Risk of readmission to the emergency department in mild COVID-19 outpatients with telehealth follow-up

Riesgo de reconsulta al servicio de urgencias en pacientes COVID-19 leves con seguimiento ambulatorio mediante telemedicina

Risco de readmissão ao departamento de emergência em pacientes ambulatoriais com COVID-19 leve com acompanhamento de telessaúde

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La resolución N.° 1430/MSGC/20 del Gobierno de la Ciudad Autónoma de Buenos Aires correspondiente al 23 de junio de 2020 habilitó el protocolo de manejo de casos confirmados con COVID-19 en instituciones extrahospitalarias. Desde entonces, el Hospital Italiano de Buenos Aires desarrolló un sistema de seguimiento ambulatorio para personas en aislamiento domiciliario, a través de la telemedicina, que permitió descentralizar la atención hospitalaria, y al mismo tiempo monitorear el control clínico evolutivo y asegurar la seguridad de estos pacientes.

Conceptos clave

A) Qué se sabe sobre el tema:
Durante la primera evaluación de un paciente con COVID-19 sospechoso o confirmado, se puede considerar la atención domiciliaria cuando la hospitalización no esté disponible, sea insegura o innecesaria. Sin embargo, durante la primera fase de la pandemia esto no fue posible hasta el 23 de junio de 2020, momento en el que habilitó el protocolo de manejo de casos confirmados con COVID-19 en instituciones extrahospitalarias, incluidas el propio domicilio de las personas.

B) Qué aporta este trabajo:
Para garantizar que el paciente recibe un seguimiento adecuado en su domicilio, deben establecerse líneas de comunicación entre el paciente o el cuidador y el equipo de tratamiento de la salud. En este contexto, los sistemas de salud debieron adaptarse rápidamente para brindar servicios adecuados en este nuevo escenario. Este trabajo se propuso estimar las tasas de reingreso al servicio de urgencias e internaciones hospitalarias dentro de los 14 días de seguimiento con telemedicina, y explorar los factores asociados con estos resultados clínicos.

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Abstract:

Introduction: To describe patients´ characteristics of confirmed COVID-19 with mild symptoms discharged home from the Emergency Department (ED) and followed using telemedicine, to estimate ED-readmission rates and hospitalization, and to explore associated factors with these clinical outcomes. **Methods:** We performed a retrospective cohort study in Hospital Italiano de Buenos Aires from June to August 2020, which included patients with mild COVID-19 symptoms, diagnosed with a positive result. Follow-up occurred from discharged until ED-readmission or 14 days. We estimate cumulative incidence using the Kaplan-Meier model and associated factors using logistic regression. **Results:** We included 1,239 patients, with a median of 41 years and 53.82% male. A total of 167 patients were readmitted to the ED within 14 days, with a global incidence rate of 13.08% (95%CI 11.32-15.08). Of these, 83 required hospitalization (median time from diagnosis 4.98 days), 5.98% was not related to any COVID-19 complication, and five patients died. After adjustment by confounders (age ≥65, sex, diabetes, hypertension, former smoking, active smoking, fever, diarrhea, and oxygen saturation), we found significant associations: former smoking (adjusted OR 2.09, 95% CI 1.31-3.34, p0 .002), fever (aOR 1.56, 95% CI 1.07-2.28, p0.002) and oxygen saturation (aOR 0.82, 95% CI 0.71-0.95, p0.009). **Conclusion:** The 13% rate of ED-readmission during 14 days of follow-up of mild symptomatic COVID-19 patients initially managed as outpatients with telehealth is highly significant in hospital management, quality performance, and patient safety.

Keywords: emergency medical services; coronavirus infections; ambulatory care; telemedicine; patient readmission.

Resumen:

Introducción: Describir las características de los pacientes COVID-19 con síntomas leves dados de alta desde la Central de Emergencias de Adultos (CEA) y seguidos en forma ambulatoria mediante telemedicina. Estimar las tasas de re-consulta a CEA y hospitalización, y explorar los factores asociados a estos desenlaces. **Métodos:** Cohorte retrospectiva de Junio a Agosto 2020 en el Hospital Italiano de Buenos Aires, que incluyó personas COVID-19 con síntomas leves. Se siguieron durante 14 días hasta la ocurrencia de re-consulta en CEA y/o hospitalización. Se utilizaron modelos de Kaplan-Meier y regresión logística. **Resultados:** De un total de 1.239 pacientes, con una mediana de 41 años y 53,82% varones, 167 pacientes re-consultaron a CEA, con una tasa de incidencia global a los 14 días del 13,08% (IC del 95% 11,32 a 15,08). De estos, 83 requirieron hospitalización (media de 4,98 días), el 6% no se relaciona con COVID-19 y 5 pacientes fallecieron. Después del ajuste por factores confundidores (edad ≥65, sexo, diabetes, hipertensión, ex tabaquismo, tabaquismo activo, fiebre, diarrea y saturación de oxígeno), encontramos asociaciones significativas: tabaquismo anterior (ORa 2,09, IC95% 1,31-3,34, p0=0,002), fiebre (ORa 1,56, IC95% 1,07-2,28, p=0,002) y saturación de oxígeno (ORa 0,82, IC95% 0,71-0,95, p=0,009). **Conclusión:** La tasa del 13% de re-consulta a CEA durante 14 días de seguimiento resultó muy significativa para la gestión hospitalaria, la calidad del desempeño y la seguridad del paciente.

Palabras clave: servicios médicos de urgencia; infecciones por coronavirus; atención ambulatoria; telemedicina; readmisión del paciente.

Resumo:

Introdução: Descrever as características dos pacientes com COVID-19 com sintomas leves e alta do Centro de Emergência de Adultos (CEA) e acompanhados ambulatorialmente por telemedicina. Estime as taxas de nova consulta ao CEA e de hospitalização e explore os fatores associados a esses resultados. **Métodos:** Coorte retrospectiva de junho a agosto de 2020 no Hospital Italiano de Buenos Aires, que incluiu COVID-19 com sintomas leves. Eles foram acompanhados por 14 dias até a ocorrência de nova consulta no CEA e / ou internação. Modelos de Kaplan-Meier e regressão logística foram usados. **Resultados:** De um total de 1.239 pacientes, com mediana de 41 anos e 53,82% homens, 167 pacientes consultaram novamente o CEA, com uma taxa de incidência global em 14 dias de 13,08% (IC95% 11,32 a 15,08). Destes, 83 necessitaram de hospitalização (média de 4,98 dias), 6% não estavam relacionados com COVID-19 e 5 pacientes morreram. Após o ajuste para fatores de confusão (idade ≥65, sexo, diabetes, hipertensão, ex-tabagismo, tabagismo ativo, febre, diarreia e saturação de oxigênio), encontramos associações significativas: tabagismo prévio (ORa 2,09, IC 95% 1,31-3,34, p0 = 0,002), febre (ORa 1,56, IC 95% 1,07-2,28, p = 0,002) e saturação de oxigênio (ORa 0,82, IC 95% 0,71-0,95, p = 0,009). **Conclusão:** A taxa de 13% de re-consulta ao CEA durante 14 dias de seguimento foi muito significativa para a gestão hospitalar, qualidade do desempenho e segurança do paciente.

Palavras-chave: serviços médicos de emergência; infecções por coronavirus; assistência ambulatorial; telemedicina; readmissão do paciente.

INTRODUCTION

The World Health Organization (WHO) has declared the coronavirus disease 2019 (COVID-19) outbreak as a pandemic in early March 2020. It has become the most life-changing event so far in this century, changing our society, economy, and healthcare systems[1].
By December 2020, the pandemic reached an estimated 70 million confirmed cases, which regrettably 1.6 million people deceased worldwide. The strategic objectives to end the COVID-19 pandemic are to slow and stop transmission, provide optimized care for all patients, and minimize the impact on health systems, social services, and economic activity.
During the first evaluation of a suspected or confirmed COVID-19 patient, home care may be considered when hospitalization is unavailable, unsafe, or needless. Three factors must be assessed when deciding whether a patient will continue the treatment at the hospital level or as an outpatient, the initial clinical status, the evaluation of the home environment, and the ability to follow-up and monitor the clinical course at home[2]. The clinical presentation, supportive care requirements, and risk factors should be evaluated initially on a case-by-case basis. Asymptomatic patients or those with mild or moderate disease without risk factors may not require emergency interventions or hospitalization. They could be followed up at home, as long as appropriate infection prevention and control measures and close surveillance of any deterioration of their health status by a caregiver are fulfilled in the home setting. If a vulnerable person is present in a patient's home and cannot be isolated from the patient, an alternative location should be offered if available.
The WHO recommends isolation and surveillance for COVID-19 symptomatic patients until ten days after symptom onset, plus at least three days without fever or respiratory symptoms[3]. To ensure that the patient is adequately followed at home, communication lines should be established between the patient or caregiver and the health care treating team. New approaches to control the spread of the virus and improve follow-ups are imperative[4], being telemedicine a remote form of healthcare delivery, which has become a fundamental way to bring medical services nowadays[5–9].
In this context, health care systems must quickly adapt to provide adequate services in this new scenario, where new digital technologies cannot be ignored to achieve a profound change[10,11]. Fortunately, telehealth services offer the opportunity to maintain access and continuity of care while reducing the potential for community transmission of the virus[12].
In Argentina, the possibility of outpatient management at patients´ homes was not an option by the Ministry of Health until June 22, 2020. Before that time, all confirmed patients, including asymptomatic or mild ones, were hospitalized. Subsequently, confirmed COVID-19 symptomatic and mild cases, evaluated in our Emergency Department (ED), were sent home to be followed via telehealth for at least ten days after being discharged from the ED. While telemedicine was already implemented at our institution[13,14], we required a rapid expansion of this service to meet the rapidly growing demand. As part of this process, we started a telehealth follow-up program within 24 hours after diagnosis to provide patients with a direct interaction with the medical treating team. After the initial telehealth evaluation, we rescheduled a second remote follow-up after 24 to 72 hours, based on the patient's clinical status or other individual needs.
About 80% of all COVID-19 patients recover from the disease without needing special treatment, mainly in mild illness cases. Those patients may also be cared for at home. Nevertheless, it can be a serious health condition for some patients. Around 1-in-5 cases develop respiratory disorder and require hospital care[15].
The risk factor evaluation associated with increased hospital readmission rates after ED discharge among patients with COVID-19 has mostly focused on critically ill patients[15], requiring critical care[16]. In contrast, less is known about the clinical features and progression of COVID-19 patients with mild symptoms after ED discharge[17,18]. Therefore, we have a substantial lack of evidence to guide decision-making strategies on mild COVID-19 cases surveillance at home.
The goals of this study were to describe the characteristics of COVID-19 patients with mild symptoms discharged from the ED (as outpatients) and followed by telemedicine, to estimate readmission rates to the emergency department and hospital within 14 days, and to explore associated factors with these clinical outcomes.

METHODS

Settings
The study took place at the Hospital Italiano de Buenos Aires, a highly complex hospital in Argentina. The facilities have a total capacity of 785 beds for hospitalization, and the ED usually attends about 500 daily consultations (which decreased 70% during the pandemic). Additionally, the hospital has a private insurance plan (PS-HIBA) with nearly 174.500 members.

Participants
We considered eligible candidates all patients who attended the ED with mild COVID-19 symptoms and were diagnosed by a positive result of RT-PCR testing for SARS-CoV-2 RNA. Only those discharged home from the ED without requiring hospitalization were included (i.e., patients who were medically stable and could receive care at home).

Study design
We conducted a retrospective observational cohort study from June 23 to August 23, 2020, that included consecutive adult patients confirmed with COVID-19 with mild symptoms discharged from the ED for outpatient management.

Outcome measures
Patients were followed up from the date of diagnosis (coincident with the initial ED discharge date) until readmission to ED or 14 days after discharge.
In those patients who had a subsequent ED-readmission and required hospitalization, experts in internal medicine reviewed the Electronic Health Record (EHR) manually to define whether this readmission was due to a related COVID-19 complication or another unrelated reason (acute occurrence).

Telehealth follow-up program
All patients involved were follow-up after discharge from the ED using a telehealth program. This service uses the EHR as an interface for the attending physician. They could reach updated patient clinical information, electronically prescribing medications, and order and visualize laboratory analysis, among others. On the patient's side, the Personal Health Record (PHR) was used to bring services and clinical data to patients. Between both systems, users can access a synchronic video call communication that also includes a chat. The Department of Health Informatics at the Hospital previously developed all the software used in this study[19].
Regarding technical specifications for the online tool through audio-video and chat, its development was based on not installing any additional software that might compromise the user experience. We carried out iterative cycles of development and testing until we obtained a final version for desktop and mobile devices.
When receiving a positive test result, mild COVID-19 patients were scheduled with a first video-call up to 24 hours after discharge from the ED, providing patients with a direct interaction with the medical treating team. Based on the assessed clinical status during the follow-up (persistent dyspnea, fever, or more risk factors), physicians rescheduled a second appointment for the next 24 to 72 hours, being able to reschedule again if needed. The remote surveillance ended no longer than ten days after diagnosis, regardless of symptom onset.
The healthcare professional should also assess whether the residential setting is appropriate for home care[20]. Considerations for home care management include whether: the patient is stable

enough to receive care at home; appropriate caregivers are available; there is a bedroom where the patient can complete recovery without sharing immediate space with others; there is a separate bathroom for the patient; resources as food and basic needs are met, and the patient and other household members are capable of adhering to recommendations as part of home care or isolation.

Data collection

All patient health information is stored in a single Clinical Data Repository (CDR) fed by the hospital EHR. The hospital health system has been evaluated by a recognized international organization (HIMSS, Level 7+) and accredited by the Joint Commission International. The CDR stores clinical documents for each patient, with the highest quality standards worldwide, from different sources such as test results, images, clinical notes, outpatient visits, ED visits, in-hospital care, among other examples.

Several secondary databases were used in this study: (a) information about epidemiological records corresponding to the initial evaluation for notification to the Ministry of Health (e.g., demographic information such as age and sex); (b) data from Institutional Registry of COVID-19 (such as evidence of positive SARS-CoV-2 test, chronic comorbidities or medications); (c) data from the EHR as an additional source (variables such as date of the first ED visit, lab results or complementary studies, the decision of in-hospital or outpatient management) and outcomes related to the progression of the illness during the follow-up period after discharge (ED readmission or hospitalization).

Ethical considerations

Ethics approval was obtained from the Institutional Review Board (CEPI#5750). The project has been carried out under The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. All data were treated with confidentiality, and restricted access was given only to the researchers involved.

Statistical analysis

A descriptive analysis of the baseline characteristics of the first ED visit was carried out, including administrative, epidemiological, clinical, images, and lab results data. We examined summary statistics and reported as means and standard deviation or medians and interquartile range.

To estimate the cumulative incidence of readmission to ED, we implemented the Kaplan-Meier estimator, considering time zero as the ED discharge date. We report the cumulative incidence of readmission at 48 hours, 3 days, 5 days, 7 days, 10 days, and 14 days. Besides, we calculated the proportion of hospitalizations and in-hospital mortality as safety proxies.

The outcomes were reported and explored to find associated factors using logistic regression, presented as unadjusted and adjusted odds ratios (ORs) with their respective 95% confidence intervals (95%CI). First, we characterized the patients using a univariate model. Then, adjustments were made for confounder variables (defined as age, sex, high blood pressure, diabetes, smoking, fever, diarrhea, and oxygen saturation) using multivariable models.

All calculations were performed with the Stata 16.0 software.

RESULTS

During the study period, 1,239 patients were included for analyses and followed as outpatients with telemedicine (**Figure 1**). Regarding baseline characteristics (**Table 1**), most patients were young (median of 41 years old) and with few comorbidities; hypertension (12%) and former smokers (11%) were the most prevalent.

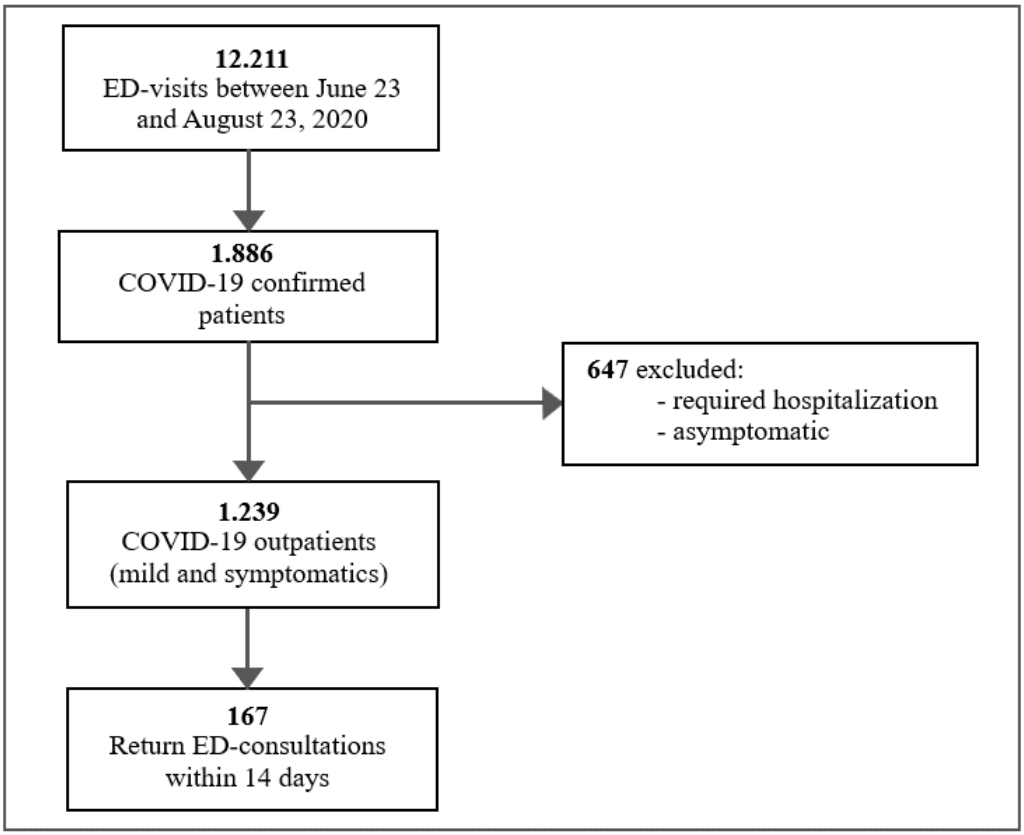

Figure N°1. Flow diagram of the study participants.

Table N° 1: Baseline characteristics.

Characteristic	All (n= 1,239)
Demographics characteristics	
Age, in years (SD)	41 (23)
Female gender	53.03% (657)
First ED visit	
Month	
June	6.38% (79)
July	44.71% (554)
August	48.91% (606)
PS-HIBA insurance plan	76.51% (948)
Attention time, in hours *	3.70 (3.05)
History and comorbidities	
Flu vaccination	29.30% (363)
Hypertension	11.95% (148)
Former smoker	10.73 % (133)
Active smoking	6.05% (75)
Asthma	3.63% (45)
Diabetes	2.42% (30)
Coronary heart disease	1.37% (17)
Solid tumor	0.32% (4)
Moderate to severe chronic kidney failure	0.32% (4)
Cerebrovascular disease	0.32% (4)
COPD	0.16% (2)
Cirrhosis	0.08% (1)
Heart failure	0.08% (1)

* Median (IQR: interquartile range)

Regarding complementary studies at the initial assessment (first ED visit): 52.54% (651) had a laboratory, 63.76% (790) had chest x-ray, and only 0.89% (11) had thorax tomography. Radiographic findings were classified into: 76.07% (601/790) mild focal opacity (increase in density of somewhat defined margins but less than a nodule); 1.90% (15/790) moderate focal opacity or diffuse interstitial pattern (linear images, peribronchial enhancement); 0.38%[3] with focal opacity or diffuse interstitial pattern (linear images, peribronchial reinforcement) or consolidation, lymphadenopathy or pleural effusion (which in its follow-up may evolutes to Acute Respiratory Distress Syndrome), and the rest with missing data (21.65% due unstructured report).

A total of 167 patients had readmission to ED within 14 days, with a global incidence rate of 13.08%, 95% CI 11.32 to 15.08. **Table 2** specifies the cumulative incidence at different times. A total of 83 ED readmissions required hospitalization (median of 4.98 days), and only 5.98% (10/167) were not related to a COVID-19 complication. Five patients died during hospitalization.

Table N° 2: Cumulative ED-visits in each pre-specified study period.

Study period	Readmission to ED (%)	Confidence interval
48 h	2,10%	95%CI 1.43 to 3.07
3 days	2,99%	95%CI 2.17 to 4.10
5 days	5,89%	95%CI 4.71 to 7.35
7 days	9,69%	95%CI 8.16 to 11.47
10 days	12,35%	95%CI 10.64 to 14.31
14 days	13,08%	95%CI 11.32 to 15.08

The bivariate analysis (**Table 3**) yielded the following associated factors: age (crude OR 1.03, p0.001), hypertension (crude OR 1.77, p 0.011), former smoker (crude OR 2.51, p0.001), laboratory (OR crude 2.21, p0.001), chest X-ray (crude OR 1.95, p0.001), myalgia (crude OR 1.49, p0.030), diarrhea (crude OR 1.91, p0.015), fever (crude OR 1.69, p0.003), heart rate (OR 1.01, p0.001), diastolic blood pressure (crude OR 1.01, p0.024), and oxygen saturation (crude OR 0.77, p0.001).

Table N° 3: Bivariate logistic regression.

	Not ED Readmission (n: 1072)	Readmission to ED within 14d (n: 167)	cOR	P-value	95%CI
Administrative variables					
PS-HIBA insurance plan	75.75% (812)	81.44% (136)	1,4	0,108	0.92 - 2.12
Working days	67.91% (728)	65.27% (109)	1,12	0,498	0.79 - 1.58
Demographics characteristics					
Age, in years *	42.56 (14.93)	50.61 (14.33)	**1,03**	**0,001**	**1.02 - 1.04**
Male sex	53.82% (577)	47.90% (80)	1,26	0,155	0.91 - 1.75
Flu vaccination	28.54% (306)	34.13% (57)	1,29	0,141	0.91 - 1.83
History and comorbidities					
Asthma	4.01% (43)	1.20% (2)	0.29	0.089	0.06 - 1.20
COPD	0.09% (1)	0.60% (1)	6.45	0.188	0.40 - 103.64
Solid tumor	0.19% (2)	1.20% (2)	6.48	0.062	0.90 - 46.35
Hypertension	11.01% (118)	17.96% (30)	1.77	0.011	1.14 - 2.74
Stroke	0.28% (3)	0.60% (1)	2.14	0.509	0.22 - 20.75
CHD	1.12% (12)	2.99% (5)	2.72	0.063	0.94 - 7.84
Chronic renal failure	0.19% (2)	1.20% (2)	6.48	0.062	0.90 - 46.35
Diabetes	2.15% (23)	4.19% (7)	1.99	0.116	0.84 - 4.72
Smoking	6.06% (65)	5.99% (10)	0.98	0.970	0.49 - 1.96
Former smoker	9.24% (99)	20.36% (34)	2.51	0.001	1.63 - 3.86
Chronic medication					
Corticosteroids	0.37% (4)	0.60% (1)	1.60	0.672	0.17 - 14.47
NSAID	1.96% (21)	3.59% (6)	1.86	0.185	0.74 - 4.69
ARAII	1.12% (12)	1.80% (3)	1.61	0.461	0.45 - 5.78
IECA	1.40% (15)	2.40% (4)	1.72	0.336	0.56 - 5.27
IECA/ARAII	2.52% (27)	4.19% (7)	1.69	0.223	0.72 - 3.95
Complementary test results					
Laboratory (n: 651)	50.00% (536)	68.86% (115)	**2,21**	**0,001**	**1.56 - 3.13**
White blood cells ** (n: 650)	4962 (4066-6122)	5006 (4197-6267)	1	0,708	0.99 - 1.01
Creatininemia ** (n: 643)	0.80 (0.68-0.96)	0.88 (0.72-1.07)	1,67	0,051	0.99 - 2.81
Uremia ** (n: 640)	26 (21-33)	27 (22-35)	1	0,194	0.99 - 1.02
Platelets ** (n: 631)	197500 (170300-230600)	194300 (162600-225000)	0,99	0,206	0.99 - 1.01
Sodium ** (n: 620)	137 (135-139)	136.2 (135-139)	0,98	0,754	0.91 - 1.06
Chloro ** (n: 620)	102 (100-103)	102 (99-103)	0,95	0,215	0.88 - 1.02
Potassium ** (n: 618)	4 (3.8-4.2)	4.1 (3.8-4.3)	1,46	0,133	0.88 - 2.41
Alkaline phosphatase ** (n: 616)	61 (50-75.5)	65 (53.5-80.5)	1	0,103	0.99 - 1.01
GOT ** (n: 615)	21 (16-28)	23.5 (18-31.5)	**1,01**	**0,011**	**1.01 - 1.02**
GPT ** (n: 615)	20 (13-32)	22 (14-35.5)	1	0,052	0.99 - 1.01
Prothrombin time ** (n: 584)	90 (82-97)	91.5 (82-100)	1	0,546	0.98 - 1.02
pH ** (n: 349)	7.36 (7.35-7.39)	7.37 (7.33-7.39)	2,74	0,81	0.01 - 10355.95
Lactic acid ** (n: 177)	1.17 (0.92-1.42)	1.25 (1-1.82)	1,88	0,111	0.86 - 4.08
C-reactive protein ** (n: 20)	10.2 (3.2-19.9)	10 (2-18)	0,97	0,62	0.87 - 1.08
Erythrocyte sedimentation ** (n: 15)	15 (8-36)	28.5 (11-46)	1,01	0,737	0.93 - 1.09
Chest X-ray	61.85% (663)	76.05% (127)	**1,95**	**0,001**	**1.34 - 2.85**
Symptoms					

Cough	55.41% (594)	63.47% (106)	1.39	0.051	0.99 - 1.95
Odynophagia	47.01% (504)	44.31% (74)	0.89	0.515	0.64 - 1.24
Headache	35.73% (383)	34.73% (58)	0.95	0.802	0.67 - 1.34
Anosmia	23.88% (256)	17.37% (29)	0.66	0.064	0.43 - 1.02
Myalgia	21.74% (233)	29.34% (49)	1.49	0.030	1.03 - 2.15
Dysgeusia	18.66% (200)	13.77% (23)	0.69	0.128	0.43 - 1.10
Arthralgias	10.26% (110)	14.37% (24)	1.46	0.113	0.91 - 2.36
Diarrhea	6.62% (71)	11.98% (20)	1.91	0.015	1.13 - 3.24
Dyspnoea	5.97% (64)	6.59% (11)	1.11	0.756	0.57 - 2.15
Abdominal pain	3.92% (42)	6.59% (11)	1.72	0.117	0.87 - 3.42
Chest pain	4.29% (46)	4.19% (7)	0.97	0.953	0.43 - 2.19
Vomiting	2.05% (22)	3.59% (6)	1.77	0.219	0.71 - 4.45
Number of symptoms	3 (2-4)	3 (2-4)	**1,1**	**0,045**	**1.01 - 1.21**
At least one symptom	95.90% (1028)	98.20% (164)	2,33	0,158	0.71 - 7.62
Vital signs					
Fever (>=37.3 °C)	57.28% (614)	69.46% (116)	**1.69**	**0.003**	**1.19 - 2.40**
Fever (>=38 °C)	29.57% (317)	39.52% (66)	**1.55**	**0.010**	**1.11 - 2.17**
Heart rate (bpm)	85 (76-96)	90 (80-98)	**1.01**	**0.001**	**1.01 - 1.03**
Respiratory rate (bpm)	17 (15-18)	16 (15-18)	**1.00**	**0.918**	**0.97 - 1.02**
Oxygen saturation (%)	99 (98-100)	99 (98-100)	**0.77**	**0.001**	**0.67 - 0.88**
DBP (mmHg)	80 (70-80)	80 (70-85)	**1.01**	**0.024**	**1.00 - 1.03**
SBP (mmHg)	120 (119-130)	120 (120-140)	**1.00**	**0.165**	**0.99 - 1.01**

* Mean (SD: standard deviation)

** Median (IQR: interquartile range)

After the adjusted analysis (Table 4) by categorical age ≥65 years, sex, diabetes, hypertension, former smoking, active smoking, fever, diarrhea and oxygen saturation, we found these associated factors with readmission to ED within 14 days: former smoking (adjusted OR 2.09, 95% CI 1.31-3.34, p0 .002), fever (adjusted OR 1.56, 95% CI 1.07-2.28, p0.002) and oxygen saturation (adjusted OR 0.82, 95% CI 0.71-0.95, p0.009).

Table N° 4: Multivariate logistic regression.

Variable	Not ED Readmission (n: 1072)	Readmission to ED within 14d (n: 167)	aOR *	P-value	95%CI
Former smoker	9.24% (99)	20.36% (34)	2,09	**0,002**	1.31-3.34
Fever	57.28% (614)	69.46% (116)	1,56	**0,019**	1.07-2.28
Diabetes	2.15% (23)	4.19% (7)	1,49	0,406	0.57-3.85
Age ≥65 years	10.07% (108)	17.37% (29)	1,39	0,221	0.82-2.36
Active smoking	6.06% (65)	5.99% (10)	1,3	0,461	0.82-2.36
Hypertension	11.01% (118)	17.96% (30)	1,2	0,472	0.72-2.02
Male sex	46.18% (495)	52.10% (87)	0,95	0,811	0.66-1.36
Oxygen saturation, in percent value **	99 (98-100)	99 (98-100)	0,82	**0,009**	0.71-0.95

* adjusted by confounders: categorical age ≥65 years, sex, diabetes, arterial hypertension, former smoking, active smoking, fever, diarrhea, and oxygen saturation.

** Median (IQR: interquartile range)

DISCUSSION

Research Implications

This study estimates the cumulative incidence rate for ED-readmission during 14 days of follow-up of mild symptomatic COVID patients with initial management as outpatient with telemedicine, resulting in 13.08%. We used a data set from a single healthcare center in the city of Buenos Aires (the initial pandemic's epicenter in Argentina). By December 2020, Argentina had seen over 1,5 million confirmed cases and 40 thousand COVID-19 related deaths[21]. In our Hospital, 9269 confirmed cases and 404 deaths. Our findings were highly relevant in this context for decision-making in hospital management, quality performance, and patient safety.

Strengths and Limitations

Our data come from a single high-complexity center, with previous telemedicine experiences that served for unprecedented large-scale adaptability, being useful for decentralization, reducing health costs, and providing support to patients. However, some limitations must be recognized. First, the population may not be representative in other health facilities of the country, where inequalities and technological barriers already described in the literature predominates, disparities in digital access, digital literacy, telehealth awareness, and cost and coverage problems[22]. Second, we could not capture individual teleconsultations data, making it impossible to explore whether the outcomes vary according to follow-up periodicity.

However, a great strength to mention is the no loss to follow-up. Data comes mostly from patients affiliated with our private insurance plan (more than 75% PS-HIBA patients), who behaves as a closed

cohort due to limited probability of having services outside the network, meaning that the real cumulative incidence of ED-readmission was not underestimated.

Interpretation of Findings

Regarding the variables associated with the initial visit to ED, age was significant in the univariate model; and after adjustment: ex-smokers (adjusted OR 2.09, 95% CI 1.31-3.34, p0.002), fever (adjusted OR 1.56, 95% CI 1.07-2.28, p0.002) and oxygen saturation (adjusted OR 0.82, 95% CI 0.71-0.95, p0.009), according with what has been previously described on severe infection (15). These results allow clinicians and guidelines to rethink risk stratification for patients at baseline. Anyway, complementary test results (laboratory or chest x-ray) in the initial assessment could be related to confounding by indication bias. This concept refers to a bias in the relationship of the expected result based on the physician's perceptions and the severity and prognosis of the disease. Due to the missing data (not every patient had these studies in the initial assessment: only 63% chest x-ray and 52% laboratory), we decided not to consider these as adjustment variables. Missing data probably influences the model's sample size and, consequently, decreases the power (not enough).

Comparison to Previous Studies

Like other studies, hospital systems with existing telehealth infrastructures have rapidly implemented high-quality virtual clinical services[23]. Luckily, there are many local reports where telehealth is an essential model of clinical services delivery, such as psychiatry[24], phlebology[25], cardiology[26].

CONCLUSION

Initially, our country's national measure was that all confirmed patients, including asymptomatic or mild ones, were hospitalized until the bed occupancy rate anticipated a potential saturation of the health system, where telehealth emerged as a necessary and essential alternative. Before the pandemic, barriers to telehealth programs such as regulatory, reimbursement, social, and unfamiliarity technology among clinicians and patients were significant[27]. But this experience can be applied or extrapolated to COVID-19 outpatients management or reuse in an eventual second wave.

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AP and BM conceived the original idea. MFGR designed the study and wrote the protocol. MV and PR reviewed the EHR for non-automated data capture (clinical interpretation). MFGR analyzed and interpreted the data. RP presented preliminary results at the national congress. DL and FP made critical feedback and institutional support. SMF and MFGR wrote and translated the manuscript. All authors contributed to the final version of the manuscript.

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