

The Evolution of Field Hospitals in Brazil: A Timeline of Critical Events

A Evolução dos Hospitais de Campanha no Brasil: Uma linha do Tempo de Eventos Críticos

La evolución de los hospitales de campaña en Brasil: una cronología de eventos críticos

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Abstract

Field hospitals are crucial temporary structures in emergencies, widely used in Brazil for significant events. Despite their transitory nature, the architecture of these facilities is often neglected, with inadequate standardization for different crises. This article investigates the evolution and importance of field hospitals in Brazilian architecture and urban planning, examining how these structures have been adapted and used in different contexts, highlighting the need for adequate planning to ensure an effective and humane response. From the response to Yellow Fever to the Covid-19 pandemic, crises such as epidemics, natural disasters, and landslides have required the installation of these emergency structures. The analysis includes theoretical and documentary studies that highlight the relevance of these temporary structures, not only as emergency measures, but as elements of urban planning and public health. Based on these studies, guidelines are proposed for future implementation of field hospitals, aiming to improve crisis response. By bringing together historical and contemporary examples, the article offers information for the development of architectural policies and practices that promote an efficient response to crisis situations in Brazil.

Keywords: Field Hospital; Emergency Architecture; Public health; Health Crises.

Resumo

Os Hospitais de Campanha são estruturas temporárias cruciais em emergências, amplamente utilizados no Brasil em eventos significativos. Apesar de sua natureza transitória, a arquitetura dessas instalações é frequentemente negligenciada, com padronizações inadequadas para diferentes crises. Este artigo investiga a evolução e a importância dos hospitais de campanha na arquitetura e urbanismo brasileiros, examinando como essas estruturas foram adaptadas e utilizadas em variados contextos, destacando a necessidade de um planejamento adequado para garantir uma resposta eficaz e humanizada. Desde a resposta à Febre Amarela até a pandemia de Covid-19, crises como epidemias, desastres naturais e desabamentos exigiram a instalação dessas estruturas emergenciais. A análise abrange estudos teóricos e documentais que ressaltam a relevância dessas estruturas temporárias, não apenas como medidas emergenciais, mas como elementos do planejamento urbano e da saúde pública. A partir desses estudos, são propostas diretrizes para futuras implementações de hospitais de campanha, visando melhorar a resposta a crises. Ao reunir exemplos históricos e contemporâneos, o artigo oferece informações para o desenvolvimento de políticas e práticas arquitetônicas que promovam uma resposta eficiente em situações de crise no Brasil.

Palavras-chave: Hospital de Campanha; Arquitetura Emergencial; Saúde Pública; Crises de Saúde.



Resumen

Los hospitales de campaña son estructuras temporales cruciales en emergencias, muy utilizadas en Brasil en eventos importantes. A pesar de su naturaleza transitoria, la arquitectura de estas instalaciones a menudo se descuida, con estandarizaciones inadecuadas para diferentes crisis. Este artículo investiga la evolución y la importancia de los hospitales de campaña en la arquitectura y el urbanismo brasileños, examinando cómo estas estructuras fueron adaptadas y utilizadas en diferentes contextos, destacando la necesidad de una planificación adecuada para garantizar una respuesta eficaz y humanizada. Desde la respuesta a la fiebre amarilla hasta la pandemia de Covid-19, crisis como epidemias, desastres naturales y deslizamientos de tierra han requerido la instalación de estas estructuras de emergencia. El análisis abarca estudios teóricos y documentales que resaltan la relevancia de estas estructuras temporales, no sólo como medidas de emergencia, sino como elementos de planificación urbana y salud pública. A partir de estos estudios, se proponen directrices para futuras implementaciones de hospitales de campaña, con el objetivo de mejorar la respuesta a las crisis. Al reunir ejemplos históricos y contemporáneos, el artículo ofrece información para el desarrollo de políticas y prácticas arquitectónicas que promuevan una respuesta eficiente a situaciones de crisis en Brasil.

Palabras clave: Hospital de campaña; Arquitectura de Emergencia; Salud pública; Crisis sanitarias.

INTRODUCTION

Field Hospitals (HCamp) play a key role in responding to public health emergencies, providing temporary and emergency care at critical times. Although designed as temporary solutions, these structures have been frequently used throughout Brazil's history in a variety of situations. Despite their vital importance, the architecture of HCamps is often neglected, presenting significant challenges in terms of operational efficiency and patient comfort.

This article aims to explore the evolution and relevance of HCamps in the field of Brazilian architecture and urbanism over time. Starting from a historical context, a timeline will be drawn up of the most significant events in Brazil that required the implementation of these structures in different regions of the country. The analysis will include studies and applications of these facilities, highlighting the architectural adaptation and urban responses required to face specific crises, such as the Covid-19 pandemic.

The discussion of this type of emergency architecture highlights both the challenges observed and the good practices aimed at improving the preparedness and effectiveness of these temporary structures. In addition, issues related to the standardization, flexibility and sustainability of these structures, which are



essential for an efficient response to future public health emergencies, will be discussed.

By understanding the importance of architecture in Field Hospitals, this research aims to contribute to the development of policies and practices that promote the creation of more adaptable, safe and humanized structures. This not only improves treatment conditions during crises, but also strengthens the resilience of communities in the face of emergency challenges in Brazil.

Main Events in Brazil

The implementation of Field Hospitals in Brazil can be observed from the Yellow Fever epidemic to the contemporary challenges faced by the country, playing a crucial role in several health crises and natural disasters.

Yellow fever was an important milestone in several aspects related to public health and epidemiology. The disease was introduced to the American continent during the colonial period, and the first recorded epidemic in Brazil occurred in Recife, in 1685 (Franco, 1969).

During the 17th century, Brazil did not have a public health system. The wealthiest received treatment at home, through private doctors. The less fortunate depended on charitable institutions such as the *Santas Casas de Misericórdia* for medical care.

According to information from the Observatório do Terceiro Setor (2020), at that time, some senators refused to believe in the seriousness of the disease and criticized the opening of a field hospital to shelter the poor. One of the senators who questioned the seriousness of the situation died from yellow fever just two weeks after giving a speech in which he referred to the “exaggerated horror” of the disease.

In the fight against yellow fever, discussions about sanitation became urgent, leading to the development of urban plans. In addition, some facilities such as schools were adapted to provide medical care (figure 1) in order to respond to the growing demand for care due to the high number of cases. As the disease was controlled and outbreaks diminished, the temporary facilities were dismantled and returned to their original use.





Figure 1: Benjamin Constant School Provisional Hospital, in Rio de Janeiro, in 1918. Source: Silveira (2020).

Cases of yellow fever have continued to be recorded over the years, but the mortality rate is not as high as in the first epidemics due to the vaccination policy implemented. In addition, to combat the disease, some field hospitals were created in strategic locations to provide medical care, with the main objective of vaccination. These measures are essential to protect vulnerable populations and contain the spread of the disease.

Another disease that ravaged the world at the end of the First World War was the Spanish Flu pandemic, which arrived in Brazil at the port of Recife from an English ship in 1918, causing great devastation (figure 2). Due to the large number of cases initially reported in Spain, the pandemic came to be known as the Spanish flu. However, dozens of other countries were also severely affected (Cabral and Schatzmayr, 2012).

The most affected Brazilian cities were Recife, Salvador, Rio de Janeiro and São Paulo, which can be justified by the greater concentration of people, facing an acute shortage of hospital beds and health professionals to deal with the outbreak (Cultural Center of the Ministry of Health, 2020).



Figure 2: Improvised field hospitals to treat patients during the Spanish Flu. Source: Silveira (2020).

Within a few weeks, the virus spread through major urban centers, causing thousands of deaths and creating panic among the population. In response, the then President of the Republic, Wenceslau Braz, called on the renowned physician Carlos Chagas to control the situation. It is important to note that, at that time, Brazil did not yet have a public health network, much less a universal health system. The population continued to depend on the *Santas Casas* and philanthropic hospitals for medical care. Faced with this scenario, Carlos Chagas had to act quickly, opening field hospitals in the country's main cities, closing schools, and prohibiting events that would result in crowds (Cultural Center of the Ministry of Health, 2020).

As the number of cases and deaths grew alarmingly, several structures were improvised to accommodate the large number of patients. However, the tents and adapted buildings generally lacked basic infrastructure, such as running water systems and adequate sanitation, which made it difficult to control infections and provide medical care to patients.

One of the most dramatic scenes of the time was the lack of coffins for so many dead in the city of Rio de Janeiro and the inability of cemeteries to absorb the volume of burials needed (figure 3). This grim scenario illustrates the magnitude of the crisis and the devastating impact that the Spanish flu had on local and global communities.



Figure 3: Corpses on the streets of Rio de Janeiro during the Spanish Flu. Source: Azevedo (2020).

Another disease that has marked and continues to mark the history of Brazil, requiring the installation of temporary medical care structures, is dengue fever. Transmitted by the *Aedes aegypti* mosquito, it is a constant public health concern in the country and in several tropical regions around the world.

According to the Osvaldo Cruz Foundation (2023), based on reports from the Pan American Health Organization (PAHO), the first dengue epidemic in the Americas occurred in Peru in the early 19th century, with subsequent outbreaks in the Caribbean, the United States, Colombia, and Venezuela. In Brazil, the first records of dengue fever date back to the end of the 19th century, in Curitiba (PR), and to the beginning of the 20th century, in Niterói (RJ).

According to data from the Ministry of Health (Osvaldo Cruz Foundation, n.d.), the first clinical and laboratory identification of the dengue virus in Brazil occurred between 1981 and 1982, in Boa Vista (RR). In 1986, epidemics were recorded in Rio de Janeiro and in some capitals of the Northeast. Since then, dengue has been a constant concern in Brazil, with continued occurrences over the decades.

Field hospitals have also played a crucial role in combating dengue over the years, especially during these periods when there is a significant increase in cases of the disease.

The Undersecretary of Infrastructure in Health of the State Department of Health of the Federal District (SES-DF), Leonídio Neto, explained the assembly of the HCamp installed in Brasília in the year 2024:

After the initial assembly of the tent skeletons, which takes approximately three hours and includes water drainage and gutters, a subsequent more detailed and time-consuming stage begins. This phase involves the arrangement of the

raised floor, the installation of partitions for the offices, the placement of furniture and equipment, such as air conditioning units for climate control, and the execution of the grounding. The entire process is supervised by the engineering department of the Health Department (SES) and follows the guidelines of the Civil Defense of the Federal District. After the structural assembly is completed, health professionals are incorporated into the site (Agência Brasília, 2024).

The use of modular tents is common practice for the installation of HCamp, because they are flexible and can be adapted as needed, which allows for an agile and efficient response to peaks in demand during dengue epidemics or other public health emergencies. Another notable and recent event was the COVID-19 pandemic, which began in late 2019 and spread rapidly around the world, causing a global public health crisis. COVID-19 is caused by the SARS-CoV-2 coronavirus and was declared a pandemic by the World Health Organization (WHO) in March 2020 (World Health Organization, 2020).

China, where the virus originated, quickly began building HCamps and implemented measures such as social isolation to address the crisis in the country's health system. These measures served, in a way, as an example for the rest of the world in dealing with the pandemic. At that time, in Brazil, most capitals chose to build field hospitals by implementing modular structures and adapting and reactivating previously deactivated properties. These initiatives aim to support the Unified Health System (SUS), concentrating cases of moderate or severe infection in referral centers. In addition, large cities have used stadiums, squares, event centers and parking lots to quickly implement these emergency health units (Farias et al., 2020).

However, the growing number of cases and deaths has been concentrated especially in the capitals of São Paulo and Rio de Janeiro. Many states, especially Rio de Janeiro, have faced major challenges such as a shortage of resources, a lack of professionals in sufficient numbers, a lack of Personal Protective Equipment (PPE) and testing kits, as well as problems related to the overpricing of field hospitals and respirators that were purchased but not delivered as planned (Fernandes and Ortega, 2021).

In the book "The social impacts of Covid-19 in Brazil: vulnerable populations and responses to the pandemic" (Matta et al., 2021), the authors note that this failure can be attributed to the fact that many beds in the public system were already inactive before the crisis, mainly due to the shortage of equipment and human resources. And with the initiative to implement HCamp, there was a significant delay in its assembly, resulting in many other idle beds that ended up being closed. Despite conflicting opinions, HCamps were extremely important in relieving pressure on permanent hospitals during this period. It was an important



milestone in rethinking the use of these structures and considering their adoption as an essential public policy.

These structures are also commonly used in events such as natural disasters. In Brazil, the most recent one that devastated almost an entire state was the flooding in Rio Grande do Sul. Heavy rains caused massive flooding, leaving many areas inaccessible and thousands of people homeless. The rapid response involved setting up field hospitals at strategic points, ensuring medical care for the victims. These temporary hospitals played a crucial role in providing immediate relief, offering essential health care amid the chaos and destruction caused by the floods. The use of field hospitals in Brazil has proven to be fundamental in several historical events, and we can see that the evolution of the implementation of these structures was facilitated by advances in health issues, urban planning and access to resources. Despite the advances, it is necessary to look again at the capacity that architecture has to respond to emerging demands, as there are still very significant limitations in terms of planning and execution.

Studies and Applications

Permanent physical hospitals and temporary field hospitals represent two extremes on the spectrum of health infrastructure, each designed to meet specific needs in different emergency and long-term contexts.

According to the newspaper Folha de São Paulo (Biderman, 2020), the main criticism of researchers and health professionals regarding the field hospitals built in Brazil to deal with the Covid-19 pandemic was the lack of adequate planning and the ineffective use of these structures.

Despite the construction of many facilities during the pandemic, several reports confirm the inadequacy of these structures, highlighting the need for more careful and strategic planning to deal with similar crises in the future. For Jessen Orellana, an epidemiologist at the Oswaldo Cruz Foundation in Manaus, as everything was done in an improvised manner, there was no time to train professionals. It was a mistake not to have used the experience accumulated in other pandemics, such as dengue, Zika or H1N1 (Biderman, 2020).

In November 2023, after the critical period of the disease had passed, the Ministry of Health ([n.d.]) released a document that “lists premises for the implementation of temporary health units (Field Hospitals) aimed at providing care to patients in the context of emergencies due to the Covid-19 pandemic” (figure 4). This demonstrates progress in the development of research for the implementation of these structures, which, despite being temporary, have been in demand over the years.



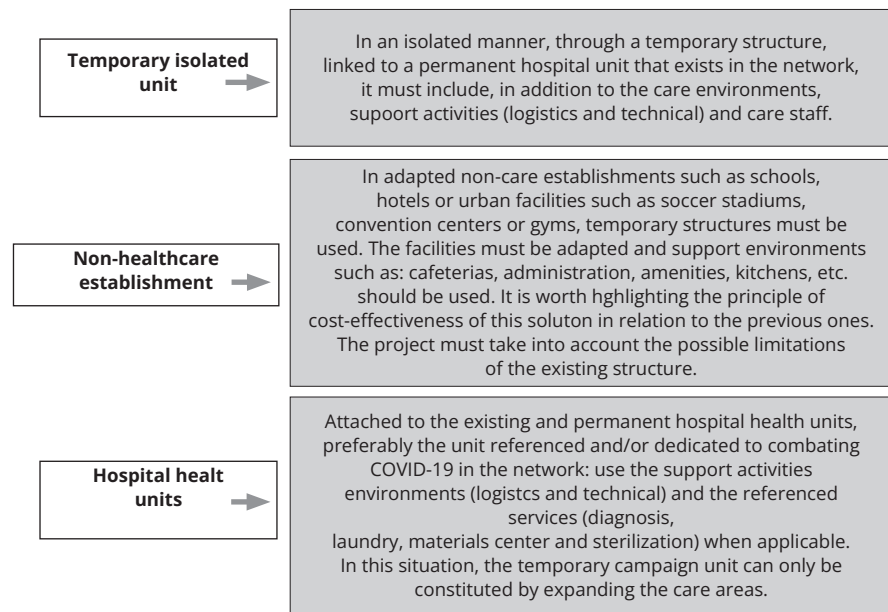


Figure 4: HCamp implementation possibilities. Source: Adapted by the authors.

However, there is a clear lack of specific information detailing the project in terms of architectural features, technical specifications or internal layout of the temporary health units, highlighting the relevance of this topic for future research.

In general, in Brazil, most temporary hospitals were built using tensile structures, which are the most common in temporary emergency architecture. However, carrying out the project during the Covid-19 pandemic was a major challenge for the architects, as in addition to being something new for those involved, there was no predefined model, the solutions were highly complex and had very short delivery times. In addition, the program was significantly different from traditional field hospitals, requiring meticulously designed and separated spaces due to the high transmissibility of the virus (Ghisleni, 2021).

On the international scene, there are more studies and research investigating the effectiveness and application of field hospitals during crises compared to Brazil. Especially after the pandemic and even in countries facing contexts of recurring conflict, these temporary structures have frequently been the subject of investigation. These studies contribute to the ongoing development of protocols and best practices for the use of field hospitals in various emergency situations around the world.

In the case of the Covid-19 pandemic, the response to the crisis was based on three principles: adaptability, flexibility and creativity (Jovanović, 2022).

These temporary hospitals are usually composed of modular containers, but can also include tents, pneumatic structures and lightweight constructions, with the possibility of additional extensions if necessary (Bakowski, 2016).

A notable example of the agility and flexibility of field hospitals was the Leishenshan Hospital in China. Built in response to the Covid-19 outbreak in Wuhan, the Leishenshan HCamp was erected in just ten days. The Leishenshan Hospital was divided into three main areas: the medical staff living area, the logistics area (such as a supply warehouse, wastewater treatment plant, garbage incineration plant and ambulance decontamination area); and the medical treatment area.

The emergence of Covid-19 has made Leishenshan Hospital a global reference, raising the question of whether the successful model of this hospital could be replicated in other countries for the development of specialized field hospitals. This study highlights three essential preconditions for addressing the complexity of an infectious disease hospital and the limited construction time that can be studied and replicated in other global contexts: 1. adoption of a modular design and use of standardized prefabricated components; 2. rapid organization of necessary resources, such as labor and machinery, in addition to the establishment of high collaboration among the various stakeholders; 3. use of the Building Information Modeling (BIM) model for its efficient and high-quality completion. Another notable example is the Nightingale field hospitals, which were built across the UK to cope with the surge in Covid-19 patients (Anandaciva, 2021). In England, six of these hospitals were built in a collaboration between the National Health Service, the national military and private sector organisations. An NHS Nightingale instruction manual was published, detailing the processes and strategies used in the temporary hospitals (BDP, 2020). After successfully absorbing the surge of patients, a few months after their completion, the Nightingales were either put on standby or repurposed as vaccination or diagnostic sites.

FINAL CONSIDERATIONS

Effectively dealing with emergency crises is essential for community resilience. The COVID-19 pandemic has highlighted the critical importance of Field Hospitals as temporary structures essential for immediate response to public health emergencies in Brazil and globally. From the initial response to Yellow Fever to recent developments during the pandemic, these facilities have been fundamental in mitigating crises such as epidemics, pandemics and natural disasters.

Although these structures are temporary, their architectural design should not be neglected, as this can compromise the effectiveness of the emergency response and the quality of care provided.

Considering the lessons learned from historical and contemporary examples, it is crucial to guide future implementations of field hospitals based on architectural



practices that promote agile and effective responses in crisis situations, with flexible and innovative strategies in the architecture of these emergency structures.

Therefore, given the constant challenges of our time, it is imperative to continue to develop policies and practices that strengthen emergency preparedness and response in Brazil and around the world, ensuring that communities are prepared to respond to future crises with the greatest flexibility and effectiveness.

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