

Hospital response plan for the city of Porto Alegre, Brazil, during the pandemic of COVID-19

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Abstract

The objective of this article is to describe the response of the hospitals of the city of Porto Alegre, Brazil, in reference to the pandemic of coronavirus disease 2019 (COVID-19) up to the present moment. Data collected from publicly available case information from the municipal department of health database were compiled and public health measures were described. Based on the current information, Porto Alegre's slope of the curve for COVID-19 in Porto Alegre appears to be flattened, and may be correlated with the implementation of social distancing and other measures taken in the city.

The following core competencies are addressed in this article: Systems-Based Practice.

Keywords: Coronavirus disease 2019, emergency, intensive care unit, pandemic, public health, social distancing

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INTRODUCTION

The 2019 coronavirus pandemic is ongoing and was caused by the virus severe acute respiratory syndrome-coronavirus-2 (SARS-CoV2). The outbreak was identified in Wuhan, China, in December 2019.^[1] The World Health Organization declared the outbreak to be a Public Health Emergency of International Concern on January 30, 2020, and then recognized it as a pandemic on March 11, 2020.^[2,3]

On January 22, 2020, the Emergency Command Center for the novel coronavirus was activated in

Brazil, and the first registered case of coronavirus disease 2019 (COVID-19) occurred on February 26, 2020, in the city of Sao Paulo.^[4]

Brazil is the largest country in South America, and the fifth largest in the world in geographic size, equivalent to 47.3% of the territory of South America and sixth in population size, with more than 210 million people.^[5] Porto Alegre is the capital of Rio Grande do Sul, the southernmost state of Brazil. The population of this city is 1,483,771 people.^[5]

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The first case of suspected COVID-19 in Rio Grande do Sul was documented in the First Epidemiologic Report of the Secretary of Health Surveillance of the Federal Department of Health (DOH) on February 3, 2020.^[6]

The objective of this article is to describe the response of the hospitals of the city of Porto Alegre, Brazil, in reference to the pandemic of COVID-19 up to the present moment.

REPORT

Data on case information, as well as public health legislation, were compiled from the publicly available Municipal Department of Health (MDOH) database and were described as follows.

On March 8, 2020, the first case of COVID-19 in Porto Alegre was confirmed. By March 16, 2020, 34 cases had been confirmed in Porto Alegre. On this date, there was publication of the first Municipal Decree related to COVID-19, instituting the Temporary Committee to Respond to Coronavirus for the Municipality of Porto Alegre,^[7] as well as suspension of all activities in both public and private schools.^[8] On March 17, 2020, Porto Alegre had a total of 45 positive cases, and the decree recommending remote work when possible was instituted by the MDOH.^[9] On March 20, 2020, commercial establishments and civil and industrial construction were closed,^[10] and by this date, the number of positive cases was 74. On March 25, 2020, the number of positive cases was 127 and people over the age of 60 were recommended to stay at home and self-isolate, as well as parks and open public spaces were closed.^[11]

On March 31, 2020, the city of Porto Alegre had 220 positive cases and 2 deaths. On this date, a state of public calamity was declared.^[12]

Starting March 17, 2020, the MDOH of Porto Alegre started having daily strategic planning meetings, discussing measures that could “flatten the curve” of the spread of SARS-CoV-2. Steps taken by the municipal government were based on the existing worldwide available data of pandemic response. The intention behind flattening the curve was to provide time for the city to increase intensive care unit (ICU) bed capacity, increase other COVID-19 units’ bed capacity, deploy triage tents, acquire necessary supplies, and create flow patterns for reorganization of the health system.

Public and private hospitals, a total of 23 institutions, were contacted for evaluation of the number of adult ICU beds available and how much each facility would be able to surge if it became necessary due to the pandemic. Porto Alegre had a total of 580 adult ICU beds, as per the data from the National Health Facilities Database (CNES).^[13]

After teleconference meetings with hospital management, it was found that ICU bed capacity could be increased by 276 beds. Among the teaching hospitals in the city, the two largest were designated to receive critical cases, and would serve as COVID-19 referral centers from other hospitals in the city, as well as for cities in the interior rural regions of the State of Rio Grande do Sul. An estimate by the MDOH, based on the international parameter that predicts the need for 2.4 ICU patients/10,000 population, defined that Porto Alegre would need at least 360 ICU beds just for SARS-CoV-2 patients. Both designated COVID referral hospitals for critical patients, at the end of the surge capacity preparation process, were capable of accommodating a total of 174 ICU-level COVID-19 patients. If the number of critical cases were to increase beyond that, beds could be requested at other institutions, totaling an available 383 ICU beds for SARS-CoV-2 patients. This potential situation was coined “extreme need” by the contingency planning group of the city.

There was a reorganization of the hospital system to maintain the ability of the COVID-19 referral hospitals to receive COVID-19 patients. Some pathologies are being directed to non-COVID-19 hospitals, thus preserving the ICU and monitored beds available to COVID-19 patients in the COVID-19 referral hospitals. The hospitals with specialized trauma care – Hospital de Pronto Socorro and Hospital Cristo Redentor – were maintained for trauma care and would be used for COVID patients only in the extreme need situation.

Inpatient beds in lower acuity, nontertiary care hospitals were gradually increasingly designated as locations to receive stable non-COVID-19 patients from higher acuity facilities, freeing up beds in those facilities for COVID-19 patients. There were also 66 beds in a lower acuity hospital that was designated to serve as a backup surge capacity location for transfer of stable COVID-19 patients from both tertiary care COVID-19 referral hospitals and other institutions, as needed.

During the initial period of the pandemic in Porto Alegre, polymerase chain reaction testing was conducted on any symptomatic patient. In a short period of time, almost all available tests had been used and as a result, testing became restricted to hospitalized patients and health-care professionals. As a result of this protocol change, the total number of documented cases is certainly an underestimate compared to the actual cases, had all patients been able to be tested. The number of positive patients with an indication for ICU level care and the number of patient deaths are data that are more accurate, as most of these patients were actually tested.

The number of occupied ICU beds was the indicator of choice to monitor the ongoing capacity of the health system due to these data being most accurate, as well as because the initial number of deaths was low and did not represent well the burden to the health system.

The number of ICU cases was divided into three different time periods: initial period, before social distancing measures, and before the closing of schools and commerce [Figure 1]; the 2 weeks following, where the effects of the implemented measures could begin to be observed [Figure 2]; and the next period where, in theory, as a result of the incubation time of

the virus, one would begin to observe a reduction in the number of new cases [Figure 3]. For each of these time periods, a linear regression was done and the average time of doubling of ICU cases was calculated. The three lines represent these three different time periods and phases of response as follows:

1. Occupation of 174 newly created ICU beds for COVID-positive patients
2. Occupation of 255 ICU beds specifically designated for COVID patients (81 more beds than the previous phase)
3. Occupation of 383 ICU beds specifically designated for COVID patients, the maximum amount that the city would be able to accommodate at the moment (128 more beds than the previous phase and 209 more beds than the first phase).

The time for doubling of cases was calculated for the first phase from the time of the first ICU patient to the time when social distancing and essential services only measures were taken. A linear regression of the number of ICU patients was plotted on this graph, which demonstrates a doubling time of 5.03 days and shows that if this trend had continued, the total number of ICU beds needed would have exceeded the capacity by April 6–13.

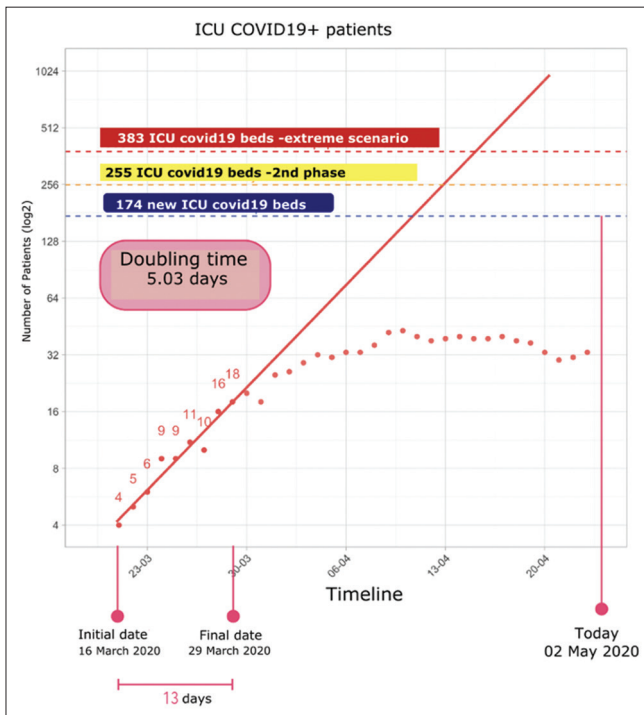


Figure 1: Cumulative number of positive intensive care unit cases of severe acute respiratory syndrome-coronavirus-2 in Porto Alegre in the initial period, before implementing any social distancing measures

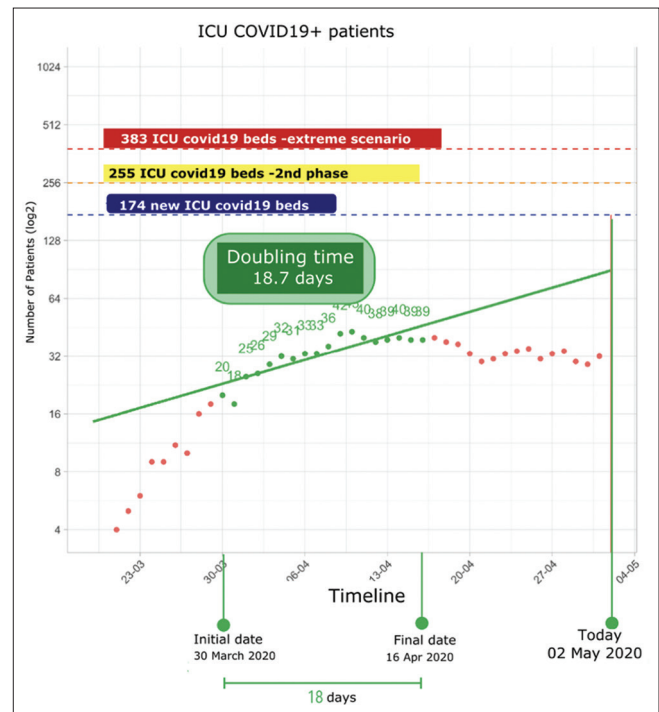


Figure 2: Cumulative number of positive intensive care unit cases of severe acute respiratory syndrome-coronavirus-2 in Porto Alegre the 2 weeks following, where the effects of the implemented measures could begin to be observed

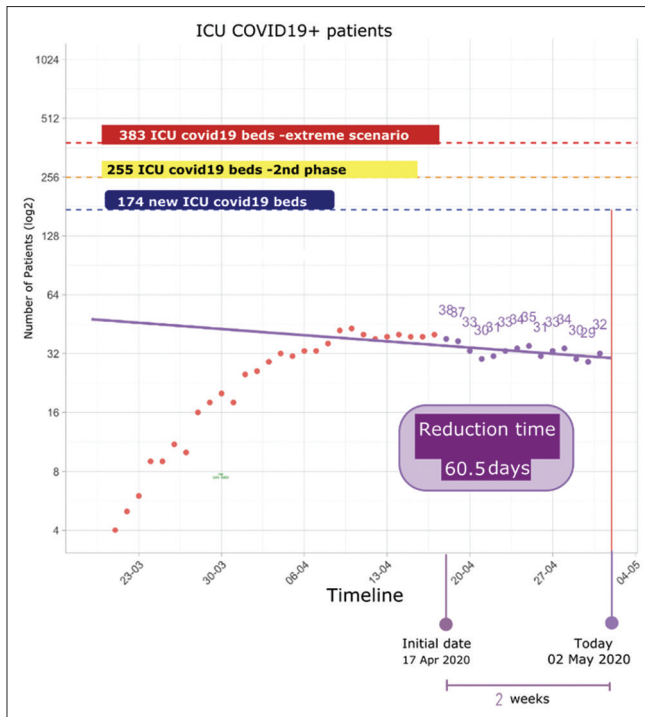


Figure 3: Cumulative number of positive intensive care unit cases of severe acute respiratory syndrome-coronavirus-2 in Porto Alegre after the Municipal Decree Measures were implemented

In approximately 2 weeks, however, when the effects of the implemented measures could begin to be observed, there is an observed reduction in the doubling time to 18.7 days [Figure 2].

In Figure 3, there is an observed decline in the number of occupied ICU beds and an increase in the doubling time to 60.5 days. This trend was observed over time, and the data from the previous 7–15 days were used as a marker for the decision to loosen or tighten social distancing and isolation measures. Over the last 15 days at the time of this writing, there has been a reduction in the number of occupied ICU beds and as a result, social distancing measures have been loosened.

The city is also building a medium-acuity hospital with 62 beds exclusively for the care of patients due to the pandemic. The new facility should be completed by the end of May 2020 and will be incorporated permanently into the overall health system, even once the pandemic response is over.

DISCUSSION

The data thus far demonstrate that the increase in deaths from COVID-19 in the city of Porto Alegre occurred at a rate lower than the average number of deaths in other Brazilian cities. The rate of increase of

positive cases in Porto Alegre also followed this same trend. From the time of writing this paper (May 1, 2020), Porto Alegre has a total of 487 positive cases, 197 cases under investigation, 1656 negative tested cases, and 14 deaths [Figures 4 and 5]. Comparatively, the number of cases in the city of São Paulo on April 30, 2020, was 1665 confirmed cases with 3622 deaths.^[14]

As far as ICU beds, there are a considerable number of available beds. As a result, the hospitals in Porto Alegre can easily accommodate transfers from lower acuity to higher acuity centers, as well as receive transfers from other areas in the state, where ICU capacity is already exceeded.

The number of positive cases of COVID-19 in Porto Alegre resembles a linear curve, rather than an exponential one. The curve of ICU patients is already on the decline. The reasons for both of these phenomena may be multifactorial, and final cause-and-effect conclusions cannot be drawn. However, given the timeline of implementation of social distancing and isolation measures placed forth by the MDOH and local government, those measures appear to correlate with the decline in case numbers and the decrease in the slope of the curve. Thanks to the gradual increase in cases, the city was able to have time to restructure its health system in response to the pandemic.

The slope of the curve of confirmed positive COVID-19 cases in Porto Alegre, as well as the slope of the curve of deaths due to COVID-19 in Porto Alegre, is flattened compared to the curve for the rest of Brazil. This may be related to the earlier implementation of social distancing and isolation measures compared to cities such as São Paulo, where the same measures were implemented 10 days after Porto Alegre.^[6] Again, as a result of this flattening of the curve, the health system and its facilities were able to reorganize themselves to accommodate the anticipated increase in volume due to COVID-19.

CONCLUSION

The slope of the curve for COVID-19 in Porto Alegre appears to be flattened, due to social distancing and other measures taken in the city, as previously described. The health system is ready to attend to the potential influx of patients, including those requiring ICU care, due to the pandemic.

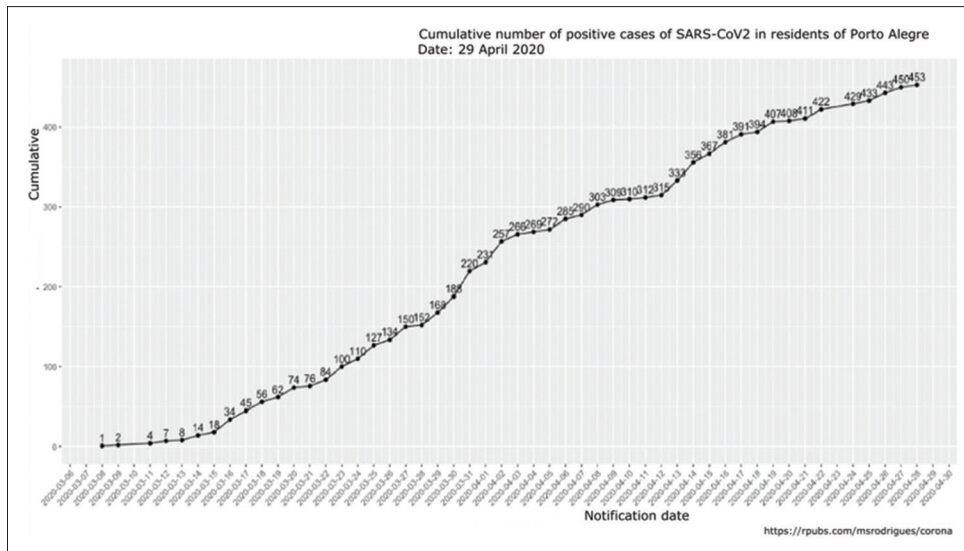


Figure 4: Cumulative number of positive cases of severe acute respiratory syndrome-coronavirus-2 in Porto Alegre

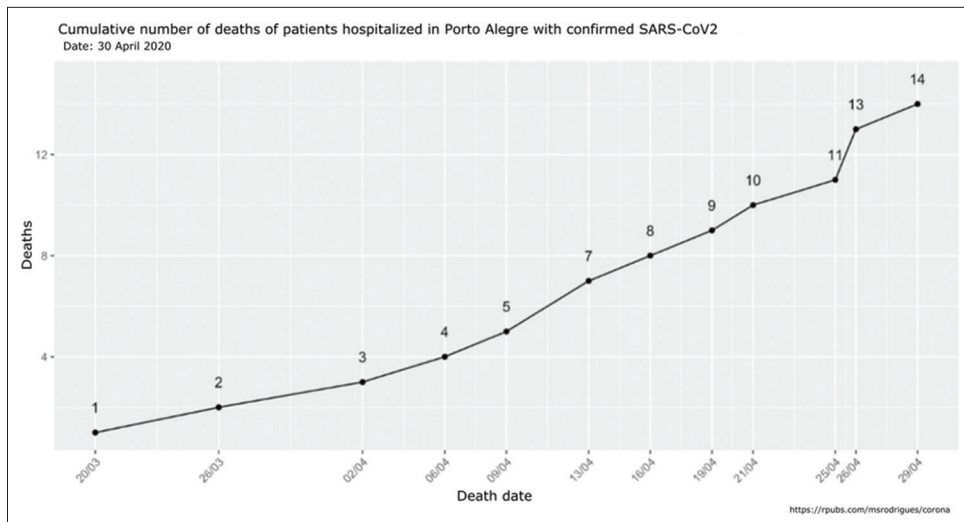


Figure 5: Cumulative number of deaths of patients hospitalized in Porto Alegre with confirmed severe acute respiratory syndrome-coronavirus-2

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Conflicts of interest

There are no conflicts of interest.

Ethical conduct of research

Data used for this article came from publicly available databases that are population based and de-identified, not individual patient data. Applicable EQUATOR network (<https://www.equator-network.org/>) research reporting guidelines were followed.

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