23</sup> Transformation, on the other hand, was linked to the mobilization of professionals, such as the implementation of the ComVida project, as well as the implemented cohort process. Transformation breaks with the previous logic and can be linked to innovative processes such as the one verified with the creation of the Comvida project.<sup>24</sup> Additional studies can be verified on the relationship between transforming capacity and innovation.

Investments in resources (physical, organizational, and symbolic) were fundamental in implementing the planned activities. In the case presented, there were enough financial resources from multiple sources (own, state government, civil society) to acquire the supplies needed to care for patients, although not always sufficient, due to their scarcity on the market. At the



beginning of the pandemic, authorities warned of the scarcity of PPE, confirmatory tests, and medicines due to the increase in world consumption.<sup>11,25</sup> The creation of a network of allies based on partnerships (professionals, hospital managers, and users), with organizational support from active leaders, that could raise donations of supplies to minimize some of this shortage, helped produce an internal political environment favorable to the implementation of new actions in a vulnerable setting (as in the case of the pandemic).<sup>26</sup> Furthermore, adopting innovations such as the cohort project to optimize PPEs was important to ensure quality of care.<sup>27</sup>

Other prominent strengths regarding infrastructure resources were the adaptation of existing beds; the rapid installation of new beds aimed at the disease; structural reforms to isolate areas; and changes in the flow of people through the wards. For Campos and Canabrava,<sup>11</sup> the COVID-19 pandemic unveiled one of the most problematic dimensions of Brazil's national health system, the precarious hospital care structure, which includes archaic building infrastructures and fragile regulatory care processes. The pandemic intensified preexisting challenges, but in this referral hospital opportunities were created to develop new solutions and incorporate ideas of adaptation, learning, and self-organization.<sup>28</sup>

Given the novelty of the pathogen, insecurity was a constant presence in participants' daily work. During the study period, the pandemic phase was considered the "first wave," characterized by lack of knowledge about the infection, excess of information (not always reliable), constant changes in disease management guidelines, and significant increases in cases and deaths in a short period.<sup>29</sup> However, even in conditions of extreme stress, professionals were able to adapt, with the goal of service continuity. Acquired skills were maintained, strengthening organizational learning.<sup>30</sup> The reorganization of work processes supported the acquisition of practical and safe skills in the clinical management of the infection.<sup>11,31</sup>

With significant numbers of professionals on sick leave, especially older professionals, there was a need to maintain continuing education, due not only to the constantly evolving situation and scientific knowledge, but also to the arrival of newly hired professionals. For Teixeira et al.,<sup>31</sup> such emergency hires, although essential, introduce new problems, given the lack of institutional norms and their inexperience with new procedures in an emergency context. The shortage of qualified professionals was widely experienced in Brazil and globally.<sup>10,32</sup>

The limited access to diagnostic tests, even by groups with high risk of exposure to the infection, was an

additional stress for frontline professionals.<sup>31</sup> Kameda et al.<sup>7</sup> consider that, in Brazil, the low availability of tests and their slow processing made it difficult to analyze COVID-19 indicators in health professionals. A study indicated that mass testing of professionals speeds up the return to work and interrupts the transmission chain in the work environment.<sup>27</sup> In countries where this strategy was implemented, transmission and absenteeism were reduced.<sup>33</sup>

In caring for infected patients and experiencing the dual fears of contracting COVID-19 and of contaminating loved ones and/or healthy patients, health professionals experienced a high degree of stress. Some reported the added stress of suffering discrimination for being health professionals. They also experienced anguish and feelings of helplessness due to the limited diagnostic tests and lack of PPE.<sup>29</sup> Under these conditions, there was a significant increase in their emotional burden, with physical and mental strain, as well as aggravation of their own preexisting health conditions, such as hypertension, depression, or anxiety.<sup>34</sup> To reduce occupational stressors, measures related to work (re)organization are needed, such as: psychological support; reduced working hours; professional development; improved working conditions; and social support.<sup>27</sup> In the present study, a voluntary hospital project (ComVida) offered support in several areas, including psychological assistance and obtaining different types of donations.

Health professionals also identified PPE insufficiency and poor quality as stress factors, especially during the initial period when, as the number of cases increased, the number of infected professionals also increased, and some died. While these difficulties are frequently seen in health care work, they can be exacerbated in situations of health crises.<sup>29</sup> Studies have found that environmental and organizational working conditions affect health professionals' work capacity, and in the case of a highly contagious disease, the lack of PPE exacerbates stress, since difficulties in accessing and using adequate protective measures contribute to increased exposure to the virus.<sup>35</sup>

Prolonging the time of PPE use to reduce consumption not only produced physical discomfort from the equipment itself (wounds caused by elastic, etc.), but also led to other conditions, such as urinary tract infections, due to poor hydration and reduced frequency of hygiene breaks. Studies have identified adverse effects of prolonged PPE use, such as cutaneous complications, headache, and physical and mental strain.<sup>35</sup>

In this hospital, visits to patients were suspended due to the high transmissibility of SARS-CoV-2. However, professionals were mobilized to create the ComVida project, in which local and regional cooperation mechanisms were established to protect patients'

**Table 3.** Lessons learned from the COVID-19 pandemic in a referral hospital. Pernambuco—BR, 2020.

1. Implementation of health and continuing education processes using web platforms;
2. Operationalization of lessons learned during the crisis period, adapting to changes;
3. Ability to change the course of actions with rapid expansion of services without compromising quality of care;
4. Creation of planning spaces that can guide information and enable timely decision-making;
5. Optimization of communication between hospital coordination and health professionals, with communication also facilitated between professionals and patients;
6. Provision of confirmation tests and examinations to break the transmission chain;
7. Implementation of agile communication about changes in PPE requirements and other hospital care and infection control protocols;
8. Adjustments in the workforce to cope with temporary shortages and sudden increase in number of patients;
9. Systematic assessment of health professionals' mental and physical health;
10. Linkages with civil society for fundraising.

Source: The authors.

emotional and mental health, a constitutive element of resilient hospitals. This led to innovations in communication and social support for patients, such as the use of mobile devices.<sup>12</sup>

Understanding how an intervention relates to the organizational and institutional political environments is important for reflecting on factors that can interfere in its implementation and the production of its effects. In this case, the hospital administration provided support, and good collaborative relational practices among workers (internal context) served to minimize the impact of the health crisis (external context) in the hospital environment.<sup>26</sup>

This study had some limitations. Because it began at the beginning of the COVID-19 pandemic, one difficulty was recruiting participants. The participants were all medical professionals working on the front line. They participated even after exhausting hours of work. Nevertheless, we had full support from the hospital management, which minimized this limitation. Another limitation was using digital technology to conduct the interviews, a necessary situation due to the pandemic. Because it is a distance modality, it was not possible to perceive certain subtleties that are possible in a face-to-face interview. However, we understand that these limitations did not reduce the quality of the work; they only made it difficult to fulfill it.

We can learn lessons from what was experienced at the study hospital during the analyzed period. The pandemic brought several challenges and learning opportunities for building more resilient health services and systems. [Table 3](#) highlights some of this knowledge that was learned, which can be fundamental to reducing the impact of future threats.

## Conclusion

The results highlight several measures that fostered hospital resilience in the pandemic context. Absorption and transformation were present at the onset of the

pandemic, and adaptation was observed as COVID-19 cases increased. However, the results also support the need to develop specific interventions and continuous learning to draw lessons from this health crisis.

Health professionals were exposed to excessive work and constant changes in routine, as well as emotional strain due to distance from family and friends, and the fear of falling ill, dying, or infecting people close to them. Support strategies, including responsive listening, along with solidarity among professionals, demonstrated the hospital's adaptability, showing organizational and professional resilience.

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