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Outpatient surveillance programme for health workers with COVID 19 in Mexico: an observational study of ambulatory treatment and early hospitalization

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Abstract

Introduction: International guidelines recommend hospital care for patients with severe Coronavirus disease (COVID-19), but fragile health care systems struggle to cope with high number of admissions, placing patients at risk of receiving substandard care. We describe an outpatient ambulatory surveillance and treatment strategy (OPAT) for health care workers (HCWs) with severe COVID-19 during low hospital bed availability periods in Mexico City.

Methods: In this observational, descriptive, retrospective study, we included HCWs with severe disease for whom there were no hospital beds available at the time of evaluation. We provided daily assessments by infectious disease specialists, daily ambulatory steroid, oral thromboprophylaxis and domiciliary low-dose oxygen. We recorded the number of patients who recovered, were hospitalized or died on follow-up.

Results: From 18 March 2020 to 16 July 2021, 1739 HCWs attended our service. A total of 540 were diagnosed with COVID-19. Seventy-four had severe COVID-19 and needed hospitalization. Immediate hospitalization was not possible in 56 patients who were sent to the OPAT and included in our study. Twenty-four patients subsequently required hospitalization and 32 recovered as outpatients.

Conclusions: We describe a feasible and safe outpatient management strategy for HCWs with severe COVID-19 in a low-resource setting.

Keywords: ambulatory, COVID-19, health care workers, OPAT, outpatient

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Introduction

In early December 2019, a pneumonia of unknown origin was reported in Wuhan, China. It was described in some persons exposed to markets, and a Beta coronavirus, the severe acute respiratory syndrome coronavirus (SARS-CoV-2), was later identified as the causative organism.[1] World Health Organization declared the new coronavirus disease (COVID-19) a pandemic on 11 March 2020. Up to 28 June 2022, more than 542 million confirmed cases have been reported worldwide.[1,2]

In Mexico, the first confirmed case was reported on 28 February 2020. As of June 2022, there have been approximately 5.6 million laboratory-confirmed cases and more than 325,580 deaths recorded in the country.[3] Mexico is one of the countries with the highest death rate among HCWs due to COVID-19, with more than 4517 deaths as of October 2021.[3] In Mexico City, COVID-19 rapidly overwhelmed the City's health system capacity, and hospital beds were reserved only for patients with critical disease (<85% SpO2 on room air). Thus, both the government and the

private sector established strategies to increase hospital bed availability across the city, including hospital reconversion and the opening of temporary hospitals to increase bed capacity.

In spite of these efforts, hospital occupancy remained high, which led to frequent periods of hospital bed unavailability for patients with severe (but not critical) disease. The 'Dr. Manuel Gea González' is a secondary care public hospital with 2196 HCWs. In early March 2020, 107 beds were reconverted for COVID-19 care. The infectious disease (ID) department was designated for the medical attention of all health care workers presenting with COVID-19. In this study, we describe an innovative outpatient management strategy for health care workers with severe COVID-19 at our department.

Methods

Study design

This is an observational, descriptive, retrospective study of patients with severe COVID-19 attending an outpatient ID s service in a secondary care public hospital in Mexico City from 18 March 2020 to 16 July 2021.

We implemented a strategy for outpatient ambulatory treatment (OPAT) for HCWs with severe COVID-19 during low bed availability periods. The strategy consisted of a package of interventions aimed at early identification of patients at high risk of hospitalization or death by daily clinical examination, daily dexamethasone, domiciliary low-dose oxygen therapy and oral thromboprophylaxis in an outpatient setting (Figure 2). We recorded demographic and clinical data. We quantified the number of patients in OPAT who recovered or required subsequent hospitalization or died; and recorded adverse events derived from the use of dexamethasone and apixaban. The hospital's ethics committee approved the study (203-21).

Participants

Adult HCWs, including physicians, nurses and administrative personnel who attended the outpatient ID service at the Manuel Gea Gonzalez hospital in Mexico City from March 2020 to July 2021 (Figure 1).

Procedures

The OPAT consisted of a set of interventions (Figure 2).

First, risk factors for severe disease and death were identified, followed by a SARS-CoV-2 real-time quantitative polymerase-chain reaction (RT-qPCR) test. Second, due to a high volume of patients, blood testing and computed tomographic scans were prioritized and requested only for high-risk patients [those with >1 risk factor or persistent fever ($>38.3^{o}$C for more than 3 days), tachycardia (>100 bpm) or oxygen saturation $<94\%$ at room air]. Blood tests included serum ferritin, white blood cell count, haemoglobin, C-reactive protein (CRP), lactate dehydrogenase (LDH), D-dimer and arterial blood gas analysis.

After this evaluation, we classified patients as severe or mild-moderate. Severe patients were defined as those patients with SpO2 $<94\%$ or PaO2 <60 mmHg or PaO2/FiO2 ratio <200 on room air, or those with signs of systemic inflammation [2 or more of the following criteria: $>38.3^{o}$C for 5 consecutive days, LDH >300 mg/dl, CRP >1 mg/dl, serum ferritin >300 µg/ml or Coronavirus Reporting and Data System (CO-RADS) of 3 or more].

Mild-moderate received standard outpatient care (observation and symptomatic management), and severe patients were referred for immediate hospitalization. During periods of low bed availability, patients with severe disease for whom there was no hospital bed available or option for referral to another hospital were enrolled into the OPAT programme. We excluded from the OPAT patients who could not attend daily visits to the hospital, patients who were deemed incapable of self-care at home and patients with poor social support.

The OPAT consisted of a package of interventions including daily face-to-face examination, daily laboratory testing, steroid administration, oral thromboprophylaxis, domiciliary low-dose oxygen therapy, self-monitoring and warning signs. Patients were followed up until recovery (defined as at least 3 days without fever and SpO2 $\geq 92\%$ on room air), hospitalization or death.

On daily examination by a trained ID specialist or resident, we assessed whether the patient met

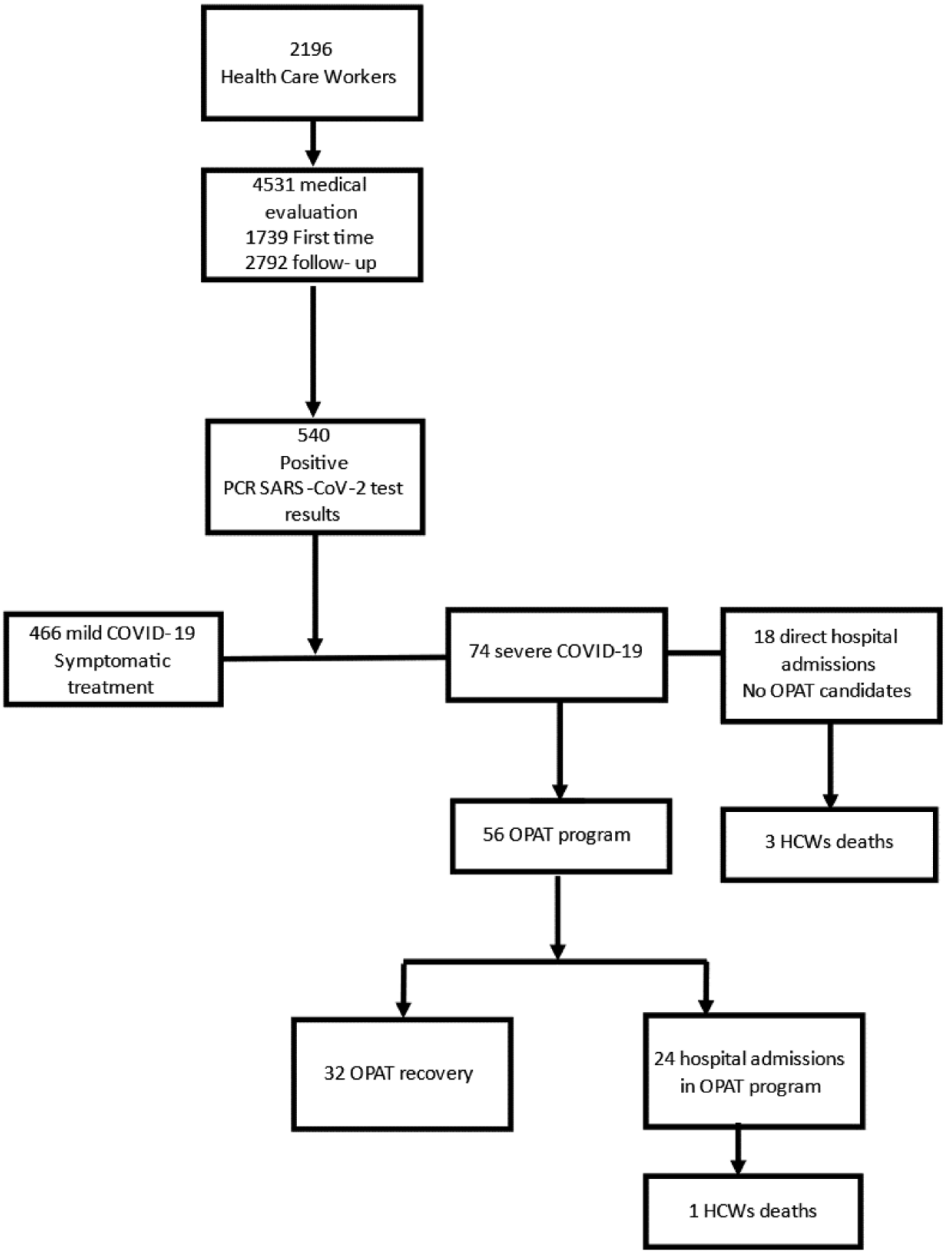

Figure 1. Health care workers evaluated in infectious disease department.

criteria for immediate hospitalization, defined as SpO2 < 92% or PaO2 < 60 mmHg or Pa/FiO2 < 200 under 3 L/min of oxygen or persistence of fever or significant worsening of laboratory results (as evaluated and defined by expert consensus on an individual basis). If patients needed immediate hospitalization, efforts to find a bed in our hospital or referral to any COVID-19 temporary were ensued. Patients who showed improvement on daily evaluation or those for whom beds were not available were continued on OPAT. After the clinical and laboratory evaluation, a trained nurse administered 6 mg of intravenous (IV) dexamethasone daily for at least 10 days. Oral thromboprophylaxis with 10 mg of daily apixaban was prescribed to those without contraindication. Domiciliary oxygen therapy was prescribed at a rate necessary to maintain an SpO2 of > 92% (no more

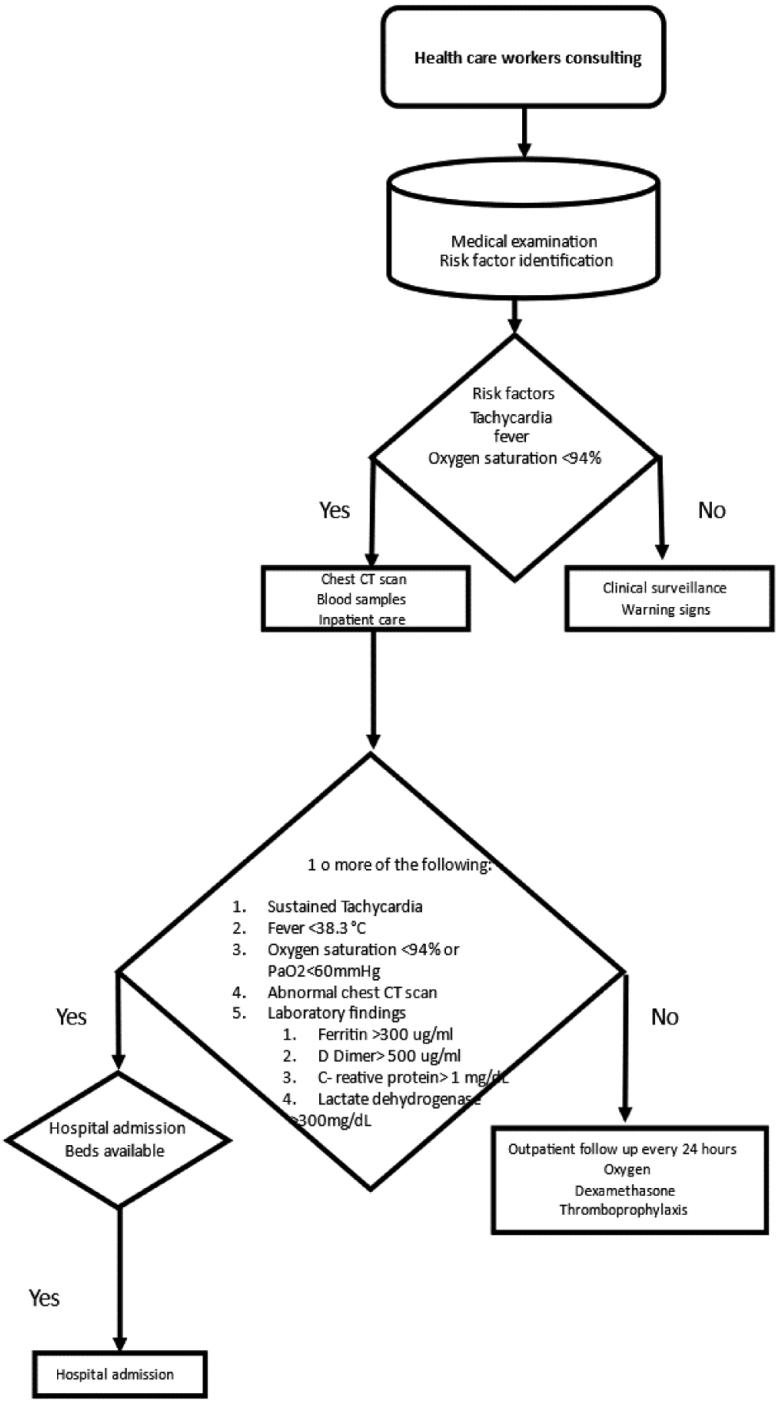

Figure 2. Model of attention for HCWs.

than 3 L/min) by nasal cannula. Patients were trained in the use of oxygen devices and self-monitoring with a pulse oximeter and digital thermometer at home. HCWs were advised to attend any emergency department if SpO2 fell below 92% under 3 L/min of oxygen or if they presented chest pain, persistent fever, severe dyspnoea, bleeding or neurological deterioration (Figure 3).

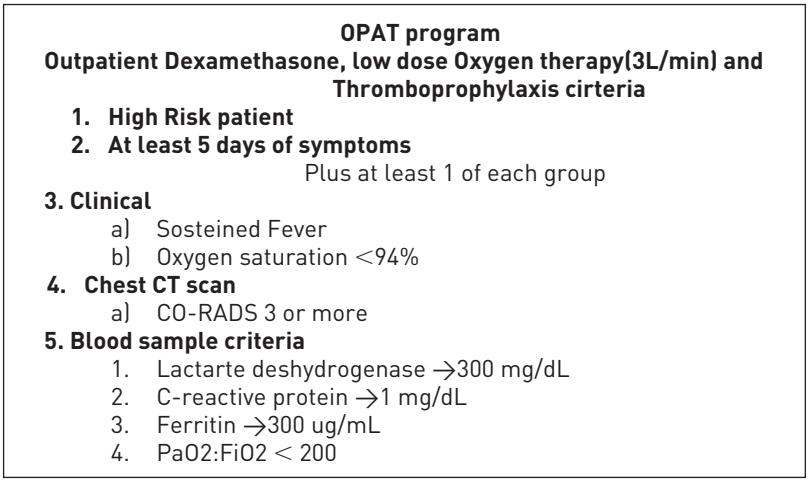

Figure 3. Criteria for OPAT programme.

Statistical analysis

We used descriptive statistics. Continuous variables are expressed as medians and ranges, and categorical variables are presented as percentages. Data analysis was conducted using SPSS version 22 (2020, IBM, New York, NY).

Results

Demographic and clinical characteristics

From 18 March 2020 to 16 July 2021, 1739 HCWs were referred to our service for evaluation for COVID-19. A total of 540 patients were positive for SARS-CoV-2. Of the 540 confirmed patients, a total of 325 (60%) were female. The median age was 38 years (18–67 years).

A total of 168 (31%) were nurses, 145 (26%) physicians and 77 (14%) were administrative personnel. The other 150 (28%) were other hospital personnel like cleaners, cooks and porters (Table 1). The most common comorbidity was obesity (25%), followed by smoking (15%) and cardiovascular disease (8%) (Table 2). The predominant symptoms were headache 72%, myalgias 69% and cough 65%. The demographic and clinical characteristics are shown in Table 2.

Disease severity and outcomes

Clinical outcomes are shown in Table 1.

Table 1. Working area of HCW.

	SARS-CoV-2 positive HCW *N* = 540
Working area, *n*/total *N* (%)	
Cleaners	31/540 (5.7%)
Administrative personnel	77/540 (14.2%)
Cooks	14/540 (2.5%)
Nurse	168/540 (31.1%)
Chief department	17/540 (3.1%)
Lab technician	13/540 (2.4%)
Inhalotherapy	8/540 (1.4%)
Laundry	13/540 (2.4%)
Physician	145/540 (26.8%)
Fellows	14/540 (2.6%)
Stretcher bearer	18/540 (3.3%)
Other	22/540 (4.0%)
Working status	
Active	524/540 (97%)
On mandatory paid leave	16/540(3%)

HCW, health care workers.

Table 2. Demographics and clinical characteristics of health care workers positive for SARS-CoV-2.

Symptoms, *n* (%)	SARS-CoV-2 positive health care workers *N* = 540
Female sex, *n*/total *N* (%)	325 (60.2%)
Age	38 (18–67)
Distribution, *n*/total *N* (%)	
19–29 years	165/540 (30.5%)
30–39 years	155/540 (28.7%)
40–49 years	116/540 (21.4%)
5059 years	91/540 (16.8%)
⩾60 years	13/540 (2.4%)
Severity of COVID-19	
Mild moderate	466 (86%)
Severe	74 (14%)
Comorbidities	
BMI	27.0 (17.2–56.9)
Distribution, *n*/total *N* (%)	
<24.9	169/540 (31.3%)
25–29.9	238/540 (44.0%)
30–34.9	99/540 (18.3%)
35–39.9	29/540 (5.3%)
40	5/540 (0.9%)
Chronic obstructive pulmonary disease	26/540 (4.8%)
Diabetes mellitus	23/540 (4.3%)
Cardiovascular disease	45/540 (8.3%)
HIV infection	2/540 (0.4%)
Chronic renal disease	7/540(1.3%)
Cancer	2/540 (0.4%)
Smoking	80/540 (14.8%)
Pregnancy	1/540 (0.2%)
Fever	185/540 (34.3%)
Myalgias	373/540 (69.1%)
Sore throat	317/540 (58.7%)
Cough	
Productive	83/540 (15.4%)
Non-productive	270/540 (50%)
Nausea	108/540 (20%)
Abdominal pain	82/540 (15.2%)
Diarrhoea	147/540 (27.2%)
Anosmia	180/540 (33.3%)
Chills	284/540 (52.6%)
Rhinorrhoea	287/540 (53.2%)
Shortness of breath	76/540 (14.1%)
Headache	393/540 (72.8%)
Dysgeusia	162/540 (30%)

BMI, body mass index.

A total of 466 (86%) HCWs had a mild-moderate disease, while 74 (14%) had severe disease. Of those, 18 were referred for immediate hospitalization due to critical disease 6 (1%) and because beds were available on initial evaluation. From these 18 patients, 3 died due to a critical disease; those patients did not have an outpatient follow-up neither received medication as outpatients by our programme and were admitted directly to hospitalization. Thus, 56 patients with severe disease for whom a hospital bed was not available were enrolled in the OPAT. Of the 56 patients enrolled in the OPAT, 32 (57%) recovered and completed the programme as outpatients, 24 were subsequently admitted during OPAT follow-up due to disease progression or increased oxygen requirements and because beds were available, and 1 died. Of the 24 (43%) patients admitted, 23 recovered and were discharged. The patient who died was admitted in the hospital on day 6 after start of OPAT and died due to ventilator associated pneumonia after 8 weeks of intensive care.

There were no reported adverse events related to IV steroid use (catheter infection or phlebitis) or

associated with the use of apixaban (bleeding) (Table 3).

Table 3. Clinical outcomes of HCW.

	SARS-CoV-2 positive HCW *N* = 540
Clinical outcome, *n* (%)	
Symptomatic observation outpatient	466/540 (86.3%)
Total hospital admissions	42/540 (7.7%)
Never received OPAT	18/540 (3.3%)
During OPAT programme	32/540 (5.9%)
Total Deaths amongst HCWs	4/540 (0.88%)
Deaths in OPAT programme	1/540 (0.18%)

HCW, health care workers; OPAT, outpatient ambulatory surveillance and treatment strategy.

Discussion

In this study, we describe our experience at implementing an outpatient management strategy for severely ill COVID-19 patients in HCWs from a secondary care hospital in Mexico City. COVID-19 caused an increased pressure in hospital systems across the world, due to a high number of admissions, particularly during the pre-vaccination era. This forced many countries to implement strategies to scale-up hospital capacity. For example, China implemented the Fangcang shelters to isolate and monitor patients with mild disease, Spain built a field hospital for emergency care of severe cases at a large convention centre (IFEMA) and Mexico City benefitted from a large COVID-19 temporary hospital that used a pre-emptive hospitalization strategy and had over 130 beds with intensive care unit (ICU) or high-flow oxygen delivery capacity.[4–6] All of these interventions were aimed at increasing hospital bed capacity for patients with need of oxygen or reducing the time to hospital and ICU referral and admission. The lack of infrastructure to adequately care for severely ill COVID-19 patients in our centre forced us to adapt a strategy using WHO recommended therapies (steroids, oxygen and thromboprophylaxis) for outpatients.[7,8]

Currently, there are many interventions aimed at treating ambulatory patients with COVID-19, including oral and IV antivirals (Paxlovid, molnupiravir and remdesivir) and monoclonal antibodies.[8–10] However, these strategies are also aimed at preventing hospitalization in high-risk patients with mild to moderate disease, and there are many challenges to their adoption, including resistance of emerging variants to monoclonal antibodies[11] and the fact that low- and middle-income countries do not have access to these therapies yet. Thus, an innovative strategy using easily accessible drugs and interventions is desirable for countries which lack access to COVID-19 antivirals and monoclonal antibodies.

We showed that a package of interventions including close daily face-to-face examinations by highly trained personnel, daily administration of steroids, domiciliary low-flow oxygen therapy and oral thromboprophylaxis is a feasible and safe alternative for treating patients with severe COVID-19 during periods of low hospital bed availability. A strict follow-up by trained physicians helped to promptly detect when patients were deteriorating and needed scale-up oxygen therapy with high-flow nasal cannulas.

Domiciliary oxygen care for chronic conditions is well described and has been common practice for decades.[12] However, domiciliary use for acute illness is usually reserved for pre-hospital, remote, combat, humanitarian and palliative care contexts. To our knowledge, this is the first description of a strategy using ambulatory steroids, oral thromboprophylaxis and domiciliary oxygen for patients with severe COVID-19.

Adequate access to oxygen delivery devices, oximeters and oxygen supply is mandatory to implement this strategy. In our city, oxygen stores, where people can buy oxygen delivery devices, equipment and refill oxygen tanks, are abundant and accessible without a medical prescription, which made this strategy feasible in our context. Other factors that are fundamental to successfully implement similar strategies are adequate training of the physicians and nurses on the correct evaluation of patients by using a set of pre-established criteria for immediate hospitalization, adequate training of the patient on how to self-monitor and how to manage oxygen delivery devices at home, and when to seek immediate care.

The results of this study should be interpreted in the adequate context: our OPAT was established at a time when the Government was prioritizing

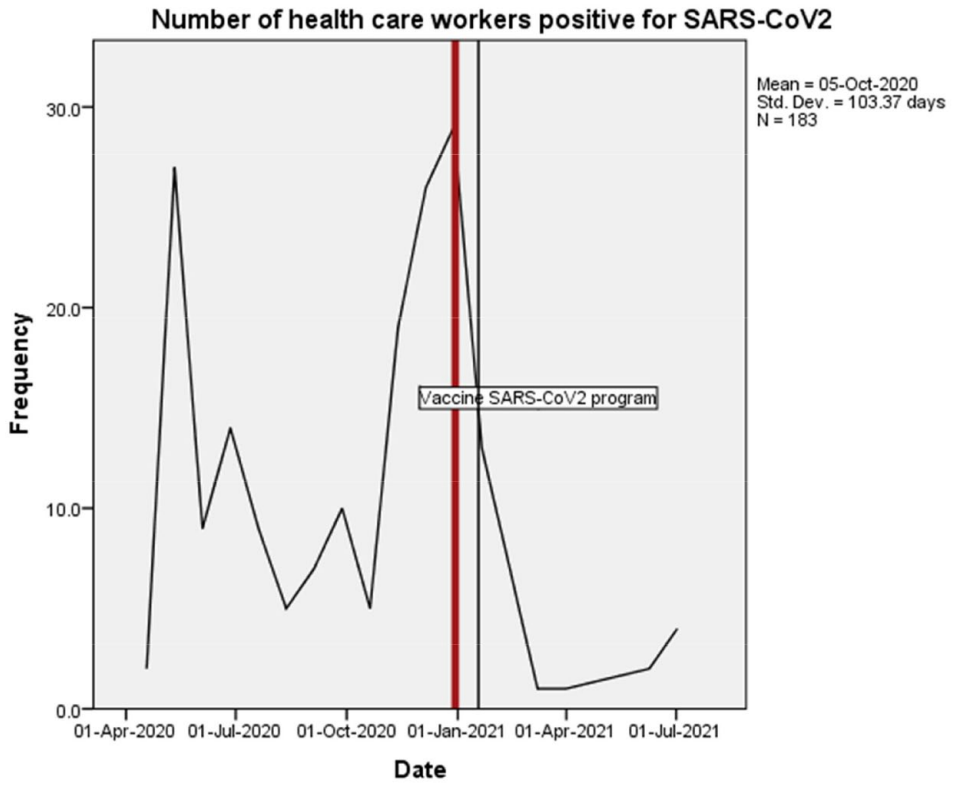

Figure 4. Line graph of health care workers and vaccine.

hospitalization for patients with SpO2 < 85% on room air and when the results of the RECOVERY trial, which found that an oral or IV dose of daily 8 mg of dexamethasone improves survival in patients who need oxygen, were still not published[7] and there were no vaccines available, which made this strategy an adequate alternative for patients who did not have access to the standard of care in the hospital.[13] This strategy allowed us to provide domiciliary services with a high standard of care for 56 HCWs who otherwise would not have received appropriate treatment. In addition, considering an average of 7 days for patient hospitalized in our centre due to COVID-19, we estimate that we averted 224 hospital/days, and allowed other patients with more severe disease to receive in-hospital care.

With the use of telemedicine technologies, an OPAT strategy could be complemented by allowing more rigorous follow-up and increasing communication with the caring team, but such strategies need resources and Internet of phone access. As evidence on the use of oral steroids and other immunomodulators evolves for the treatment of patients with severe COVID-19 (such as baricitinib), providers should consider introducing them in OPAT strategies as they are easy to administer, safe and effective in reducing mortality.

It is important to mention that after the COVID-19 vaccination programme for HCWs in our hospital started, we observed a reduction of 91% in the number of HCWs who sought care in our department, and no HCWs needed hospitalization in the period from February 2021 to July 2021 (Figure 4). This highlights the fact that health care systems (and governments) should prioritize vaccination, as it is considered one of the most effective preventive actions for COVID-19 case reduction, hospitalization and death. On the other hand, in the post-vaccination era, the implementation of an ambulatory package of interventions for patients with severe COVID-19 that ensures continuous care, close follow-up and domiciliary treatment delivery is a necessity, particularly in contexts were vaccination rates are still low.[14–18]

The strengths of our study include the use of a pre-defined set of criteria for assessment of severity and hospitalization requirements, and that care was provided by physicians trained in ID, which allowed for reliable daily follow-up. Furthermore, the supervised provision of daily steroids and laboratory evaluation allowed us to monitor the adverse effects related to its administration.

The main limitation of our study is its observational nature and a lack of a comparison group, which would require a different type of study to evaluate. Furthermore, we did not evaluate the cost-effectiveness of this intervention.

Conclusion

A package of interventions for outpatient management of severe COVID-19 consisting of daily clinical examinations, ambulatory steroids and domiciliary oxygen therapy with oral thromboprophylaxis may be feasible and safe during periods of low hospital bed availability in middle-income settings.

Declarations

Ethics approval and consent to participate

The study was approved by the Investigation and Ethics Committee of the Hospital Dr. Manuel Gea Gonzalez with register number 19CI 09 012 001. For the study, all patients signed an informed consent form.

Consent for publication

Not applicable.

Author contributions

Estefania Sienra Iracheta: Conceptualization; Data curation; Investigation; Methodology; Writing – original draft.

Braulio Josue Mendez Sotelo: Data curation; Formal analysis; Investigation.

Mercedes Aranda Audelio: Investigation; Methodology; Supervision.

José Hiram Hernández Jeronimo: Investigation.

Rosa Villaseñor Martinez: Investigation.

David Humberto Martinez Oliva: Conceptualization; Data curation; Formal analysis; Supervision; Writing – review & editing.

Cesar Lopez Vejar: Investigation.

Juan Pablo Ramirez Hinojosa: Project administration.

Bruno Ali Lopez Luis: Investigation.

Javier Martínez Garcia: Data curation; Resources; Software; Validation.

Luz Elena Cervantes Villar: Investigation; Resources.

Pilar Miyoko Martinez Matsumoto: Investigation; Methodology.

Ana Patricia Rodriguez Zulueta: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Supervision; Writing – review & editing.

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Competing interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Availability of data and materials

Not applicable.

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