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Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin



Nationwide surveillance system to evaluate hospital-acquired COVID-19 in Brazilian hospitals

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ARTICLE INFO

Article history:

Received 9 December 2021

Accepted 3 February 2022

Available online 14 February 2022

Keywords:

COVID-19

Cluster

Nosocomial infection

Infection control



SUMMARY

Background: Although the risk of SARS-CoV-2 transmission within hospitals has been well recognized, there is a paucity of data on its occurrence. Our aim was to report the incidence of hospital-acquired (HA) COVID-19 at Brazilian hospitals.

Methods: We investigated the incidence of HA COVID-19 in Brazilian hospitals using data from a national surveillance system, from August 2020 through September 2021. Definitions of HA COVID-19 were: (1) symptom onset >14 days after hospital admission plus a positive SARS-CoV-2 RNA or antigen test; (2) symptom onset on days 8–14 after admission, plus a positive SARS-CoV-2 RNA or antigen test positive, plus documented high-risk exposure. We performed descriptive analyses and reported HA COVID-19 rates using pooled mean and percentile distribution.

Results: A total of 48,634 cases of HA COVID-19 were reported from 1428 hospitals. Incidence ranged from 0.16/1000 patient-days at neonatal intensive care units (ICUs) to 5.8/1000 patient-days at adult ICUs. The highest incidence of HA COVID-19 was during the months March to July 2021, similar to that which was observed for community-acquired COVID-19.

Conclusions: This report provides a national view of the burden of HA COVID-19. The highest incidence of HA COVID-19 similar that which was observed for community-acquired COVID-19. We believe that this reflects the difficulty of implementing preventive measures. Further studies evaluating risk factors for the hospital transmission of SARS-Cov-2 should clarify strategies to minimize the risk of HA COVID-19 and may be applicable to other respiratory diseases. Furthermore, the implementation of a national system to evaluate HA COVID-19 has the potential to shine a light on this problem and lead to interventions in each hospital.

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Introduction

The first report of coronavirus disease (COVID-19) cases already described the risk of nosocomial acquisition, alerting infection control services around the world [1]. To face this threat, since the beginning of this pandemic, society and government-sponsored guidance on infection prevention and control (IPC) for healthcare institutions was developed, tailored by countries and by institutions according to their specific conditions and updated as the evidence advanced [2–4]. Backbones of IPC in all healthcare facilities are the appropriate use of personal protective equipment (PPE), isolation of suspected and confirmed COVID-19 cases, provision of adequate infra-structure and administrative measures, environmental cleaning and ventilation, physical distancing, and hand hygiene.

The risk of acquiring COVID-19 during hospitalization was recently evaluated in a report including 314 UK hospitals. Authors estimated that 7% of all COVID-19 patients had acquired the infection in the hospital [5]. Although the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission within hospitals has been well recognized, there is a paucity of data on its occurrence, especially at the national level. Our aim was to report the incidence of hospital-acquired (HA) COVID-19 at Brazilian hospitals.

Methods

We investigated the incidence of HA COVID-19 in Brazilian hospitals using data collected through a national surveillance system, from August 2020 to September 2021.

Brazil has 27 states, approximately 6425 hospitals, of which approximately 2000 have intensive care units (ICUs). Since 2010, there has been a nationwide surveillance system to monitor healthcare-associated infections in hospitals, coordinated by the federal government through the Brazilian Health Regulatory Agency (ANVISA). Starting in August 2020, hospitals were instructed to monthly report data on the occurrence of HA COVID-19; reporting was non-mandatory. Surveillance definitions for HA COVID-19 were: symptom onset >14 days after admission, and positive SARS-CoV-2 RNA or rapid antigen test antigen positive; OR symptom onset on days 8–14 after admission, and SARS-CoV-2 RNA or rapid antigen test antigen positive

and epidemiologically linked to high-risk exposure within the hospital such as with a health care worker (HCW), another patient, or visitors. For neonatal units, additional criteria were: hospitalized since birth and SARS-CoV-2 RNA or rapid antigen test antigen positive collected after 48 h of life [6].

Data were notified using the electronic form Limesurvey, available on the ANVISA website (<https://pesquisa.ANVISA.gov.br/index.php/667695?lang=pt-BR>). Data were reported separately by type of ICU (adult, paediatric and neonatal), and medical or surgical units. We evaluated data from August 2020 to September 2021.

Data on COVID-19 in the community were obtained through the official website of Brazil's Ministry of Health [7].

We performed descriptive analyses and calculated two rates: proportion of patients with HA COVID-19 (dividing the number of HA COVID-19 by the number of hospital-discharged patients and multiplying the result by 100). Incidence of HA COVID-19 (dividing the number of HA COVID-19 by the number of patient-days and multiplying the result by 1000, similar to other healthcare-associated infections). We calculated the pooled mean and percentile distribution of incidence. Duplicate notifications were excluded, and we maintained the most recent notification.

Results

During the study period 48,634 cases of HA COVID-19 were reported from 1428 hospitals, with a peak in March 2021, when 8929 cases were reported. Among the hospitals, 35% were public, 31% non-profit, and 30% private. Adult ICUs and adults medical-surgical units presented higher rates of HA COVID-19 than paediatric and neonatal ICUs (Table 1).

The highest incidence of HA COVID-19 was during the months of March to July 2021, similar to that which was observed with community-acquired COVID-19 (Figure 1).

Discussion

To the best of our knowledge, this is the first report evaluating nosocomial transmission of SARS-CoV-2 based on a national surveillance system. Published articles usually describe the proportion among COVID-19 cases that were

Table 1
Rates of Hospital Acquired (HA) COVID-19 in Brazilian hospitals from August 2020 to September 2021

| Unit type | No. of units | No. of HA-COVID-19 | No. of discharge patients | Pooled proportion of patients with HA-COVID-19 (%) | No. of patient-days | Pooled mean of incidence of HA-COVID-19 (per 1000 patient-days) | Percentile distribution of incidence of HA-COVID-19 (per 1000 patient-days) | | | | |
|------------------------------|--------------|--------------------|---------------------------|--|---------------------|---|---|-----|------|------|-------|
| | | | | | | | 10% | 25% | 50% | 75% | 90% |
| Paediatric ICU | 221 | 75 | 53,822 | 0.14 | 219,717 | 0.34 | 0.0 | 0.0 | 0.0 | 0.0 | 0.12 |
| Neonatal ICU | 253 | 75 | 72,552 | 0.10 | 461,691 | 0.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.035 |
| Adult ICU | 925 | 20,835 | 657,622 | 3.17 | 3,557,789 | 5.86 | 0.0 | 0.0 | 0.10 | 0.85 | 4.83 |
| Adult medical-surgical units | 1007 | 27,649 | 3,815,435 | 0.72 | NA | NA | NA | NA | NA | NA | NA |

NA, not available.

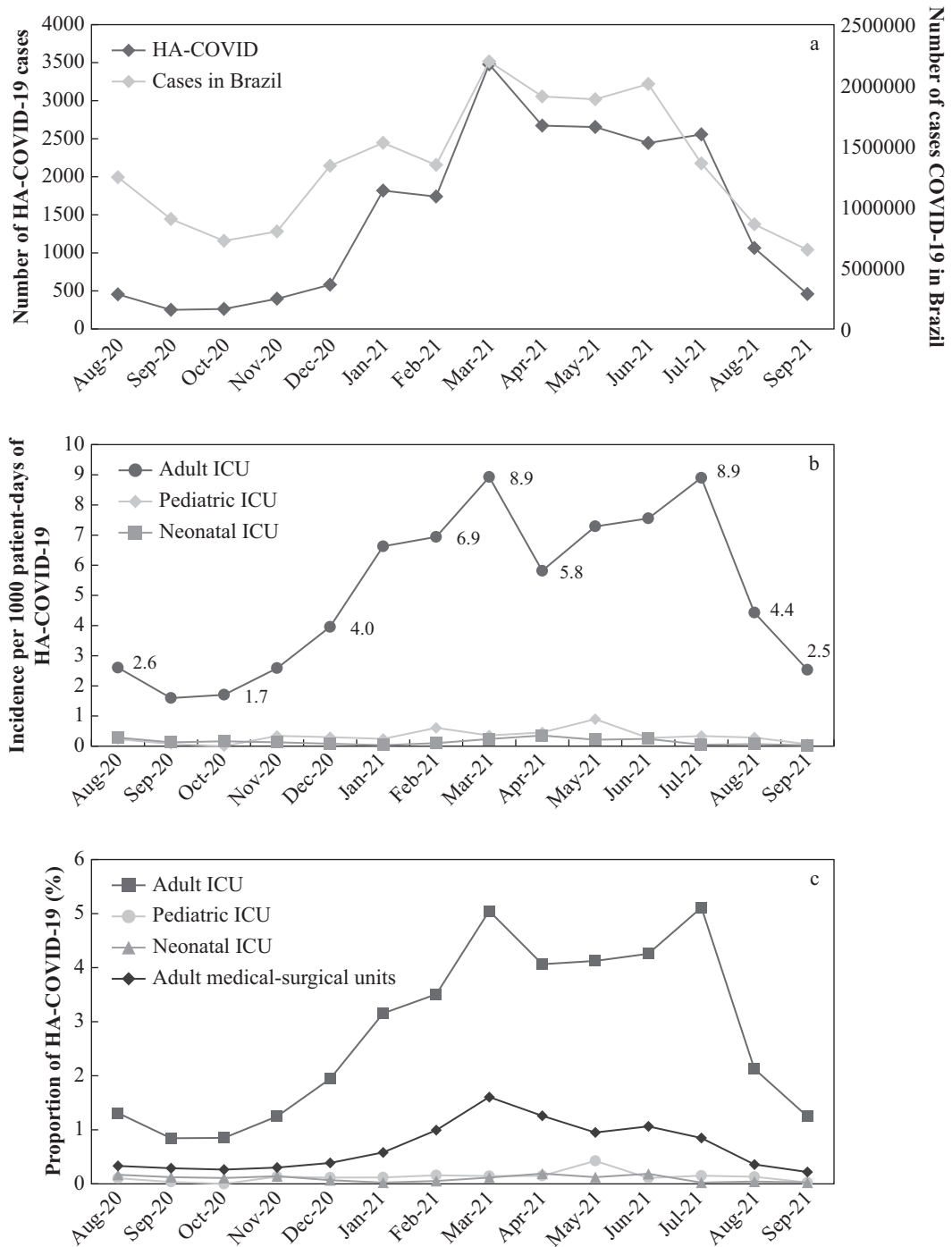


Figure 1. Number of COVID-19 cases in Brazil and hospital-acquired (HA) COVID-19 (a). Proportion of HA COVID-19 by type of intensive care unit (ICU) (b). Incidence of HA COVID-19 by type of unit (c) in Brazilian hospitals. Data from August 2020 to September 2021.

nosocomially acquired [5,8]. Since the beginning of this pandemic, ANVISA has played a pivotal role in guiding by strategies for IPC of COVID-19 for hospitals and other healthcare settings [9]. In August 2020, as part of the COVID-19 Strategic Preparedness and Response Plan, ANVISA developed the HA COVID-19 surveillance system, expecting to produce essential data that is reported here. In this sense, it was remarkable to detect almost 50,000 cases of HA COVID-19 during the study period, reiterating the importance of creating a system that allows

measurement of the burden of hospital-acquired cases. Besides collecting statistics, we believe that the implementation of a national system to evaluate HA COVID-19 has the potential to uncover this challenge and develop interventions in each hospital. In other words, we believe that the requirement to report rates may have influenced institutions to either adopt or review their infection control strategies.

The highest incidence of HA COVID-19 was among adult ICUs and medical-surgical units during the months March to July

2021, similar to that which was observed with community-acquired COVID-19. Adequate control measures should have prevented the influence of the incidence of COVID-19 in the community cases over hospital-acquired cases. We speculate that this behaviour reflects the difficulty of implementing effective prevention measures during periods of high transmission. In this scenario of high transmission in the community, hospitals experienced several challenges, such as a shortage of trained professionals, both due to excess work and absences due to COVID-19, leading to high turnover of HCWs and the presence of professionals with less experience in ICU care and perhaps in preventative measures.

Although the adherence rate indicates under-reporting, we think there were a suitable number of hospitals reporting this indicator. Moreover, considering only hospitals with ICUs (which were probably the ones responsible for treating severe COVID-19 cases), the adherence rate was 60%, which we considered a representative sample. We attribute this readiness to report data, to the already existing structure, beliefs, trust, and habit of infection control services in surveillance systems sponsored by the government.

Our study has limitations. First, the adherence rate indicates under-reporting, either because the hospital decided not to notify its data, or due to limited access to laboratory tests. However, we believe that our sample of more than 1000 hospitals is valuable. Furthermore, as already discussed, a great proportion of Brazilian hospitals are small (less than 50 beds) and primary-level hospitals (without specialized care and limited laboratory services). These small health institutions did not provide care to COVID-19 patients and thus did not report data. Second, it was not possible to make a detailed characterization of patients affected by HA COVID-19 and to link the risk with infection control strategies. We are aware that it would be helpful to have descriptive data of adherence of hospitals to recommendations and to provide analysis of institution and national risk factors. However, we believe that the data from our surveillance system was a first step and brought useful information on the burden of HA COVID-19. Further studies are needed to address these points. Unfortunately, it was not possible to compare the incidences between different types of hospitals (i.e., privates versus public, academic versus general, and hospital size) and with infection control strategies. Third, with the definition we adopted (>14 days after admission as HA), cases may have been missed. Finally, clinical data of HA COVID-19 cases were unavailable.

In conclusion, this report provides a national view of the burden of HA COVID-19. Data from 1428 Brazilian hospitals showed 48,634 cases of HA COVID-19 reported during 13 months, and an incidence of HA COVID-19 that varied widely and was much higher in adult ICUs (0.16 per 1000 patient-days in neonatal ICUs, and 5.8 per 1000 patient-days in adult ICUs). Further studies evaluating risk factors for the transmission of SARS-CoV-2 during healthcare should clarify strategies to

minimize the risk of healthcare-acquired COVID-19 or other respiratory diseases for patients, staff and visitors.

Conflict of interest statement

The authors have indicated that they have no conflicts of interest regarding the content of this article.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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