

## **PREPARATION AND RESTRUCTURING OF THE CENTRAL HOSPITAL ARISTARCHO PESSOA FOR THE FACING OF CRISES**

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### **ABSTRACT**

The State of Rio de Janeiro hosts events bringing together millions of people with risks of mass incidents. Disasters from natural and technological events such as flood and landslides are also realities in the city. The CBMERJ operates in all these events in addition to national and international operations. With an average occupancy rate of 90% of its hospital beds, the Central Hospital Aristarcho Pessoa (HCAP) is the only hospital in the health system of CBMERJ. The main goal was to describe an HCAP organizational planning to prepare and respond to incidents involving multiple victims (military and their dependents). After detailed and exploratory research, an operational organization chart was drawn up, the scaling of spaces, a call plan and the reallocation of functions through new functional or geographical responsibilities. Despite the high bed occupancy rate, HCAP has the capacity to reorganize its technical and administrative planning through an adapted Incident Command System and the training of the troops. The actions need to be aligned from the boards of HCAP and external agencies to ensure synergy during the response of a major event.

**Keywords:** Firefighters; Disaster Planning; Hospital Planning; Hospital Administration; Risk Management.

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## 1. INTRODUCTION

The State of Rio de Janeiro hosts mass events that bring together millions of people every year. In recent years, the city has hosted major events such as World Youth Day, the World Cup, the Olympics, in addition to routine events such as New Year, Carnival, *Rock in Rio*, soccer games and concerts. Apart from that, the city faces its own fragility to natural and technological disasters to which it was significantly exposed in recent months, such as the events taken place in the Boa Esperança/Niterói and Muzema/RJ Communities, as well as the April 2019 storm that caused several floods and resulted in deaths, and the May 2019 collapse of part of the Rafael Mascarenhas tunnel (CBMERJ, 2019; PRADO, 2019).

Holding major sporting events of worldwide visibility, such as the FIFA World Cup and the Olympics, offers increased risk as these events are potential targets, capable of boosting the interest of criminals in plotting terrorist attacks (FORTES , 2012).

High concentrations of people from different cities and countries give rise to other vulnerabilities such as a greater risk to the spread of infectious diseases and water contamination, for example, which also require specific surveillance systems as those created at the Olympic and Paralympic Games in London 2012 (SEVERI *et al.*, 2012) and Athens 2004 (HADJICHRISTODOULOU *et al.*, 2006).

In addition to medical care, psychological and psychiatric issues must not be neglected. During the 2015 terrorist attacks in Paris, a psychological support group of psychiatrists, psychologists, nurses and

volunteers who had already been previously trained for such an event was created for victims and families (HIRSCH *et al.*, 2015) ).

In these crisis scenarios, chaos, panic and disorganization take place. Wasted resources and lack of response planning can cost lives and millions of dollars, which is what happened in the USA in the 70s. After a wildfire that devastated California, despite human and material resources, the response plan failed. After this devastating experience, two projects were created to address any emergency situation, whether in response to natural disasters or emergencies with victims of dangerous products, victims of planned events, military missions, among others. The *Incident Command System-ICS* and the *Multi Agency Coordination System* are organizational structures with standardized principles and management for the aforementioned incidents (FEMA. FEDERAL EMERGENCY MANAGEMENT AGENCY, 1979). This ICS model has been adopted in Brazil as a tool for operational actions, by the Fire Departments of Paraná, São Paulo and Rio de Janeiro (SOUZA, 2014).

In Brazil, the Army's Chemical, Biological, Radiological and Nuclear Defense System (SisDQBRNEx) provides for permanent actions regarding human resources training and operational readiness, in order to allow a prompt and effective response to threats, incidents/accidents or disasters involving CBRN agents. This system is guided by interoperability with the other State Armed Forces and Auxiliary Forces to achieve joint actions, and by integrated action with other governmental and non-governmental actors (MINISTÉRIO DA SAÚDE, 2014).

No spectator, resident or worker is free from falling victim to incidents in the city of RJ. Military firefighters who act directly in these crisis situations can fall victim themselves. With an occupancy rate of

over 90%, the HCAP may face difficulties receiving firefighters victimized by any of these events (HCAP, 2019).

But this is a national issue, since, according to the World Health Organization (WHO), the optimal number of hospital beds should be from 3 to 5 for every thousand inhabitants (AHSEB, 2014) and Brazil only has 2.4 beds/1000 inhab. (SAÚDE, 2018).

During the 2014 World Cup, a study calculated the minimal available hospital beds in the 12 cities that would host the event (MIRANDA *et al.*, 2017). Based on data from the National Registry of Health Facilities – CNES (SUS, 2019), at the time, the study mapped vacancies in general hospitals, and found that all units had complete shortage of care for victims in the case of a disaster.

The study carried out by Freitas, 2016 showed that Maracanã and Engenhão stadiums and the Sambadrome would be strategic points for the hospital care of victims of outbreaks, however, it also found that the hospital treatment capacity during the Rio-2016 Games was insufficient for mass victims (FREITAS *et al.*, 2016).

Highly praised as an example of hospital preparedness for major threats, Israeli hospitals constantly develop security actions and response planning for incidents of any nature. Drills are routinely performed as a crucial part of preparedness as is the reallocation of spaces (GOLABEK-GOLDMAN, 2016).

In 2016, the HCAP was contacted by the State Government to create a unique Standard Operating Procedure for the 2016 Olympics.

For the hospital to be minimally prepared, the SOP provided for training, drills and the purchase of supplies (CNN, 2016).

During a crisis response, a primary factor of uncertainty and difficulties in management relate to situations in which, in performing their role, individuals receive orders from different sources. This makes their action expensive and ineffective, since such orders can be superimposed, generating a waste of resources or personnel, or be contradictory, even, generating antagonistic actions that compromise the effectiveness of the action (NASSAR, 2017; OFDA /LAC, 2013).

The lack of a clear command structure, the new responsibilities of professionals, the inadequate use of resources, the lack of integration of the agencies involved in the event, disorganized or non-existent logistics management can place the entire hospital response operation at risk.

Therefore, the aim of this work is to describe HCAP's organizational planning for preparedness and response to crisis situations.

## **2 MATERIAL AND METHODS**

### **2.1 TYPE OF STUDY**

This was a descriptive and exploratory research, in which the analysis of spaces and technical and administrative functions of the HCAP were studied concerning hospital response during a crisis scenario.

## 2.2 SETTING OF THE STUDY

The setting of the study was Central Hospital Aristarcho Pessoa of the Military Firefighters Corps of the State of Rio de Janeiro in 2019.

## 2.3 QUALITATIVE ANALYSIS

The study results regarding the shift schedule and ICS application were obtained by means of organization charts and flowcharts made using *smartArt in Windows 10* version 1803.

The photos and animations were made by a graphic design company, which manipulated, edited and altered the real photographs generating full-scale simulations of the scenarios for instructional purposes.

The following programs were used: *Adobe Illustrator CC 2018*, *Adobe Photoshop* and *Adobe Illustrator*. For animation to be used in power point presentations, program *Adobe Premiere Pro CC 2019* was used. The Material used for *in locu* photos were: cameras *Canon EOS REBEL T5i*, *G1X*, and *iPhone X* using *Gimbal Zhiyun Smooth 4* (stabilizer).

## 2.4 ETHICAL AND LEGAL ISSUES

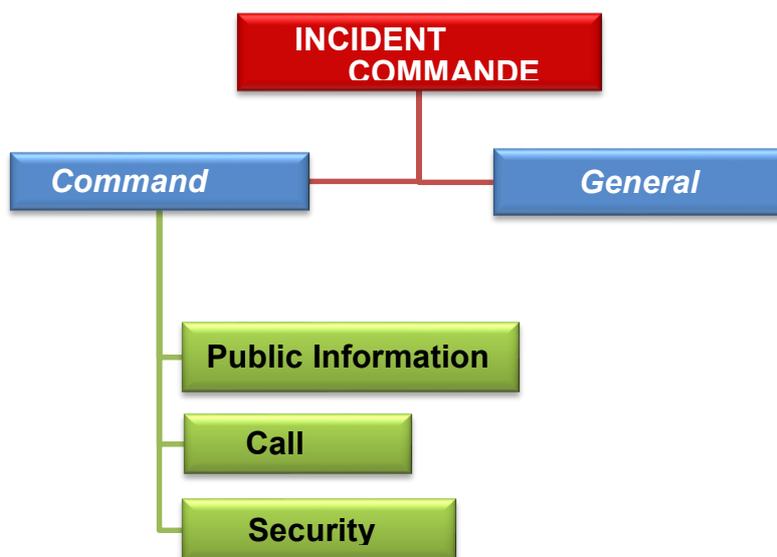
The study was authorized by the Technical and Administrative Board of HCAP and approved by the Directorate-General of Health.

### 3 RESULTS

Failures in the command structure in crisis scenarios, particularly when several agencies and institutions are involved, the lack of standardization in communications and integration of intra-hospital teams resulted in an operational organization chart where roles were reallocated by means of tool Incident Command System(ICS), a shift schedule and the resizing of physical spaces, which will be demonstrated as a result of this work.

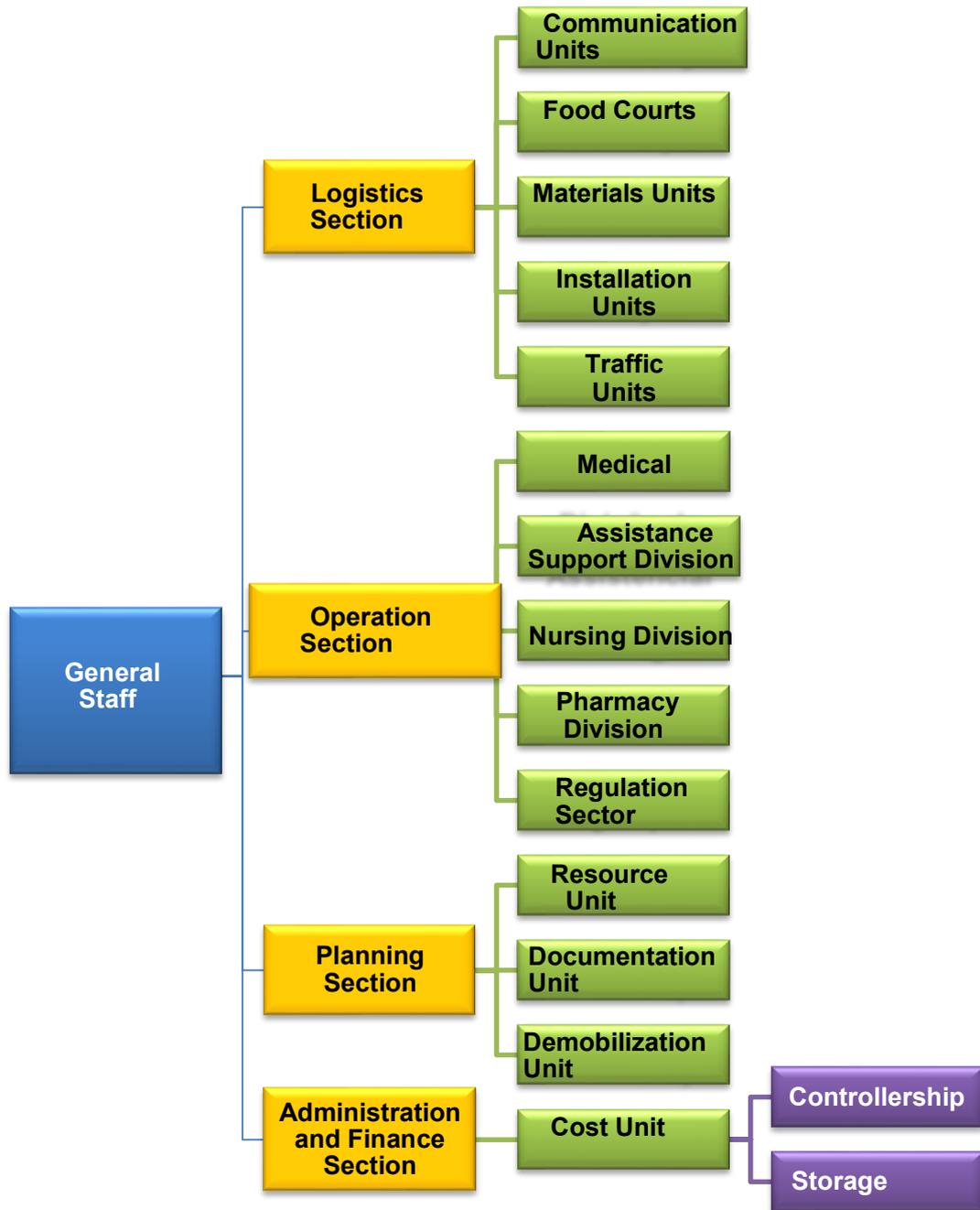
#### 3.1 OPERATIONAL ORGANIZATION CHART AND FUNCTIONS REALLOCATION

The following organization charts illustrate a proposal for an ICS adapted to the HCAP, where the hierarchy of sectors with new responsibilities and/or technical and administrative adaptations, due to their modular organization, can expand or contract according to the magnitude of the event.



**Organization Chart 1.** Incident control system proposal for HCAP

Source: Authors



**Organization Chart 2.** Organization chart from General Staff  
Source: Authors

When groups are divided into task force and intervention, such division is not necessarily made according to each group's primary activities, nor geographically in their original sectors. For establishing all

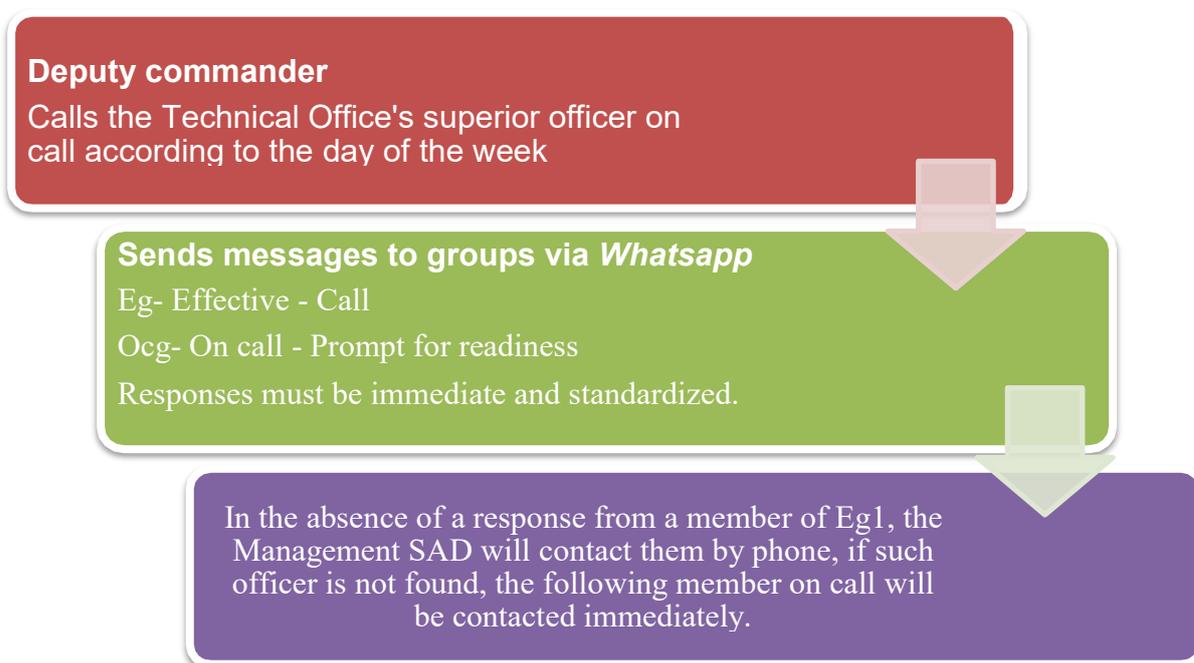
roles and responsibilities, a chart divided into chain of command, section, unit and roles was created. In this chain of command, the leader of each unit or sector must report directly to the person in charge of each section (logistics, operations, planning and management and finance) who reports to the general *staff*. It describes all the responsibilities in this chain of command included in the two organization charts according to the Hospital's needs. It is important to note that the incident commander, initially, is the most senior officer on site. As other officers arrive, such as administrative and/or technical management officers, the command is transferred vertically, reaching the Commander in Chief and even the State Governor, depending on the magnitude of the event. The common terminology, through the standardization of international nomenclature, were strictly followed in the chain of command and sections so that they can be used and identified in any scenario of any magnitude, regardless of the agents involved. This common terminology prevents new jargon and/or terms from being used by the agencies and organizations involved, preventing communication and information losses during incident response.

### 3.2 SHIFT SCHEDULE

The shift schedule must be elaborated in *WhatsApp* groups, following the model tested during the 2016 Olympics SOP. For each day of the week, the groups will be divided into an Effective Group (Eg) and an On-call Group (Ocg). The days of the week are numbered from 1 to 7, representing Sunday through Saturday. If the event occurs on a Sunday, for example, effective group 1 (Eg1) will be called. The deputy commander calls the superior officer, who is on call, according to the day of the week so that the latter can assess the shift schedule. In case of an incident with multiple victims reported by the press or 5 or more victims of the same event received at the HCAP, the superior officer calls the

other officers according to the shift schedule as authorized by the Technical Officer (Flowchart 1).

After taking up their posts, communication radio devices must be handed over to the incident commander, *General staff* and *Command staff*. At HCAP, radio devices are routinely used by the guard, duty officer, driver and deputy commander.



**Flowchart1. Shift schedule**  
Source: Authors

### 3.3 PHYSICAL SPACE RESIZING

In general, the number of beds in hospitals is insufficient to handle events with multiple victims. Therefore, it is common for spaces within the hospital to be reallocated and patients transferred to other hospital units.

After *in locu* mapping of the HCAP, three spaces were chosen for remodeling, aimed at increasing the capacity for multiple victims, namely: the management parking lot, one of the food courts and the waiting room of the outpatient clinics.

In order to simulate these spaces with their current functions and, afterwards, with the new scenarios, a graphic design project was developed in which actual photos of the spaces were edited, manipulated and created with the new compositions, for instructional purposes. The photos show these spaces' "before and after" in full scale.

The management parking lot was chosen to house the field hospital because of its proximity to emergency care and radiology and since the area is isolated from families and the press, who will be able to stay in the study center.

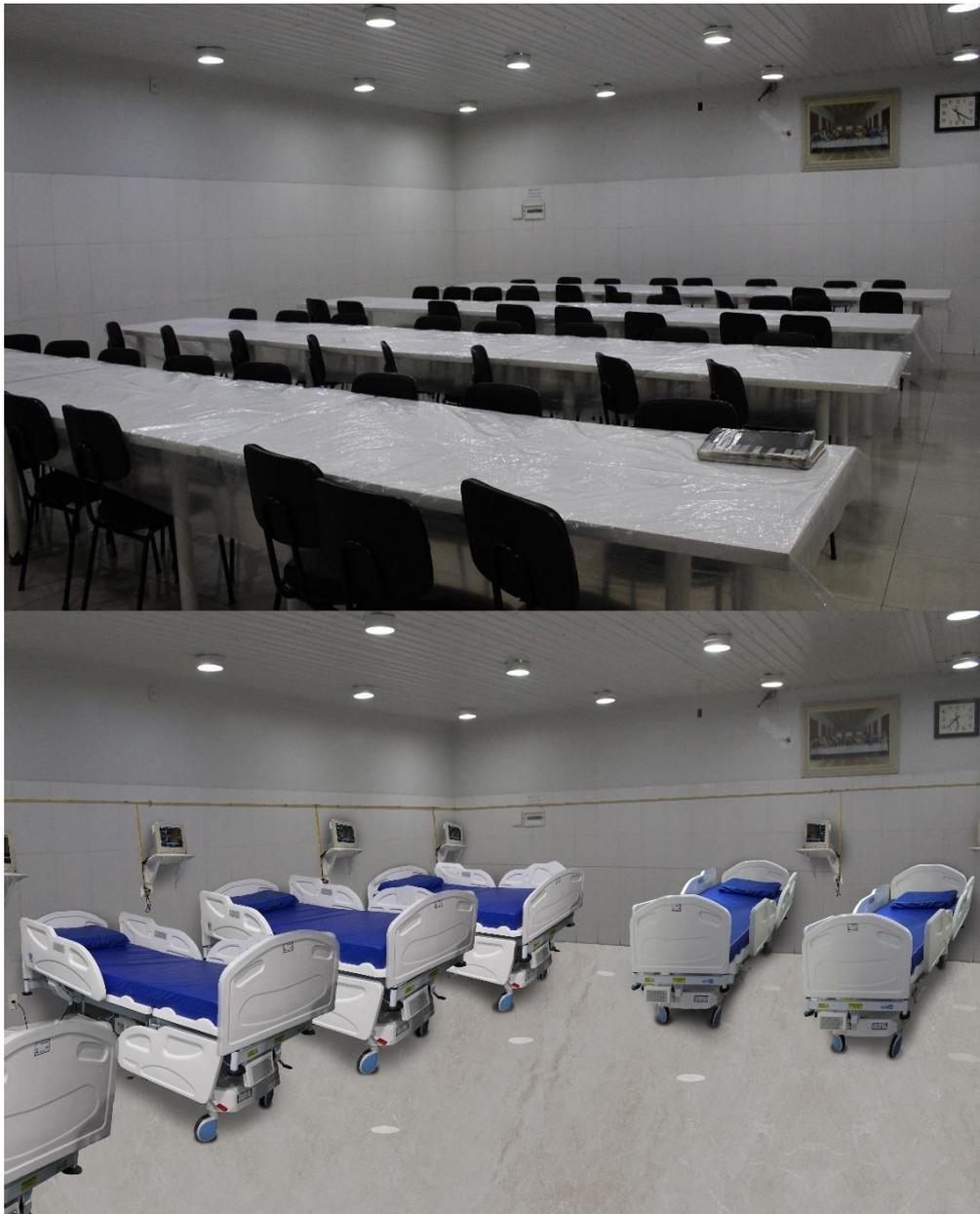
Figure 1 is an actual photo of the management parking lot, and an illustration with the comparison of the field hospital in full scale. The field hospital has a capacity for 4 beds for yellow patients and 1 bed for red patients in each assembled section. In the management parking lot, only 1 section can be assembled.



**Figure 1: Management parking lot before and after field hospital assembly.**  
Source: Authors

The second space analyzed was one of the food courts. In the past, this food court did not exist, and therefore is not directly attached to the kitchen. In figure 2, the food court was remodeled to receive 7 full-

scale beds for red patients, according to the RDC-50 architecture and health standards (ANVISA, 2002). For this transformation, in addition to a team of professionals: 7 beds, technological resources, such as monitors, medical gas cylinders and other supplies.



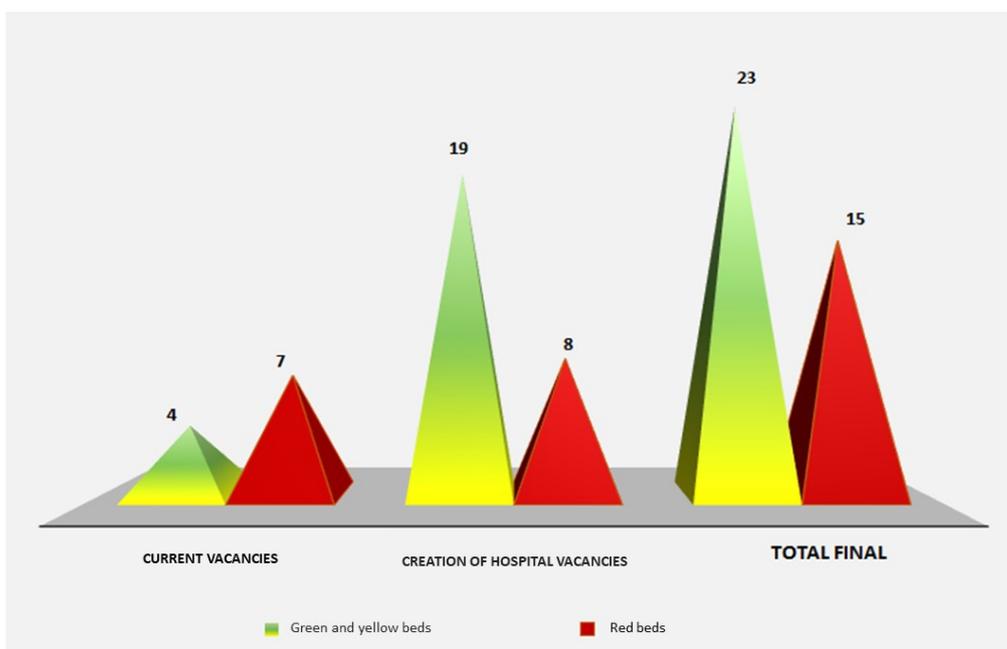
**Figure 2. Food court of the soldiers before and after the bed assembly.**  
Source: Authors

For the care of green victims, the reception room can be easily adapted. The beam seats and infusion chairs can be used for medication administration and patient observation. For suturing, the hospital is equipped with an office for minor surgical procedures on the ground floor of the same space (Figure 3). This space is far from the beds assigned for red and yellow patients, has a ramp for patient access and a parking area for ambulances and other vehicles that may carry the victims.



**Figure 3. List of outpatient clinics before and after assembly for green victim care.**  
Source: Authors

If such spaces are resized, hospital capacity would increase by 15 green victims (10 in the infusion chairs and 5 in one of the beam seats), 4 yellow victims and 8 red victims. Compared to what we have today (7 ICU vacancies + 1 emergency care bed for red victims), if there were 8 more red vacancies, the capacity would increase by 115%. In relation to beds for green and yellow victims, capacity would increase by 475%, since there are only 4 beds for yellow victims in emergency care, reaching 19 more beds for green and yellow victims, as shown in figure 4.



**figure 4. Numerical representation of the increase in the number of vacancies after the reallocation of spaces**

Source: Authors

#### **4. DISCUSSION**

The holding of major events in the city of RJ and in Brazil brought together thousands of people. Hospital capacity to care for victims from these events, for adverse reasons, was shown to be insufficient both in

the study of the 2016 Olympics and the 2014 World Cup, where cities other than RJ were involved (FREITAS et al, 2016; MIRANDA et al, 2017). This way, there is national unpreparedness regarding hospital care for victims of major disasters.

The HCAP could easily be the go-to hospital in the event of a crisis in the city of RJ, both for its own users and the general population, due to its geographic location. Located in Rio Comprido neighborhood, which is only 4.5 km away from Maracanã Stadium, and is close to the South Zone and the sambadrome, the risk of victims arriving voluntarily regardless of being entitled to the CBMERJ health system is a reality.

This data reinforces the need for health professionals to undergo specialized training and for the HCAP to be technically and administratively prepared in case military firefighters, their dependents and the general population fall victim to chemical, biological, radiological or nuclear exposure (CBRN) or other disasters corroborating SisDQBRNEx's planning (MINISTÉRIO DA SAÚDE, 2014; SAÚDE, 2014) and as described in the Paris attack (HIRSCH *et al.*, 2015).

Partial or total interruption of essential services, such as electricity, water, gas, telephony and internet, can take place during a crisis scenario. This way, communication will not depend on private HCAP cell phones and land lines, and will be made by communication radio devices, already used by soldiers and duty officers and also delivered to the incident commander, *command staff* and *general staff* as they take up their posts.

Just as no hospital has enough beds to face a health crisis, the HCAP does not have enough beds to care for the victims of these

events, according to international (AHSEB, 2014) and national data (SAÚDE, 2018) .

As shown in Figure 1, the field hospital could be an alternative for fast and low-cost care in these cases. With the increased number of victims, the adaptation of the food court and clinic as spaces for medical care can also be a solution (figures 2 and 3), reaching more than double the current capacity, in beds for red patients, for example, as shown in figure 4.

However, increasing the number of vacancies in the HCAP alone may not be enough to successfully help victims. Transfers to other reference and previously mapped hospital units are part of the ICS. Conflicting command orders during these events involving multiple agencies, institutions and organizations are also a threat (NASSAR, 2017; SOUZA, 2014). Applying an organization chart with the roles established as shown in the results (organization charts 1 and 2), can be a solution for these unfortunate events and allow the smooth operation and execution of the incident command system.

Correct ICS application allows the safety of those involved in the accident, the fulfillment of objectives and the safe and efficient use of resources (FEMA. FEDERAL EMERGENCY MANAGEMENT AGENCY, 1979) .

The attainment of all of the results of this study for ICS application will take time and adjustment like any other project. Therefore, training, simulation and capacity building are valuable tools for testing and adjusting the response operation. The experience of the current Emergency Relief Office in major events and the activation of its

Teaching, Training and Research Section (SETEP) are strong allies for the training and qualification of the military.

Applying increasingly realistic security and training protocols, testing communication and increasing defense are actionable recommendations from Israeli protocols that should be further studied to aid HCAP's planning (GOLABEK-GOLDMAN, 2016).

Although CBMERJ offers Clinical Psychology service for outpatient care, psychology care must be provided in disasters due to the nature of the events that military firefighters must face every day, along with a mental health promotion strategy.

After training the entire HCAP staff and simulating an incident, the firefighters stationed at the hospital were able to undergo a simulated experience of chemical agent contamination (CNN, 2016). But despite the simulation's success, HCAP preparedness must be continuous and remain updated with more realistic scenarios, by means of a unique incident command system.

## **5. CONCLUSION**

The HCAP has the physical structure to prepare for a crisis response. However, preparing the troops by means of drills and training in simulated disaster scenarios, the acquisition of supplies and permanent contact with agencies and institutions involved in crises are a must.

The study points to viable measures for increasing the number of beds at the HCAP by reallocating spaces (parking lot, food court and

outpatient clinics) and human resources, as well as a patient transfer planning.

Technical and administrative actions must be agreed upon by the HCAP boards and the intra and intersectoral bodies to ensure synergy during the response to a major event. The single incident control system will be successfully applied on the basis of the information and communication that will provide agility and security to the professionals involved in the emergency situation and especially to the military and their dependents who may fall victim to these incidents.

The CBMERJ Disaster Psychology Section and Service were created on 02/23/202, by means of directive CBMERJ No.1141 (IOERJ, 2021).

Seven months after the completion of this study, the COVID-19 pandemic took the world by surprise, and this work was used at HCAP in part during the year 2020.

***Conflict of interest statement:*** We have no conflict of interest to disclose.

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