Dealing with the impact of the COVID-19 pandemic on a Rapid Response Team operation in Brazil: Quality in practice

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ABSTRACT

Quality problem or issue Up to July 13, 2020, more than 12 million laboratory-confirmed cases of COVID-19 infection have been reported worldwide, 1,864,681 in Brazil. We aimed to assess an intervention to deal with the impact of the COVID-19 pandemic on the operations of a rapid response team (RRT).

Initial assessment An observational study with medical record review, was carried out at a large tertiary care hospital in Fortaleza, a 400-bed quaternary hospital, 96 of which are ICU beds. All adult patients admitted to hospital wards, treated by the RRTs during the study period, were included, and a total of 15,461 RRT calls were analyzed.

Choice of solution Adequacy of workforce sizing.

Implementation The hospital adjusted the size of its RRTs during the period, going from 2 to 4 simultaneous on-duty medical professionals.

Evaluation After the beginning of the pandemic, the number of treated cases in general went from an average of 30.6 daily calls to 79.2, whereas the extremely critical cases went from 3.5 to 22 on average. In percentages, the extremely critical care cases went from 10.47 to 20%, with p <0.001. Patient mortality remained unchanged. The number of critically-ill cases and the number of treated patients increased two-fold in relation to the pre-pandemic period, but the effectiveness of the RRT in relation to mortality was not affected.

Lessons learned The observation of these data is important for hospital managers to adjust the size of their RRTs according to the new scenario, aiming to maintain the intervention effectiveness.

Key words: COVID-19; Hospital Rapid Response Team; Critical Care; Critical Care Outcomes; Mortality; Workforce
INTRODUCTION

The 2019 Coronavirus Disease (COVID-19) epidemic has spread throughout China and, secondarily, also outside of China, with a basic reproductive number estimated at 2.21 to 3.32 and a mortality rate of approximately 2.3% (1). Up to June 4, 2020, more than 6.5 million cases of COVID-19 infection have been reported worldwide. Of these, 584,016 were reported in Brazil (2). Available data suggest that up to 20% of patients with COVID-19 develop a critical illness, primarily characterized by acute respiratory distress syndrome (ARDS) (3).

The rapid response teams (RRTs) consist of health professionals exclusively dedicated to providing care to hospitalized patients identified at being high risk of worsening, using criteria of the severity of illness and clinical deterioration, with MEWS (Modified Early Warning Score) being one of the most frequently used scores (4). These scores are implemented aiming to prevent cardiac arrest in patients admitted to hospital wards, as well as to reduce mortality (5). Failure to detect clinical deterioration can decrease RRT effectiveness.

To date, several studies have described the demographic, clinical, and biological characteristics of patients with COVID-19 and radiological or pathological findings associated with COVID-19. However, so far, no article has been published describing the marked impact of the pandemic on the rapid response team operation in hospital wards. This brief report seeks to present the analysis of the impact of the COVID-19 pandemic on a rapid response team operation from a large quaternary hospital in Brazil.

METHOD

Study design and participants: This observational study took place at a large tertiary-care hospital, in the city of Fortaleza, Ceará, Brazil, a 400-bed general hospital,
with six intensive care units, and approximately 1,600 admissions per month. The institution's RRT originally comprised two simultaneous on-duty professionals with intensive care experience, which, during the pandemic period, was expanded to four simultaneous on-duty professionals. Over the course of the study period, ICU capacity was increased from 44 to 96 beds. When the study was being carried out (May 14, 2020), the hospital had 358 inpatients, with 314 confirmed or suspected cases of COVID-19. The first confirmed case of COVID-19 in Ceará occurred on March 15, 2020. Patients were admitted primarily through the emergency department from the entire state of Ceará. We identified rapid response team calls in adult patients in the wards (aged ≥18 years) carried out from January 1, 2019, to May 14, 2020.

**Procedures:** The data were collected directly from the electronic medical records related to cases treated by the rapid response team. Using a standardized case record form, we recorded data on demographics, degree of severity of illness according to institutional classification, vital signs, and patient outcomes (death and referral to ICU). Data were also collected from the Modified Early Warning Score (MEWS) to evaluate patient severity of illness: scores two and three were considered medium severity and four or more high severity (4).

**Data analysis:** Categorical quantitative results are expressed as percentages and counts and numerical results as central tendency measures. A temporal transformation of the database was carried out daily to assess the temporal variation of treated cases, with a weekly seasonal decomposition. The associations between the determinant variables and the outcome were verified using the Chi-square test for categorical variables and the Mann-Whitney test for numerical variables. Missing data were not imputed. A p-value of up to 0.05 were considered significant. The data were analyzed using the SPSS (Statistical Package for the Social Sciences) software, v23, SPSS, Inc.
Ethical Aspects: The study was submitted for ethical assessment of the National Research Ethics Commission and was approved under number 66415317.9.0000.5049.

Results

In total, 15,461 cases treated by the RRT were evaluated during the study period, of which 56.3% were females. The mean age of the patients was 67 years, with a standard deviation of 21 years. After the start of the COVID-19 pandemic, the number of treated cases increased, going from an average of 30.6 cases treated daily to 79.2. Similarly, the number of patients with an extremely critical clinical condition also increased, from an average of 3.5 daily cases of patients with this profile to 22 cases.

The increase in the degree of severity of illness can also be observed with the decrease in the proportion of moderate severity codes, which went from 34.11% to 25.43%, and an increase in the proportion of high severity (10.47 to 20 %, p-value <0.001). Also, the MEWS median went from 1 (IQR 1-2) to 2 (IQR 2-3), with a p-value <0.001, as well as the percentage of patients who were referred to the ICU increased from 2.29% to 6.23% (p-value <0.001). During the COVID pandemic a weekly average of 14.0 patients were admitted to the ICU compared to 5.8 admissions per week prior to the pandemic. Finally, the number of deaths decreased slightly, but without statistical significance (p = 0.991).

Discussion

To the best of our knowledge, this is the first work that assessed the impact of the COVID-19 pandemic on RRT operations. In this brief report, we identified that the number of cases treated by the RRT during the pandemic period increased 2.6-fold in relation to the period prior to the pandemic. The severity of illness of the treated patients also increased two-fold in relation to the previous period, leading to a scenario
of a higher number of treated patients and more severely-ill individuals within the same day. Even in the face of this scenario, the mortality of treated patients remained unaltered.

The COVID-19 pandemic has led to a higher occupancy rate of hospital units than previously observed, as well as turning these units to places that are practically exclusive for patients with this disease (6). In addition to generating an unexpectedly high demand for health services, COVID-19 also frequently leads patients to critical and severe clinical conditions (7). These combined factors may explain the almost exponential increase in RRT-treated cases during the observed period, as well as the higher than six-fold increase in the average of critical illness cases treated daily. The increase of almost three-fold in the number of referrals of patients to ICU is also in accordance with the existing literature to date (8).

Even with the increase observed in the volume and complexity of care, the number of deaths has not increased. Probably, the resizing that occurred in the studied RRT, which went from 2 to 4 simultaneous on-duty medical professionals, was important to maintain the intervention effectiveness in reducing mortality (5, 9).

One of the limitations that can be considered in this work is the lack of confounding factor control in relation to other factors that could determine the observed change. However, as 87% of the patients admitted to the institution at the time of the analysis were patients with COVID-19, it is likely that the COVID-19 pandemic is the main factor associated with the change.

We conclude that the COVID-19 pandemic led to a significant increase in the density of care provided by the RRTs, as well as doubled the severity of illness and complexity of patients. The observation of these data is important for hospital managers
to adjust the size of their RRTs according to the new scenario, aiming to maintain the intervention effectiveness.

Data availability

The data underlying this article cannot be shared publicly due to Brazilian research laws. The data will be shared on reasonable request to the corresponding author.
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Figure. a: Temporal variation of the mean daily number of cases treated by the Rapid Response Team, general cases. b: Temporal variation of the mean daily number of cases treated by the Rapid Response Team extremely-critical cases. c: Variation in the level of severity of illness, pre- and post-COVID-19; d: Variation in the MEWS scores, pre- and post-COVID-19, e and f: Referral to ICU and treated cases that resulted in death, pre- and post-COVID-19 emergence, respectively.
