

Preventing COVID-19 among healthcare professionals through a virtual learning environment

Prevenção da COVID-19 entre profissionais de saúde por meio de ambiente virtual de aprendizagem

Prevención del COVID-19 entre los profesionales de salud mediante un entorno virtual de aprendizaje

 Alexandre Lins Werneck¹,  Camilla da Silva Nunes Santiquio²

Received: 27/11/2023 Accepted: 30/04/2024 Published: 24/05/2024

Objective: to analyze the impact of educational intervention on preventing COVID-19 among health professionals. **Methods:** quasi-experimental epidemiological study with pre and post-test, with a quantitative analytical approach with correlation between variables carried out in a city in the interior of the state of São Paulo. The study was divided into four stages: pre-test; team training; testing to detect antibodies against COVID-19 in a similar group from another health unit and in the researched group, and post-test. The educational intervention took place through a virtual learning environment using the WhatsApp chat application, with a total of four themes held weekly. **Results:** 30 professionals participated, of which 83.33% were women, 36.6% were nursing professionals, 30% were over 60 years old; 80% did not present risk conditions and 50% had secondary education. Regarding the function, in the group composed of administrative staff, attendants and cleaning services, it was observed that the variables demonstrated a statistical tendency towards significance, since the value of $p=0.02$ and 0.008 , respectively, in the pre-test, and of $p=0.01$ and 0.004 , in the post-tests. Comparing the values of the independent variables, before and after the intervention, an increase in the mean, median and mode values and a reduction in deviation and standard error are noted. From the results obtained from testing among professionals who took part in the research and those who did not participate, it appears that the positivity rate for participants was 14.94% and for non-participants it was 34.52%. **Conclusion:** it was found that continuing education provided the construction of knowledge for health professionals towards a safer and more effective practice.

Descriptors: Health Education; Disease prevention; Health personnel; Pandemics; COVID-19; Health Centers.

Objetivo: analisar o impacto da intervenção educativa na prevenção da COVID-19 entre profissionais de saúde. **Método:** estudo epidemiológico quase-experimental com pré e pós-teste, de abordagem quantitativa do tipo analítica com correlação entre variáveis realizado numa cidade do interior paulista. O estudo foi dividido em quatro etapas: pré-teste; capacitação da equipe; testagem para detecção de anticorpos contra a COVID-19 em grupo similar de outra unidade de saúde e no grupo pesquisado, e pós-teste. A intervenção educativa se deu por meio de ambiente virtual de aprendizado utilizando o aplicativo de conversas WhatsApp, no total de quatro temáticas realizadas semanalmente. **Resultados:** participaram 30 profissionais, dos quais 83,33% eram mulheres, 36,6% profissionais de enfermagem, 30% tinham mais de 60 anos; 80% não apresentavam condição de risco e 50% possuíam ensino médio. Com relação à função, no grupo composto por administrativos, atendentes e serviço de limpeza, observou-se que as variáveis demonstraram tendência estatística de significância, visto que o valor de $p=0,02$ e $0,008$, respectivamente, no pré-teste, e de $p=0,01$ e $0,004$, nos pós-testes. Comparando os valores das variáveis independentes, antes e após a intervenção, nota-se aumento dos valores de média, mediana e moda e uma redução de desvio e erro padrão. Dos resultados obtidos das testagens entre os profissionais que fizeram parte da pesquisa e os que não participaram, verifica-se que a taxa de positividade dos participantes foi de 14,94% e dos não participantes foi de 34,52%. **Conclusão:** verificou-se que a educação permanente proporcionou a construção de conhecimentos para os profissionais de saúde na direção de uma prática mais segura e resolutiva.

Descritores: Educação em Saúde; Prevenção de doenças; Pessoal da Saúde; Pandemias, COVID-19; Centros de saúde.

Objetivo: Analizar el impacto de las intervenciones educativas en la prevención de la COVID-19 entre los profesionales sanitarios. **Método:** Estudio epidemiológico cuasiexperimental con pre-test y post-test, utilizando abordaje analítico cuantitativo con correlación entre variables, realizado en una ciudad del interior del estado de São Paulo. El estudio se dividió en cuatro etapas: pre-test; capacitación del equipo; prueba de anticuerpos contra COVID-19 en un grupo similar de otra unidad de salud y en el grupo de investigación; y post-test. La intervención educativa se llevó a cabo a través de un entorno virtual de aprendizaje utilizando la aplicación de chat Whatsapp, con un total de cuatro temas semanales. **Resultados:** Participaron 30 profesionales, de los cuales 83,33% eran mujeres, 36,6% profesionales de enfermería, 30% tenían más de 60 años, 80% no presentaban condiciones de riesgo y 50% tenían educación secundaria. Con relación a la función, en el grupo formado por administradores, auxiliares y limpiadores, se observó que las variables presentaron una tendencia estadísticamente significativa, con p-valores de $0,02$ y $0,008$, respectivamente, en el pre-test, y p-valores de $0,01$ y $0,004$ en los post-tests. Al comparar los valores de las variables independientes antes y después de la intervención, se observó un aumento de los valores de la media, la mediana y la moda y una reducción de la desviación típica y el error. Los resultados obtenidos de las pruebas entre los profesionales que participaron en la investigación y los que no, muestran que la tasa de positividad para los participantes fue del 14,94% y para los no participantes del 34,52%. **Conclusión:** Se constató que la formación continuada proporcionó a los profesionales sanitarios conocimientos para crear prácticas más seguras y eficaces.

Descriptorios: Educación em Salud; Prevención de enfermedades; Personal de salud; Pandemias; COVID-19; Centros de Salud.

Corresponding Author: Camilla da Silva Nunes Santiquio – camillanunes84@gmail.com

1. Master's Program in Nursing at the Faculdade de Medicina de São José do Rio Preto. São José do Rio Preto/SP, Brazil.

2. Mirassol Town Hall. Mirassol/SP, Brazil.

INTRODUCTION

On January 30, 2020, the World Health Organization (WHO) issued its highest level of alert to the world, through a declaration that pointed out that the COVID-19 pandemic was a health emergency disease of international importance, caused by a previously unknown virus, later called SARS-Cov-2¹.

Studies^{2,3} showed that approximately 80% of COVID-19 cases were mild or moderate and could be monitored in Primary Health Care (PHC), a level of care capable of containing the transmissibility of the disease. However, cases that required assistance at the secondary level could lead to the collapse of the health system². Early identification and adequate management of mild cases of flu-like symptoms minimize the demand for hospital services, reducing the burden on secondary health care³.

Facing the pandemic requires the development of risk management plans at various levels (national, state, municipal and local), strengthening action in the country, which considers the population to be monitored (mild cases of COVID-19 and other health problems)⁴; the adequate protection of health professionals, with safe conditions to carry out their work, also avoiding that they serve as a source of contamination. In this sense, it is important to train health professionals in order to reduce harm to themselves and the patient⁵.

Given this context, questions arise in the fields of health and education from the perspective of one of the biggest challenges in the practice of health professionals: continuing education. The need to train professionals who would work on the front line of the pandemic, as well as the structuring of health services, with care flows for people with respiratory symptoms, to offer resolute, qualified and humanized care, from PHC to higher levels attention complexes⁶.

Thus, health education should and needs to be understood as assistance and guidance in facing problems that affect the health of individuals and the community. It is extremely necessary to strengthen health-promoting actions. Thus, through continuing education, it is possible to protect the team, improve and organize health services⁷.

The infection rate in these health workers is 7.3% compared to 5% in the general population, which is justified by the length of time professionals are exposed to the disease-causing agent. The Centers for Disease Control and Prevention (CDC) reported that approximately 11% of those infected with SARS-CoV-2 are healthcare professionals⁸.

A study carried out by Fundação Getulio Vargas, in May 2020, showed that 88% of health professionals who participated in the survey reported “feeling afraid” of the novel coronavirus, 60% reported “not feeling prepared” to act in the midst of the pandemic and 89 % reported that

they had not received any type of training. When evaluating the item “Training to deal with the crisis” by professions, approximately 50% of doctors and nurses said they had received some guidance or training, while only 10% of Community Health Workers stated that they had received some type of guidance⁹.

The performance of health workers is a central element in fighting the pandemic, therefore, the plan to combat COVID-19 must include protection and preservation of their health. Therefore, this study aimed to evaluate the impact of educational intervention on the training of health professionals and more specifically, to describe the influence of training through a Virtual Learning Environment - VLE in preventing contamination and illness from COVID-19 of these professionals. of health.

METHODS

This is a quasi-experimental study applying pre and post-tests, a quantitative analytical approach with correlation between variables. Data were collected at the Health Center II, in the city of Mirassol, in the state of São Paulo, from April 2020 to July 2022.

Information on serological results from health professionals working at the Salvador Vitta Basic Health Unit was used; only laboratory data served as a comparison criterion with those of the research population, in order to compare the contamination rate among professionals from related services, but who did not participate in the educational intervention process.

The study population was made up of employees working at Health Center II. The inclusion criteria were the professionals who make up the team and provide services in the unit. As an exclusion criterion, professionals who were absent for some reason during the data collection period were considered.

A questionnaire was used with two blocks of questions, the first was the characterization of the sample (sex, age, occupation, education and whether or not they have any risk conditions for COVID-19), which became the dependent variables in the descriptive statistical analysis. The second part was composed of questions inherent to the Coronavirus divided into three distinct areas: “Knowledge about coronavirus”, Prevention and “Work environment”. The study was divided into four stages: 1. Application of the pre-test; 2. Training of the Health Center II team; 3. Periodic testing; and 4. Application of the Post-test.

In the first stage of the research, a questionnaire was administered between April 4th and 20th, 2020 to all employees of the Mirassol Health Center II, after the research participants signed the Free and Informed Consent Form.

In the second stage, the team was trained between May 4th and 29th, 2020 using the WhatsApp™ application, which took place weekly. In the third stage, 19 periodic tests were carried out with a test to detect antibodies to COVID-19; On this occasion, 13 periodic tests were carried out on employees at the Salvador Vitta Basic Health Unit.

The contents covered were: “What is coronavirus?”, “Prevention against coronavirus”, “Myths and truths about COVID-19” and “Flow of care and humanized user reception”; the approaches defined concepts, origin, form of contagion, effective prevention methods inside and outside the work environment, demystifying fake news spread on the topic and science of the municipal health network service flow team for suspected and/or contaminated users by COVID-19 prepared by the local manager.

In the fourth stage, the post-test questionnaire was applied to assess whether there was a change in knowledge on the topic. The questionnaire was administered between February 12th and 20th, 2021 to the same professionals who had answered the pre-test.

To evaluate the questionnaire, scores were defined to measure performance in each question block. The correct and/or expected answers were added together and defined the participants' performance. The classification was then defined after adding up the performance and presented as a percentage: up to 50%: Poor; from 51 to 70%: Fair; from 71 to 90%: Good; and 91 to 100%: Excellent.

After tabulating the data, two statistical analysis functions were performed: descriptive and inferential. At times, given the need, the following were used for better understanding: mean, median, mode, standard deviation, standard error, maximum value, minimum value, significance and Mann-Whitney U. In a descriptive way, the profile of the sample studied was outlined, considering the variables analyzed and their consequences. The data were replicated absolutely and relatively in this first part.

In the inferential scope, dependence analysis and prediction between the variables proposed in the scope of the work were used. The Kolmogorov Smirnov normality test was performed. The results of independence between the proposed variables were obtained by analyzing the p values (significance), with the result considered significant when $p < 0.05$. All analyzes were obtained using SPSS Statistics™ Software (Version 23) linked to the features of the Excel™ tool (version 2016).

This research was approved by the Ethics and Research Committee (CEP) of the Faculdade de Medicina de São José do Rio Preto (FAMERP) under the Certificate of Presentation of Ethical Appreciation – CAAE - No. 35526320.0.0000.5415 and opinion No. 4180373. All participants signed the Informed Consent Form, as required by Resolution No. 466, of

December 12, 2012, of the Brazilian National Health Council, which rules research involving human beings.

RESULTS

30 employees participated, of which 83.33% (25) were female. The age with the highest prevalence was people aged 60 or over, which represented 30% (9) of those surveyed.

When asked about “whether or not they present any risk conditions for COVID-19 infection”, 80% (24) reported not having any risk conditions. Regarding the type of role they perform in the health unit, the majority were nurses (nurses, nursing technicians and nursing assistants), which corresponded to 36% of the sample (n=11). In terms of education level, 50% had secondary education (n=15).

Regarding function/occupation, the group composed of “attendants and support/cleaning service” performed “100% Poor” in the “Knowledge About COVID-19” category before receiving specific training and a performance of “100% Good” or “Excellent”, after training.

In terms of “Prevention”, the group made up of “administrative staff, attendants and support/cleaning services” performed “50% Poor” or “Fair” in the pre-test and “100% Good” or “Excellent”, in the post-test. In both themes, the Mann-Whitney U test showed that the variables had a statistical tendency towards significance, that is, the result of one influencing the result of the other in a possible variation, after analyzing the themes “Knowledge about COVID-19” and “Prevention”, since the P value was equal to 0.02 and 0.008, respectively, in the pre-test, and 0.01 and 0.004 in the post-test (Table 1).

When comparing the data obtained in the pre and post-test by level of education, it is possible to notice an evolution in all the topics covered in all groups. In the independent variables “Knowledge About COVID-19” and “Prevention”, the inferential statistical analysis demonstrated that both presented a p-value>0.05, that is, they are statistically significant (Table 2).

Table 1. Function/occupation and respective percentages in relation to the use of the questionnaire administered and divided between pre and post-test. Mirassol, SP, Brazil. 2022.

FUNCTION/OCCUPATION													
USE*	Total		Administration		Attendant		Nursing		Cleaning		Doctor		P Value
	N	%	N	%	N	%	N	%	N	%	N	%	
	30	100.0	6	20.0	4	13.33	11	36.67	2	6.67	7	23.3	
KNOWLEDGE ON THE VIRUS - PRE-TEST													
1	16	53.33	4	66.67	4	100.0	6	54.55	2	100.0	-	-	0.020
2	3	10.00	-	-	-	-	3	27.27	-	-	-	-	
3	9	30.00	2	33.33	-	-	2	18.18	-	-	5	71.43	
4	2	6.67	-	-	-	-	-	-	-	-	2	28.57	
KNOWLEDGE ON THE VIRUS - POST-TEST													
1	-	-	-	-	1	25.00	-	-	-	-	-	-	0.014
2	-	-	-	-	1	25.00	-	-	-	-	-	-	
3	6	20.00	4	25.00	2	50.00	-	-	1	50.00	-	-	
4	24	80.00	2	75.00	-	-	11	100.0	1	50.00	7	100.0	
PREVENTION ON THE VIRUS - PRE-TEST													
1	2	6.67	1	16.67	1	25.00	-	-	-	-	-	-	0.008
2	7	23.33	3	50.00	1	25.00	2	18.18	1	50.00	-	-	
3	17	56.67	2	33.33	2	50.00	8	72.73	1	50.00	4	57.14	
4	4	13.33	-	-	-	-	1	9.09	-	-	3	42.86	
PREVENTION ON THE VIRUS - POST-TEST													
3	14	46.67	4	66.67	3	75.00	6	54.55	1	50.00	-	-	0.004
4	16	53.33	2	33.33	1	25.00	5	45.45	1	50.00	7	100.0	
WORK ENVIRONMENT - PRE-TEST													
1	7	23.33	1	16.67	2	50.00	2	18.18	2	100.0	-	-	0.100
2	5	16.67	1	16.67	-	-	3	27.27	-	-	1	14.29	
3	15	50.00	4	66.67	2	50.00	6	54.55	-	-	3	42.86	
4	3	10.00	-	-	-	-	-	-	-	-	3	42.86	
WORK ENVIRONMENT - POST-TEST													
3	4	13.33	1	16.67	2	50.00	-	-	1	50.00	-	-	0.937
4	26	86.67	5	83.33	2	50.00	11	100.00	1	50.00	7	100.0	

Note - *Use (%): 1- Poor up to 50%, 2 - Fair 50.01 to 70.00%, 3 - Good 70.01 to 90.00% to 4 - Excellent >90.00%.

Table 2. Education and respective percentages in relation to the use of the questionnaire administered and divided between pre and post-test. Mirassol, SP, Brazil. 2022.

EDUCATIONAL LEVEL													
USE*	Total		Primary Education		Secondary Education		Higher Education		Higher Education and +		P Value		
	N	%	N	%	N	%	N	%	N	%			
	30	100.0	3	10.0	15	50.00	7	23.33	5	16.67			
KNOWLEDGE ON THE VIRUS - PRE-TEST													
1	16	53.33	3	100.00	11	73.33	2	28.57	-	-	0.024		
2	3	10.00	-	-	3	20.00	-	-	-	-			
3	9	30.00	-	-	1	6.67	5	71.43	3	60.0			
4	2	6.67	-	-	-	-	-	-	2	40.0			
KNOWLEDGE ON THE VIRUS - POST-TEST													
1	-	-	-	-	-	-	-	-	-	-	0.010		
2	-	-	-	-	-	-	-	-	-	-			
3	6	20.00	2	66.67	4	26.67	-	-	-	-			
4	24	80.00	1	33.33	11	73.33	7	100.0	5	100.0			
PREVENTION ON THE VIRUS - PRE-TEST													
1	2	6.67	1	33.33	1	6.67	-	-	-	-	0.034		
2	7	23.33	1	33.33	5	33.33	1	14.29	-	-			
3	17	56.67	1	33.33	9	60.00	4	57.14	3	60.00			
4	4	13.33	0	-	-	-	2	28.57	2	40.00			
PREVENTION ON THE VIRUS - POST-TEST													
1	-	-	-	-	-	-	-	-	-	-	0.010		
2	-	-	-	-	-	-	-	-	-	-			
3	14	46.67	2	66.67	10	66.67	2	28.57	-	-			
4	16	53.33	1	33.33	5	33.33	5	71.43	5	100.0			
WORK ENVIRONMENT - PRE-TEST													
1	7	23.33	2	66.67	4	26.67	1	14.29	-	-	0.089		
2	5	16.67	-	-	4	26.67	-	-	1	20.00			
3	15	50.00	1	33.33	7	46.67	5	71.43	2	40.00			
4	3	10.00	-	-	-	-	1	14.29	2	40.00			
WORK ENVIRONMENT - POST-TEST													
3	4	13.33	1	33.33	3	20.00	-	-	-	-	0.327		
4	26	86.67	2	66.67	12	80.00	7	100.0	5	100.0			

Note - *Use (%): 1- Poor up to 50%, 2 - Fair 50.01 to 70.00%, 3 - Good 70.01 to 90.00% to 4 - Excellent >90.00%.

In Table 3, it is possible to verify that comparing the values of the independent variables without grouping before and after the intervention, in relation to the values of mean, median, mode, standard deviation and standard error. It is possible to notice a significant increase in the mean, median and mode values and a reduction in the deviation and standard error values.

Table 3. Mean, median, mode, standard deviation and standard error values related to Knowledge about Coronavirus, Coronavirus Prevention and Work Environment in pre and post-test moments of the research sample. Mirassol, Brazil, 2022.

	<i>Mean</i> %	<i>Median</i> %	<i>Mode</i> %	<i>Standard</i> <i>Deviation</i>	<i>Standard</i> <i>Error</i>
Knowledge on the coronavirus					
Pre-test	54.76	50.0	35.71	0.24	0.04
Post-test	94.29	100.00	100.00	0.08	0.01
Prevention					
Pre-test	73.81	71.43	71.43	0.16	0.03
Post-test	91.90	92.86	100.00	0.08	0.01
Work environment					
Pre-test	69.05	71.43	71.43	0.17	0.03
Post-test	92.42	90.91	90.91	0.06	0.01

When comparing the results obtained from the testing of professionals who were part of the research (Health Center II) and those who did not participate in the educational intervention of another health unit (Basic Health Unit Salvador Vitta), there is a greater occupational risk and, consequently, greater risk of contamination, the positivity rate at Health Center II was lower when compared to that of the other Basic Health Unit (Table 4).

Table 4. Positive and negative occurrences and respective percentages of tests per health unit. Mirassol, SP, Brazil, 2022.

	<i>HEALTH CENTER II</i>		<i>BHU SALVADOR VITTA</i>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
<i>Results</i>	589	100.00	168	100.00
Positive	88	14.94	58	34.52
Negative	501	85.06	110	65.48
<i>Total</i>	589	100.00	168	100.00

DISCUSSION

The data revealed a predominance of female participants (83.33%). This predominance corroborates a study carried out by the Escola Nacional e Saúde Pública (ENSP/Fiocruz) and the Centro de Estudos Estratégicos (CEE/Fiocruz), which outlined the profile of health professionals working on the front line of the pandemic. It showed that 77.6% of the total research sample were women, similar to another work carried out with PHC professionals, who work to fight COVID-19, whose sample showed that 89.1% are women¹⁰. The majority of the

group surveyed by Fiocruz is made up of Nursing professionals, followed by doctors, similar to the data from this research, in which 36.66% are Nursing professionals and 23.33% are doctors.

The predominant age group was professionals aged 60 and over (30%), followed by professionals aged between 40 and 49 years (26.66%). On the other hand, the result of a nationwide study carried out by Fiocruz in March 2021 to analyze the impact of professionals who worked on the front line during the first year of the pandemic, showed that the most common age group is professionals aged between 36 and 50 years old, which represented 44% of the sample¹¹.

This data shows the fragility of the health service where the research was carried out, as it is in the midst of a public health problem of international importance; since the Ministry of Health's Booklet of Recommendations for the Protection of Health Service Workers in the care of COVID-19 and other flu-like syndromes advises reallocating professionals over 60 years of age to management and support functions in order to minimize contact with people and contaminated environments.

The educational approach with adults is not always effective, as the main actor is equipped with concepts¹¹, however, the evolution of research participants is notable, taking into account the improvement in the use of the topics covered and the low contamination rate, which is worth considering a safer and more reflective practice.

According to work carried out by the ENSP/Fiocruz, the WhatsApp™ application was considered the main tool in the dissemination of fake news when it comes to COVID-19, being responsible for more than 73% of the news false ones that circulated¹², however, this application used here is a Digital Information and Communication Technology (DICT), allowing the exchange of information and replicating discussions that could only be held in classrooms. In this sense, the application can be used as a Virtual Learning Environment (VLE), and despite some limitations, it adds value to the education process, as it is one of the conversation applications most used by the population¹³.

Technological evolution in recent years, characterized by the advancement of the internet, has contributed to changes in the interaction between individuals and in the teaching-learning processes¹⁴. Distance learning became the main teaching method during the pandemic, as it respected physical distancing measures and provided excellent and democratic teaching opportunities¹⁵.

Communication and information technologies have become fundamental elements of education, especially in teaching and work in the health sector, making digital platforms

strategies for education and care management, as they are not limited to the dissemination of knowledge, but rather learning constructivist¹⁴.

A study carried out to assess knowledge during the Middle East Respiratory Syndrome (MERS) crisis in 2015 and redone during the pandemic, demonstrated higher scores in the second moment (68.0% versus 79.7 %, $p < 0.01$), which defines experience as having a direct influence on increasing knowledge, that is, measuring knowledge of a given subject at different times causes it to positively alter understanding of the subject¹⁶. These data are in line with those obtained in the research, in which the average value when evaluating “Knowledge about Coronavirus” in the pre and post-test was 54.76 and 94.29, respectively, and “Prevention” was 73.81 and 91.90 in the pre and post-test.

It appears that continuing education actions aimed at health professionals can support the appropriation of knowledge and sharpen debates related to topics previously little known and discussed among these professionals¹⁶, considering the evaluation of the themes “Knowledge about Coronavirus” and “Prevention”, the p values were equal to 0.02 and 0.008, respectively, in the pre-test, and 0.01 and 0.004 in the post-test when the variable “Function/occupation” was analyzed. There was also statistical significance when evaluating the variable “Education”, the p results were 0.024 and 0.010, respectively in the pre and post-test for “Knowledge about Coronavirus” and 0.034 and 0.010 for the theme “Prevention”.

The results obtained when analyzing the results of periodic testing carried out in both services and a positivity rate of 14.94% in professionals who took part in the study and 34.52% in those who did not participate in the research, reinforce the importance of applying educational interventions in prevention of contamination against COVID-19. It is important to highlight that when an individual is tested POSITIVE, in the detection test for antibodies, they “carry” this result until the end of the testing, this justifies the number of positive occurrences.

The use of technological tools in the search for alternative paths proved to be beneficial in the research proposal and, thus, could minimize digital inequality¹⁷.

CONCLUSION

Education in the field of health is a process of building knowledge, always seeking to produce knowledge that interferes with and qualifies care practice. Over the last few years, reflections have been accumulated regarding the countless possibilities for changes in the training of these health professionals.

The pandemic caused by a previously unknown virus that began in 2019 and continues to this day, made us adapt to teaching tools that were not commonly used and that became the only means of disseminating information.

As important as using the available digital tools is adapting them to the intended audience, as was done in this study when it was noted that the WhatsApp™ application would be more applicable, that is, more accessible than Google Classroom. The change in strategy reflected the data obtained after comparing the assessments before and after the training, mainly related to knowledge and prevention against the Coronavirus.

Finally, the process of building knowledge for health professionals must be daily and committed to the collective, in order to build a safer and more effective practice for themselves and users; what was possible to observe with the data obtained from periodic testing of the research population. Furthermore, new studies must be carried out with the aim of validating WhatsApp™ as an essential tool for exchanging information in educational spaces.

REFERENCES

1. Ministério da Saúde (Brasil). COVID-19 Guia orientador para o enfrentamento da pandemia na Rede de Atenção à Saúde [Internet]. 4. ed. Brasília: Ministério da Saúde; 2021 [cited in 3 Sep 2021]. 254 p. Available from: <https://www.conass.org.br/biblioteca/covid-19-guia-orientador-para-o-enfrentamento-da-pandemia-na-rede-de-atencao-a-saude/>
2. Rio AFM, Lira LSSP, Reis IM, Silva GA. Atenção primária à saúde frente à COVID-19 em um centro de saúde. *Enferm Foco (Brasília)* [Internet]. 2020 [cited in 4 Sep 2021]; 11(1 N esp): 246-51. Available from: <http://revista.cofen.gov.br/index.php/enfermagem/article/download/3666/836>
3. Sart DT, Lazarini WS, Fontenelle LF, Almeida APSC. Qual o papel da Atenção Primária à Saúde diante da pandemia provocada pela COVID-19? *Epidemiol Serv Saúde* [Internet]. 2020 [cited in 4 Sep 2021]; 29(2):e2020166. Available from: <https://www.scielo.br/j/ress/a/SYhPKcN7f8znKV9r93cpF7w/?format=pdf&lang=pt>
4. Ministério da Saúde (Brasil). Portaria nº 2.436, de 21 de setembro de 2017. Aprova a Política Nacional de Atenção Básica (PNAB), estabelecendo a revisão de diretrizes para a organização da Atenção Básica, no âmbito do Sistema Único de Saúde (SUS) [Internet]. D.O.U., Brasília, DF, 21 set 2017 [cited in 12 Sep 2021]. Available from: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2017/prt2436_22_09_2017.html
5. Cavalcante JR, Santos ACC, Bremm JM, Lobo AP, Macario EM, Oliveira, WC, et al. COVID-19 no Brasil: evolução da epidemia até a semana epidemiológica 20 de 2020. *Epidemiol Serv Saúde* [Internet]. 2020 [cited in 3 Oct 2021]; 29(4):e2020376. Available from: <https://www.scielo.br/j/ress/a/zNVktw4hcW4kpQPM5RrsqXz/?format=pdf&lang=pt>
6. Brito SBP, Braga IO, Cunha CC, Palacio MAV, Takenami I. Pandemia da COVID-19: o maior desafio do século XXI. *Vigil Sanit Debate* [Internet]. 2020 [cited in 03 Oct 2021]; 8(2):54-63 DOI: <https://doi.org/10.22239/2317-269x.01531>.
7. Ministério da Saúde (Brasil). Secretaria-Executiva. Secretaria de Gestão do Trabalho e da Educação na Saúde. Glossário temático: gestão do trabalho e da educação na saúde [Internet]. 2. ed. Brasília, DF: Ministério da Saúde; 2012 [cited in 4 Sep 2021]. 44 p. (Série A. Normas e Manuais Técnicos). Available from: https://bvsms.saude.gov.br/bvs/publicacoes/glossario_gestao_trabalho_2ed.pdf

8. Bielicki JA, Duval X, Gobat N, Goossens H, Koopmans M, Tacconelli E, et al. Monitoring approaches for health-care workers during the COVID-19 pandemic. *Lancet Infect Dis*. [Internet]. 2020 [cited in 10 Oct 2021]; 20(10):e261-7. Available from: <https://www.sciencedirect.com/science/article/pii/S1473309920304588/pdf?md5=a4f32b8b65f403b84899f72cbef0c9ef&pid=1-s2.0-S1473309920304588-main.pdf>
9. Jackson Filho MJ, Assunção AA, Algranti E, Garcia EG, Saito CA, Maeno M. A saúde do trabalhador e o enfrentamento da COVID-19. *Rev Bras Saúde Ocup*. [Internet]. 2020 [cited in 3 Oct 2021]; 45:e14. Available from: <https://www.scielo.br/j/rbso/a/Km3dDZSWmGppgYbjgc57RCn/?format=pdf&lang=pt>
10. Machado MH, Wermelinger M, Machado AV, Pereira EJ, Aguiar Filho W. Perfil e condições de trabalho dos profissionais da saúde em tempos de COVID-19: a realidade brasileira. In: Portela MC, Reis LGC, Lima SML, editores. *Covid-19: desafios para a organização e repercussões nos sistemas e serviços de saúde* [Internet]. Rio de Janeiro: Observatório Covid-19 Fiocruz; 2022 [cited in 15 Apr 2022]. p. 283-295. (Série Informação para ação na Covid-19). Available from: <https://books.scielo.org/id/kymhj/pdf/portela-9786557081587-21.pdf>
11. Santos TA, Santos HS, Silva MN, Coelho ACC, Pires CGS, Melo CMM. Precarização do trabalho de enfermeiras, técnicas e auxiliares de Enfermagem nos hospitais públicos. *Rev Esc Enferm USP* [Internet]. 2018 [cited in 13 Apr 2022]; 52:03411. Available from: <https://www.scielo.br/j/reeusp/a/CdSrXtq7Cjvx4syWxnwtmKm/?format=pdf&lang=pt>
12. Galhardi CP, Freire NP, Minayo MCSM, Fagundes MCM. Fato ou fake? Uma análise da desinformação frente à pandemia da COVID-19 no Brasil. *Ciênc Saúde Colet*. [Internet]. 2020 [cited in 13 Apr 2022]; 25(Supl 2):4201-10. Available from: <https://www.scielo.br/j/csc/a/XnfpYRR45Z4nXskC3PTnp8z/?format=pdf&lang=pt>
13. Filho FGS, Menezes EN. O uso do aplicativo whatsapp como ambiente virtual de educação. In: VI Congresso Nacional de Educação [Internet]. Anais VI CONEDU. Campina Grande, PB: Realize Editora; 2019 [cited in 05 May 2022]. Available from: <https://www.editorarealize.com.br/index.php/artigo/visualizar/61763>
14. Holanda LAL, Nascimento ADA, Borges BS, Pereira FT, Frade AL, Santos CB, et al. Teleodontologia, formação profissional e assistência odontológica no sistema único de saúde brasileiro: relato de experiência. *Revista Journal of Health* [Internet]. 2020 [cited in 22 Feb 2024]; 1(24):51-67. Available from: <https://phantomstudio.com.br/index.php/JournalofHealth/article/download/1579/pdf>
15. Görgens P, Andrade P. A educação universitária apoiada pelas tecnologias digitais de informação e comunicação: algumas ideias práticas. *Revista Eletrônica Científica Ensino Interdisciplinar* [Internet]. 2020 [cited in 22 Feb 2024]; 6(17):267-80. Available from: <https://periodicos.apps.uern.br/index.php/RECEI/article/view/1969/2112>
16. Freitas FV, Rezende Filho LA. Modelos de comunicação e uso de impressos na educação em saúde: uma pesquisa bibliográfica. *Interface Comun Saúde Educ*. [Internet]. 2011 [cited in 05 May 2022]; 15(36):243-55. Available from: <https://www.scielo.br/j/icse/a/RPNY3vRSTRHssdB7YP5KYks/?format=pdf&lang=pt>
17. Rosane ASM, Cristiane AS. A educação em saúde no contexto da atenção primária em saúde. *Rev Fam, Ciclos Vida Saúde Contexto Soc*. [Internet]. 2017 [cited in 13 Apr 2022]; 5(Supl 2):282-88. Available from: <https://seer.uftm.edu.br/revistaeletronica/index.php/refacs/article/view/2261/2221>

Associated Publisher: Rafael Gomes Ditterich.

Conflict of Interests: the authors declared there is no conflict of interests.

Financing: none.

CONTRIBUTIONS

Alexandre Lins Werneck collaborated in the conception of the study and its design, writing and revision. **Camilla da Silva Nunes Santiquio** contributed to the conception of the study and its design, data collection and analysis, writing and revision.

How to cite this article (Vancouver)

Werneck AL, Santiquio CSN. Preventing COVID-19 among healthcare professionals through a virtual learning environment. *Rev Fam, Ciclos Vida Saúde Contexto Soc.* [Internet]. 2024 [cited in *insert day, month and year of access*]; 12(1):e7194. Available from: *insert access link*. DOI: *insert DOI link*.

How to cite this article (ABNT)

WERNECK, A. L.; SANTIQUIO, C. S. N. Preventing COVID-19 among healthcare professionals through a virtual learning environment. **Rev. Fam., Ciclos Vida Saúde Contexto Soc.**, Uberaba, MG, v. 12, n. 1, e7194, 2024. DOI: *insert DOI link*. Available from: *insert access link*. Access in: *insert day, month and year of access*.

How to cite this article (APA)

Werneck, A.L., & Santiquio, C.S.N. (2024). Preventing COVID-19 among healthcare professionals through a virtual learning environment. *Rev. Fam., Ciclos Vida Saúde Contexto Soc.*, 12(1), e7194. Retrieved in *insert day, month and year of access* from *insert access link*.



This is an open access article distributed under the terms of the Creative Commons License