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Usefulness of Telemedicine Outpatient Follow-Up in Covid-19

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ABSTRACT

The COVID-19 disease in Mexico was presented in the year 2021 2,441,886 confirmed patients, 436,431 suspected cases and 229,353 deaths. In the Mexican Institute of Social Security (I.M.S.S.) within Phase 3 of the COVID-19 contingency, I implement a specific work method using information and communication technologies (ICTs) for telemedicine follow-up of patients with diagnostic suspicion of COVID-19 . The objective was to evaluate the usefulness of gray, green, yellow and red signaling in demographic and clinical aspects through telemedicine with follow-up at home for 14 days in patients with COVID-19 of the North I.M.S.S. delegation, between August 2020-November. 2021. Material and Methods: Non-experimental, cross-sectional, prospective, longitudinal, non-probabilistic convenience design, in 3053 patients from the Family Medicine Units of the D.F. North of the I.M.S.S, prior consent, a telemedicine follow-up

is granted for 14 days, capturing data on a digital platform made up of four categories; Gray group (absence of symptoms suggestive of COVID-19, SS-COVID-19), Green group (presence of SS-COVID-19), yellow group (SS-COVID-19 plus family history), Red group (presence of symptoms older than COVID-19 and referral to hospital), using Chi-square test and Cox regression model, with SPSS version 21 program. Results: Of 3053 patients presence in gray group (n=1813), green (n=731), red (n=265) and yellow (n=244); female sex (62.3%), group of 31-40 years (26.4%), arterial hypertension with 2.2, diabetes mellitus 1.78, obesity 82%; clinical symptoms, myalgia and headache with 1.19 times more risk, respectively, with a significant difference ($p < 0.05$).

Introduction

In Mexico, the prevalence of mortality registered due to COVID-19 disease between January-August 2020 represented the second cause of death at the national level with about 108,658 cases, only below cardiovascular diseases [1,2]. As of March 2021, there were 2,151,028 confirmed patients and 440,983 suspected cases [3]. To reduce the progression of the COVID-19 disease, prediction models have been carried out to stratify it, including age, comorbidities, among others, in order to guide clinical care, allocating scarce resources [4]. The use of Information and Communication Technologies (ICTs) have offered good expectations in Latin America, used in respiratory diseases and even COVID-19. Within ICTs, telemedicine is a tool that provides safe and accessible medical care [5-7]. Physicians previously trained in the use of telemedicine consider it a useful tool that offers treatment for COVID-19 patients with satisfactory results and at low cost, being accepted in medical consultation areas [8-10], Other benefits are mitigating disparities in access and reducing the risk of viral transmission of COVID-19 [11,12].

The management of COVID-19 patients on an outpatient basis by telemedicine has helped describe the type of risk for their hospital admission and the duration in days of clinical symptoms [13,14]. The Galician Health System carried out a telemedicine and care telemonitoring tool (TELEA) in COVID-19 patients that included within its criteria the high or low probability of severity, clinical symptoms, comorbidities, age, among others, divided into 4 groups, showed percentage differences between patients consulted in the emergency room and hospitalized, with an average follow-up of 11 days (95% CI 10.8-11) [15]. Another study where the same tool (TELEA) was used demonstrated adequate clinical control with home monitoring of COVID-19 patients, being useful and safe [16]. The objective of this study is to evaluate the usefulness of gray, green, yellow and red signaling in demographic and clinical aspects through telemedicine with follow-up at home for 14 days in patients with COVID-19 of the North I.M.S.S. delegation, between August 2020-November 2021.

Materials and Methods

Study Design

The present study is a non-experimental, cross-sectional, prospective, longitudinal design with compliance with the operational definition of COVID-19 with or without a positive confirmatory PCR test within the first days of the disease (mild COVID-19, which are evaluated in the units of family medicine, ambulatory management) and in home follow-up with telemedicine and remote monitoring.

Scope and Period of Study

This study was conducted in the 23 Family Medicine Units (U.M.F) of the Decentralized Administrative Operation Body (O.O.A.D.) of the North Delegation of the Federal District (D.F. North) of the Mexican Institute of Social Security (I.M.S.S.): U.M.F. Number (No.) 2, U.M.F. No. 3, U.M.F. No. 5, U.M.F. No. 6, U.M.F. No. 11, U.M.F. No. 13, U.M.F. No. 14, U.M.F. No. 16, U.M.F. No. 17, U.M.F. No. 20, U.M.F. No. 23, U.M.F. No. 33, U.M.F. No. 34, U.M.F. No. 35, U.M.F. No. 36, U.M.F. No. 37, U.M.F. No. 40, U.M.F. No. 41, U.M.F. No. 44, U.M.F. No. 49, U.M.F. No. 94, U.M.F. No. 120 and Area General Hospital/ U.M.F. No.. 29, in the period August 2020-November 2021. In the year 2020 the O.O.A.D. of the D.F. North of the I.M.S.S. issued a document [17] that aimed to provide outpatient medical care to patients with COVID 19 through electronic means and / or smartphones of the First Level of Care Medical Units of the O.O.A.D. of the D.F. North and as a first step the patient went to a respiratory triage, defined as an area within the FMU.

Where patients who presented with symptoms of respiratory diseases were classified based on severity, in order to be able to identify patients whose symptoms could be suspected carriers of the SARS-COV-2 virus and to be able to carry out a decision. of early decisions to start the appropriate treatment in the patient with compliance with the COVID-19 operational definition [18] subsequently the patient, with prior informed consent, was invited to carry out telemedicine, which was defined as a form of

communication established by a smartphone with predetermined applications, in which the family doctors of the U.M.F. they could communicate in real time with a patient with follow-up for 14 days and a duration of approximately 15 minutes by telemedicine performed by remote monitoring defined as the registration in an electronic COVID-19 platform of health conditions at the end of the patient improvement plan COVID-19 that consists of health care services provided to patients on an outpatient basis in beneficiaries of the I.M.S.S., determining in the patient a health condition made up of four category colors; gray, green, yellow and red group.

Participants

After accepting the informed consent, 3053 patients were considered in a non-probabilistic manner for convenience, who entered telemedicine and remote monitoring of the north delegation in the period August 2020-November 2021, meeting the eligibility criteria of any age, with or without comorbidities such as type 2 diabetes mellitus, systemic arterial hypertension, obesity, male and female gender as well as meeting the COVID-19 operational definition (as indicated by the I.M.S.S. medical benefits department) [18] with or without positive confirmatory PCR test within the first days of the disease (mild COVID-19, evaluated in family medicine units, outpatient management) and in home follow-up with telemedicine and remote monitoring. The exclusion criteria were patients with severe COVID-19 (immediately sent to the second level of care, hospital), not having a smartphone, not having the ability to use a smartphone with video call or whose smartphone does not have the app. and patients who present dyspnea and due to said condition cannot attend telemedicine or are hospitalized for the same reason.

Variables

The measurements were made considering as independent variables such as age, clinical symptoms (headache, cough, fever, conjunctivitis, myalgias, arthralgias, rhinorrhea, odinophagia, anosmia, chest pain, dyspnea, sex, comorbidities (overweight, obesity, diabetes and arterial hypertension) , number of days of COVID-19 illness and remote monitoring dependent considered by four category colors: Gray Group (absence of symptoms suggestive of COVID-19, SS-COVID-19), Green Group (presence of SS-COVID-19), yellow group (SS-COVID-19 plus family history), red group (presence of major symptoms of COVID-19 and referral to the IMSS General Zone Hospital). It will be carried out in a non-probabilistic way for convenience, with 250 patients the sample is calculated; who enter the northern delegation in the period September-December 2020.

Ethical and Legal Aspects

The data is included in a registry endorsed by the ethics and health research committee.

Statistical Methods

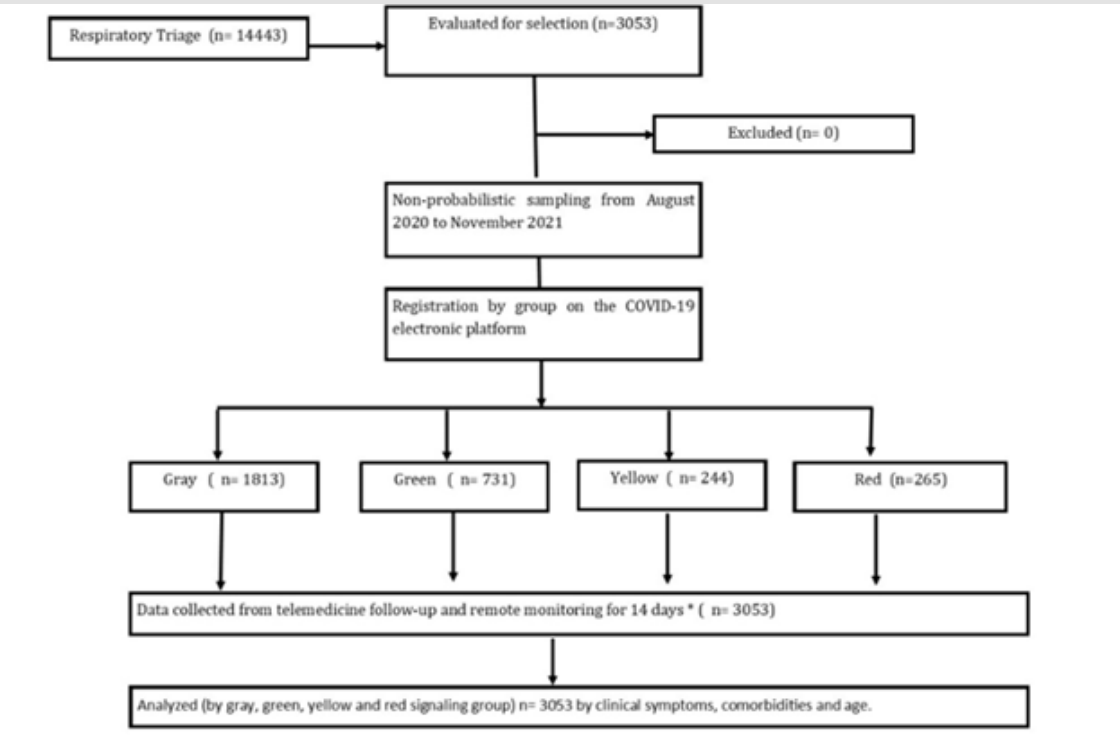
For the size of the sample, it was carried out in a non-probabilistic way for the convenience of patients who met the inclusion criteria and were integrated according to the document issued by the O.O.A.D. of the North D.F. of the I.M.S.S., that according to the construction of the patient flow diagram, the usual techniques of descriptive statistics were carried out. In the comparison of the signaling groups with the clinical symptoms of COVID-19, the Pearson Chi-square test was used. The Cox regression model was used taking telemedicine signals as strata, covariates comorbidities, clinical symptoms; Age as a quantitative variable of outcome, allowing survival graphs to be made, with the use of 95% confidence intervals, considering a value of $p < 0.05$ to be statistically significant. The statistical package Statistical Package for Social Sciences (SPSS) version 21 was used in the analysis.

Results

In the present study of the 3053 patients, 59.4% (n=1813) were found in the gray group, 23.9% green (n=731), 8.7% red (n=265) and 8% yellow (n=244). predominantly female in all signaling groups and 31-40 years in the green and red groups (25.7%, 26.4%, respectively); comorbidities such as diabetes mellitus 25.4%, arterial hypertension 38.9%, obesity 51.6% and bronchial asthma 5.7% with predominance in the yellow group, with a statistically significant difference $p < 0.05$. (See Figure 1 and Table 1) The symptoms of patients with COVID-19 predominated in the red group: dyspnea (44.9%), chest pain (73.2%), shortness of breath (48.7%), odynophagia (38.5%), arthralgia (35.1%), myalgia (10.9%) and diarrhea (9.1%), followed by the yellow group with headache (98.4%) and cough (99.2%) and the green group with fatigue (55.5%) and runny nose (22.7%), all with a significant difference $p < 0.05$. (See Table 2) Using the Cox regression model, it is shown that there is a significant association ($p< 0.05$) between clinical symptoms such as headache with 70.6% (95.0% CI .600, .830), myalgia 1.19 (95.0% CI 1.025, 1.420) times more risk, respectively; and survival (cumulative survival of 41% with a median age of 44 years) among patients with COVID-19 followed by telemedicine according to signaling (green, yellow and red groups) during the period 2020-2021 in the North Delegation of the I.M.S.S. (See Table 3 and Figure 2)

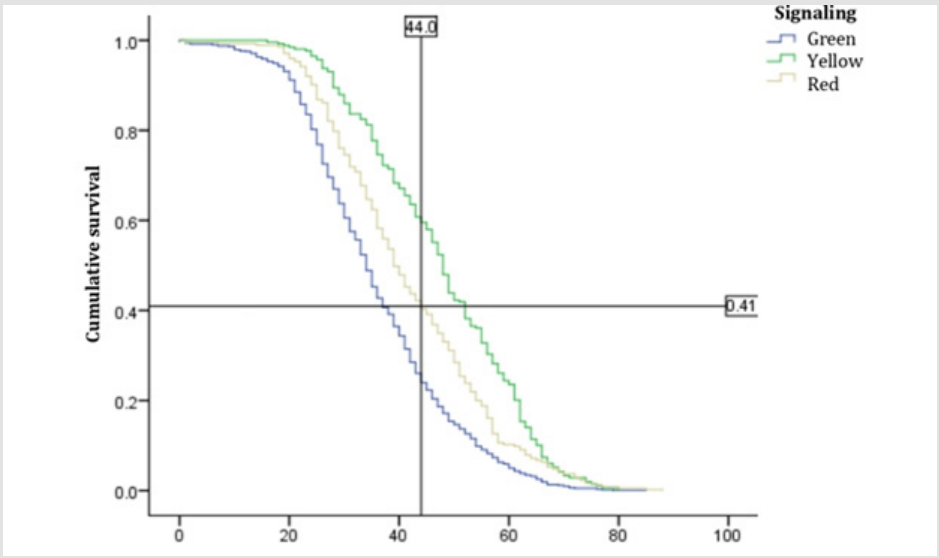
There is a significant association ($p<0.05$) between comorbidities such as systemic arterial hypertension 2.26 (95.0% CI 1.888, 2.717), type 2 diabetes mellitus 1.78 (95.0% CI 1.449, 2.191) and obesity 2.4% (95.0% CI .690 , .974) times more risk, respectively; and survival (cumulative survival of 41% with a median age of 45 years) among patients with symptoms of myalgia due to COVID-19 followed by telemedicine according to signaling during the period 2020-2021 in the Northern Delegation of the I.M.S.S. (See Table 4 and Figure 3) Table 5 and Fig. 4 show a

significant association (p<0.05) between comorbidities such as systemic arterial hypertension 41.6% (95.0% CI .375, .463), type 2 diabetes mellitus 40.6% (95.0% CI . 361, .456) and obesity 1,183 (95.0% CI 1,065, 1,313) times higher risk, respectively; and survival (cumulative survival of 41% with a median age of 45 years) among patients with symptoms of myalgia due to COVID-19 followed by telemedicine according to signaling during the period 2020-2021 in the Northern Delegation of the I.M.S.S (Figure 4).



Note: *day of end of follow up for the characteristics analyzed; clinical symptoms, comorbidities and age.

Figure 1: Flow of participants through telemedicine with follow up at home for 14 days in patients with Covid -19 of the northern delegation of the I.M.S.S.S between August 2020-November 2021.



Note: *Clinical Symptoms: myalgias P=0.023; headache P= 0.000;Cough P=0.867; difficulty breathing p-0.440; rhinorrhea p=0.349; odynophagia p=0.743; arthralgias p=0.314; fatigue p=0.193.

Figure 2: Cumulative survival by age in patients with clinical symptoms*with COVID-19 followed by telemedicine according to signaling during the period 2020-2021 in the Northern Delegation of the I.M.S.S.

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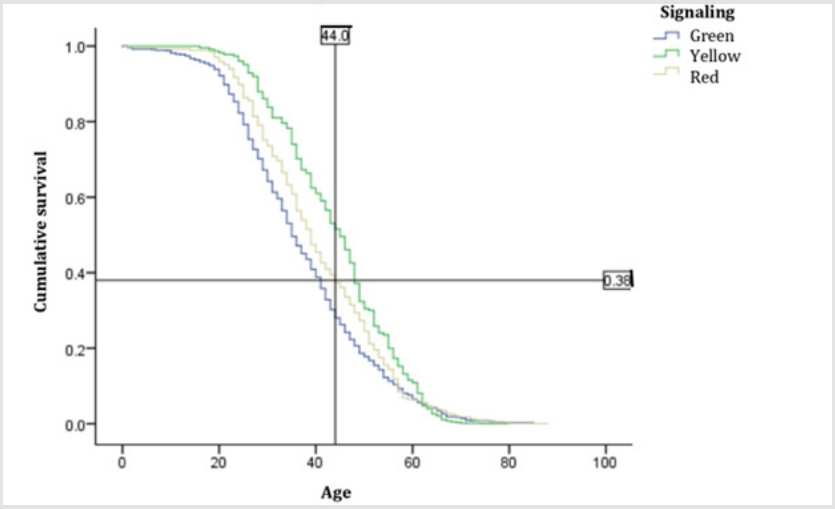
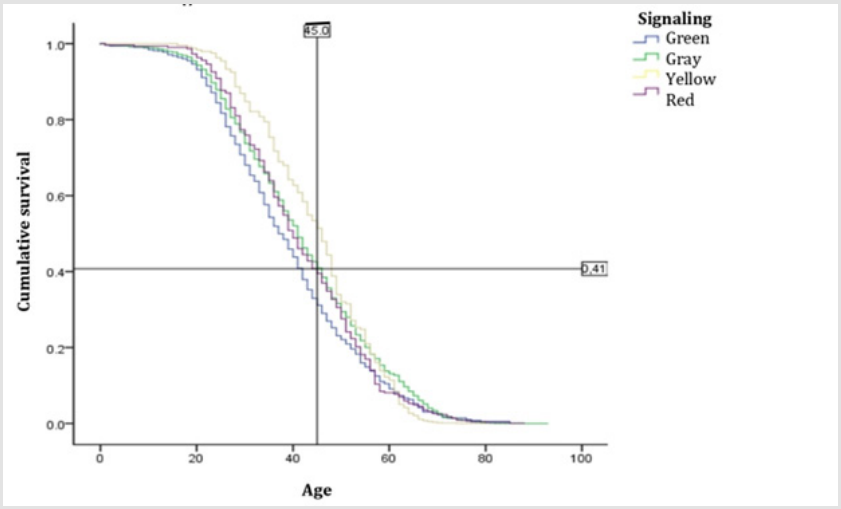


Note:*Comorbidities: Diabetes Mellitus type 2P=0.000, Systemic Arterial Hypertension p+ 0.000; Obesity p=0.024; Bronchial asthma P=0.485.

Figure 3: Cumulative survival by age in patients with comorbidities* of COVID-19 followed in telemedicine by signaling (green, yellow and red) during the period 2020-2021 in the North delegation of the I.M.S.S.



Note: *Comorbidities: Diabetes Mellitus type 2P=0.000, Systemic Arterial Hypertension p+ 0.000; Obesity p=0.000; Bronchial asthma P=0.002.

Figure 4: Cumulative survival by age in patients with comorbidities* of COVID-19 followed by telemedicine according to signaling during the period 2020-2021 in the North delegation of the I.M.S.S.

Table 1: Demographic characteristics in patients with COVID-19 followed by signaling through telemedicine during the period 2020-2021 in the North Delegation of the I.M.S.S.

Demographic Characteristics	Group 1 Gray		signaling						P=value*
			Group 2 green		Group 3 Yellow		Group 4 Red		
	n=1813	%	n=731	%	n=244	%	n=265	%	
Sex									
Male	811	44.2	354	48.4	92	37.7	123	46.4	0.03
Female	1002	55.3	377	51.6	152	62.3	142	53.6	
Age Groups									

≤ 5 years	10	0.6	6	0.8	0	0	1	0.4	0.00
6a 10 years	11	0.6	9	1.2	0	0	1	0.4	
11a 20 Years	90	5	50	6.8	4	1.6	9	3.4	
21a 30 Years	385	21.2	219	30	32	13.1	58	21.9	
31a 40 years	369	20.4	188	25.7	48	19.7	70	26.4	
41a 50 years	349	19.3	144	19.7	62	25.4	51	19.2	
51a 60 years	231	12.7	73	10	45	18.4	47	17.7	
61a70 years	182	10	32	4.4	46	18.9	17	6.4	
71a 80 years	126	6.9	8	1.1	7	2.9	9	3.4	
≥ 81 years	60	3.3	2	0.3	0	0	2	0.8	
Comorbidities Diabetes Mellitus type 2 No SI	1463 350	80.7 19.3	711 20	97.3 2.7	182 62	74.6 25.4	230 35	86.8 13.2	0.000
Systemic Arterial Hypertension No SI	1394 419	76.9 23.1	699 32	95.6 4.4	149 95	61.1 38.9	213 52	80.4 19.6	0.000
Human Immunodeficiency syndrome No SI	1806 7	99.6 0.4	727 4	99.5 0.5	241 3	98.8 1.2	261 4	98.5 1.5	0.077
Cancer No Si	1810 3	99.8 0.2	729 2	99.7 0.3	243 1	99.6 0.4	265 0	100 0	0.706
Obesity No SI	1547 266	85.3 14.7	692 39	94.7 53	118 126	48.4 51.6	217 48	819 18.1	0.000
Bronchial Asthma No SI	1779 34	98.1 1.9	727 4	99.5 0.5	230 14	94.3 5.7	257 8	97 3	0.000
Cardiovascular Diseases No SI	1788 25	98.6 1.4	727 4	99.5 0.5	240 4	98.4 1.6	261 4	98.5 1.5	0.297
Immune Diseases No SI	1807 6	99.7 0.3	730 1	99.9 0.1	243 1	99.6 0.4	262 3	98.9 1.1	0.14
neurological Diseases No SI	1808 5	99.7 0.3	731 0	100 0	243 1	99.6 0.4	264 1	99.6 0.4	0.484
Kidney Diseases No SI	1805 8	99.6 0.4	730 1	99.9 0.1	242 2	99.2 0.8	263 2	99.2 0.8	0.389

Note: *Pearson's Chi-square test P<0.05.

Table 2: Frequency of symptoms in patients with COVID -19 followed by signaling through telemedicine during the period 2020-2021 in the North delegation of the I.M.M.S.

Symptoms	Group 1 Gray		signaling						P=value*
			Group 2 green		Group 3 Yellow		Group 4 Red		
	n=1813	%	n=731	%	n=244	%	n=265	%	
Headache									
No	1501	82.8	110	15	4	16	88	332	0
Si	312	17.2	621	85	240	984	177	668	
Cough									
No	1358	749	116	15.9	2	0.8	91	34.3	0
Si	455	25.1	615	84.1	242	99.2	174	65.7	
Odynophagia									
No	1647	90.8	468	64	174	71.3	163	61.5	0
Si	166	9.2	263	36	70	287	102	38.5	
Rhinorrhea									
No	1735	95.7	565	77.3	210	861	212	800	0
Si	78	4.3	166	22.7	34	13.9	53	200	
Arthralgias									
No	1748	96.4	525	71.8	196	803	172	64.9	0
Si	65	3.6	206	28.2	48	19.7	93	35.1	
Fatigue									
No	1629	89.9	325	44.5	121	49.6	215	81.1	0
Si	184	10.1	46	55.5	123	50.4	50	18.9	
Dyspnea									
No	1808	99.7	731	100	244	100	146	55.1	0
Si	5	0.3	0	0	0	0	119	44.9	
Chest pain									
No	1805	99.6	731	100	244	100	71	26.8	0
Si	8	0.4	0	0	0	0	194	73.2	
Myalgias									
No	1801	99.3	704	96.3	233	95.5	236	89.1	0
Si	12	0.7	27	3.7	11	4.5	29	10.9	
Difficulty breathing									
No	1671	92.2	424	58	166	68	136	51.3	0
Si	142	7.8	307	42	78	32	129	48.7	
Diarrhea									
No	1777	98	678	92.7	22.5	92.2	241	90.9	0
Si	36	2	53	7.3	19	7.8	24	9.1	

Note: *Pearson's Chi-square test p<0.05

Table 3: Cox regression Model with Clinical symptoms of the equation in patients with COVID-19 followed by telemedicine according to signaling during the period 2020-2021 in the North Delegation of the I.M.S.S.

Clinical symptoms	B	ET	Wald	GI	Sig.*	EXP(B)	95.00% Lower	EXP (B) Higher
Difficulty in breathing	0.132	0.17	0.596	1	0.44	1.141	0.817	1.593

Chest Pain	-0.192	0.19	1.056	1	0.304	0.822	0.567	1.194
Myalgias	0.182	0.08	5.17	1	0.023	1.199	1.025	1.402
Rhinorrhea	-0.071	0.076	0.877	1	0.349	0.932	0.803	1.08
Arthralgias	0.084	0.083	1.012	1	0.314	1.087	0.924	1.28
Fatigue	0.087	0.067	1.697	1	0.193	1.091	0.957	1.242
Headache	-0.348	0.083	17.765	1	0	0.706	0.6	830
Cough	-0.014	0.083	0.028	1	0.867	0.986	0.838	1.161
Odynophagia	-0.023	0.07	0.107	1	0.743	0.977	0.853	1.12

Note: *P<o.oo5

Table 4: Cox regression Model with Comorbidities of the equation in patients with COVID-19 followed by telemedicine according to signaling during the period 2020-2021 in the North Delegation of the I.M.S.S.

Clinical symptoms	B	ET	Wald	GI	Sig.*	EXP(B)	95.00% Lower	EXP (B) Higher
Difficulty in breathing	0.132	0.17	0.596	1	0.44	1.141	0.817	1.593
Chest Pain	-0.192	0.19	1.056	1	0.304	0.822	0.567	1.194
Myalgias	0.182	0.08	5.17	1	0.023	1.199	1.025	1.402
Rhinorrhea	-0.071	0.076	0.877	1	0.349	0.932	0.803	1.08
Arthralgias	0.084	0.083	1.012	1	0.314	1.087	0.924	1.28
Fatigue	0.087	0.067	1.697	1	0.193	1.091	0.957	1.242
Headache	-0.348	0.083	17.765	1	0	0.706	0.6	830
Cough	-0.014	0.083	0.028	1	0.867	0.986	0.838	1.161
Odynophagia	-0.023	0.07	0.107	1	0.743	0.977	0.853	1.12

Table 5: Cox regression Model with Comorbidities of the equation in patients with COVID-19 myalgia symptoms followed by telemedicine according to signaling during the period 2020-2021 in the North Delegation of the I.M.S.S.

Clinical symptoms	B	ET	Wald	GI	Sig.*	EXP(B)	95.00% Lower	EXP (B) Higher
Difficulty in breathing	0.132	0.17	0.596	1	0.44	1.141	0.817	1.593
Chest Pain	-0.192	0.19	1.056	1	0.304	0.822	0.567	1.194
Myalgias	0.182	0.08	5.17	1	0.023	1.199	1.025	1.402
Rhinorrhea	-0.071	0.076	0.877	1	0.349	0.932	0.803	1.08
Arthralgias	0.084	0.083	1.012	1	0.314	1.087	0.924	1.28
Fatigue	0.087	0.067	1.697	1	0.193	1.091	0.957	1.242
Headache	-0.348	0.083	17.765	1	0	0.706	0.6	830
Cough	-0.014	0.083	0.028	1	0.867	0.986	0.838	1.161
Odynophagia	-0.023	0.07	0.107	1	0.743	0.977	0.853	1.12

Discussion

Remote monitoring was an effective tool to be able to identify the signaling presented by the digital platform in a faster and more efficient way, identifying patients with serious symptoms for a possible immediate referral to the second level of care (hospital), in addition to the signaling of major and minor symptoms of COVID-19, elaboration of a similar program was that of a Spanish study where they categorized by follow-up groups in criteria regarding major and minor symptoms, using a program called TELEA 14 (home teleassistance platform) which integrates a electronic medical record allowing telemedicine and remote monitoring at home, making it easier for patients to send messages, questionnaires, clinical parameters or videos to their own medical record, using a sample of 1191 patients, not reporting significant differences in sex 53.4% men and 53.6% women; Unlike our study, where a significant percentage predominated in the female sex in the 4 signaling groups. According to our results, the predominant symptoms were in the red group of major symptoms (dyspnea, chest pain and shortness of breath) and minor symptoms (arthralgia, myalgia); headache and

cough in yellow and fatigue and rhinorrhea in green; Escudero, et al. [19] reported that the most frequent signs and symptoms in the 2020 period were: fever (>90%), dry cough (70%) and respiratory distress (37%).

Systemic arterial hypertension is the main comorbidity presented in the red signaling group with 19.6%, with similar results in other studies [19] from 18 to 49% and diabetes mellitus with 13 to 32%, being the control of these diseases important to reduce possible complications of COVID 19 The results of a study by the National University of Córdova [20] refer to 89.85% (n=567) of positive COVID-19 patients (with PCR test) who recovered with an outpatient follow-up model compared to our study where the 38.9% had a follow-up by telemedicine and remote monitoring (yellow group). In our study, the patients referred to hospital represented the red group with 48.7% (with difficulty breathing), of these no deaths were reported compared to the situation in China [21] which was 14% .

Conclusion

The health results achieved show that the use of telemedicine and remote monitoring in the North delegation of the I.M.S.S. was useful in gray, green, yellow and red signaling in demographic and clinical aspects in the care of patients with COVID-19, demonstrating frank effectiveness in the prevalence obtained in each signaling by group used through a digital platform of registered data from comorbidities and clinical symptoms of patients with COVID-19, however additional studies are needed to confirm these findings in other areas with different conditions.

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Conflict of Interests

The researchers of this article declare that there is no economic conflict or conflict of interest.

The Name and Address Where the Work was Performed

Study carried out in the 23 Family Medicine Units (U.M.F) of the Decentralized Organization of Administrative Functioning (O.O.A.D.) of the North Delegation of the Federal District (D.F. North) of the Mexican Institute of Social Security (I.M.S.S.): U.M.F. Number (No.) 2, U.M.F. No. 3, U.M.F. No. 5, U.M.F. No. 6, U.M.F. No. 11, U.M.F. No. 13, U.M.F. No. 14, U.M.F. No. 16, U.M.F. No. 17, U.M.F. No. 20, U.M.F. No. 23, U.M.F. No. 33, U.M.F. No. 34, U.M.F. No. 35, U.M.F. No. 36, U.M.F. No. 37, U.M.F. No. 40, U.M.F. No. 41, U.M.F. No. 44, U.M.F. No. 49, U.M.F. No. 94, U.M.F. No. 120 and Area General Hospital/ U.M.F. No. 29.

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