

Identification of Information Communication Technology Tools Used by Healthcare Professionals in Combating COVID-19 Pandemic

COVID-19 Pandemisi ile Mücadelede Sağlık Çalışanlarının Yararlandığı Bilgi İletişim Teknolojisi Araçlarının Belirlenmesi

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ABSTRACT Objective: Information is changing rapidly and being constantly updated in the fight against coronavirus disease-2019 (COVID-19) infection. Obtaining up-to-date information has become an important requirement of healthcare workers during this time. The purpose of this study was to determine information communication technology (ICT) tools used by healthcare workers to access up-to-date information concerning COVID-19 disease during the peak period. **Material and Methods:** This descriptive study was conducted with the participation of 134 healthcare workers, 59 physicians and 75 nurses, working in Karadeniz Technical University Farabi Hospital. A data form developed by the authors was employed as a data collection tool. The data were analyzed using the chi-square and Wilcoxon signed rank tests. **Results:** Length of use of ICT tools and applications increased significantly compared to the pre-pandemic period ($p<0.05$). The ICT tool regarded as most useful by physicians and nurses for obtaining up-to-date information about the COVID-19 disease during the pandemic was the official Health Ministry web site (76.4% and 71.4%, respectively) and WhatsApp (28.0% and 32.8%, respectively). The academic databases most employed for access to professional information among healthcare workers during this period were Google Scholar (44.8%), PubMed (44.0%), and MEDLINE (20.9%). **Conclusion:** During the COVID-19 pandemic, healthcare workers mostly followed the Ministry of Health publications for access to up-to-date information on the COVID-19 disease, and benefited WhatsApp application the most. During this period, there was a significant increase in the time that healthcare workers use (ICT) tools to obtain information about clinical applications. The data obtained from this study will be a useful guide for strategies aimed at facilitating access to evidence-based information on the part of healthcare workers during times of pandemic.

ÖZET Amaç: Koronavirüs hastalığı-2019 [coronavirus disease-2019 (COVID-19)] enfeksiyonuyla mücadelede bilgiler hızla değişmekte ve sürekli güncellenmektedir. Bu süreçte, güncel bilgi edinmek sağlık çalışanlarının önemli bir gereksinimi hâline gelmiştir. Çalışmada sağlık çalışanlarının COVID-19 pandemi döneminde, COVID-19 hastalığına ilişkin güncel bilgilere erişim için yararlandığı bilgi iletişim teknolojisi (BIT) araçlarının belirlenmesi amaçlandı. **Gereç ve Yöntemler:** Tanımlayıcı nitelikte olan çalışma, Karadeniz Teknik Üniversitesi Farabi Hastanesi çalışmakta olan 59 doktor ve 75 hemşireden oluşan toplam 134 sağlık çalışanının katılımıyla gerçekleştirildi. Çalışmada veri toplama aracı olarak araştırmacılar tarafından geliştirilen veri formu kullanıldı. Çalışmadan elde edilen veriler ki-kare ve Wilcoxon İşaretli Sıralar Testi kullanılarak analiz edildi. **Bulgular:** Çalışmada sağlık çalışanlarının COVID-19 pandemi döneminde klinik uygulamalara ilişkin bilgi edinme amacıyla BIT araçlarını ve BIT uygulamalarını kullanma süresinin pandemi öncesine göre anlamlı düzeyde arttığı belirlendi ($p<0,05$). COVID-19 pandemi döneminde, hekimlerin ve hemşirelerin salgın hastalığa ilişkin güncel bilgi edinmek için en yararlı gördüğü araçlar Sağlık Bakanlığının resmi internet sitesi (sırasıyla %76,4; %71,4) ve WhatsApp uygulaması (sırasıyla %28,0; %32,8) idi. Bu dönemde, sağlık çalışanlarının mesleki bilgiye erişim amacıyla en çok yararlandığı akademik veri tabanlarının sırasıyla Google Scholar (%44,8), PubMed (%44,0) ve MEDLINE (%20,9) olduğu belirlendi. **Sonuç:** COVID-19 pandemi döneminde, sağlık çalışanlarının COVID-19 hastalığına ilişkin güncel bilgilere erişim için en çok Sağlık Bakanlığı yayımlarını takip etmiş ve en çok WhatsApp uygulamasından yararlanmıştı. Bu dönemde, sağlık çalışanlarının klinik uygulamalara ilişkin bilgi edinme amacıyla BIT araçlarını kullanma süresinde anlamlı bir artış söz konusu olmuştur. Çalışmadan elde edilen veriler, pandemi dönemlerinde sağlık çalışanlarının kanıt dayalı bilgilere erişimini kolaylaştırmaya yönelik stratejiler için yönlendirici bilgiler içermektedir.

Keywords: Access to information; COVID-19; healthcare personnel; pandemic

Anahtar Kelimeler: Bilgiye erişim; COVID-19; sağlık personeli; pandemi

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The current half-life of knowledge in medicine is regarded as approximately 18-24 months, and it is predicted that in approximately four years, the half-life will be only 73 days.¹ Exchanges of information among colleagues, printed publications such as books and journals were previously largely used in order to obtain new information.² However, advances in information communication technology (ICT) in the last decade have led to different and much more rapidly-updated sources of information being available for healthcare workers. These include internet-based tools such as cell phone applications, electronic databases, social media tools, electronic libraries, and search engines.³ These represent easy and rapid means of accessing information for healthcare workers, both before and after graduation.^{4,5} The use of ICT tools provides important conveniences for both physicians and nurses, such as reducing the workload, saving time, and facilitating communication.^{3,5}

ICT tools are widely used among healthcare workers for professional purposes such as increasing the quality of care by providing internet access, improving care outcomes, widespreading evidence-based practices in clinics, gaining professional knowledge, continuous learning, self-improvement.⁶⁻⁹ Healthcare professionals can also use ICT tools to share their experiences and connect with colleagues.¹⁰

Healthcare workers' up-to-date professional information requirements increase and speed of access to such information becomes particularly important under conditions such as technological advances, scientific discoveries, disasters, and epidemics.^{11,12} Especially in pandemic periods that affect the whole world and spread rapidly, it becomes imperative that the current best practice knowledge is transferred to the healthcare professionals who need it most, equal to or faster than the rate of spread of disease.¹³ For example, in early March 2003, an outbreak of severe acute respiratory syndrome (SARS) occurred in South China, Hong Kong, Vietnam and Singapore. Infection has spread to Canada, United States of America (USA), Australia and Europe through people who travel to these areas.¹⁴ The lack of sufficient knowledge of doctors around the world about SARS, a new disease that was previously unknown, posed a potentially important problem in combating the dis-

ease. In order to quickly solve this problem, a web page has been created to provide physicians with new information about the radiographic findings expected in SARS cases, and to share diagnosis and treatment guidelines as quickly as possible and the link of the page has been distributed through personal communication tools and e-mails.¹⁵

At the present time, the world is facing the threat of the coronavirus disease-2019 (COVID-19) pandemic. In December 2019, the COVID-19 disease that emerged in Wuhan, China's Hubei province, spread rapidly and turned into a pandemic, and as of March 2020, Europe had become the epicenter of the pandemic.¹⁶ Initially, Turkey was in the last place compared to the European countries in terms of the cases' rapid doubling time. However, after the 100th case had been detected, doubling time in Turkey ranked 5th after Spain, Austria, Switzerland, and South Korea in 34 days.¹⁷ In the pandemic process where the virus spreads rapidly, it is especially significant for healthcare workers to be able to access information and to monitor day-to-day changes on subjects such as the disease agents, diagnostic criteria, treatment algorithms, and care pathways in order to be able to provide uninterrupted patient care and to be able to bring the pandemic under control.¹⁸ In that context, the use of ICT is vital in terms of speed and ease of access to information.¹⁹

Since the COVID-19 is a global pandemic, approaches toward finding a solution, case management, the follow-up process, and the risks faced by patients and healthcare workers must all be considered at the global level. Problems, correct and incorrect approaches, and identified solutions in different regions can all be useful guides for other countries.²⁰ Therefore, in order to wage an effective campaign against the pandemic, a constant information flow and communications are needed through the establishment of a common global language. Various ICT tools can be employed for this purpose. Factors such as personal preferences, habits, user skills, and the user's confidence in the information obtained all affect the selection of the ICT tool to be employed.²¹

The purpose of this study was to determine which resources healthcare workers employed to up-

date their professional knowledge and improve their skills during the COVID-19 pandemic, and whether any changes occurred in those preferences.

MATERIAL AND METHODS

RESEARCH TYPE

The research was designed as a descriptive study.

STUDY SETTING

The research was conducted at a university hospital in the Eastern Black Sea region of Turkey. The university hospital is a tertiary education and research hospital with a bed capacity of 780. In addition to serving the province in which it stands, it also serves as a territorial reference hospital to which patients from neighborhood provinces requiring advanced treatment and care are referred.

POPULATION AND SAMPLE SELECTION

The study population consisted of physicians and nurses actively working in the university hospital where the study was performed during the “peak” period of the COVID-19 pandemic. Inclusion criteria were age over 18, voluntarily consenting to participate, being a physician or a nurse, having responsibility for patient care and treatment, and working on an active basis during the “peak” of the COVID-19 pandemic. Individuals with less than three months’ work experience were excluded. The sample size was calculated at 132 using Open Epi software according to a single population proportion formula ($n = \frac{DEFF * N * p(1-p)}{[(d^2/Z^2_{1-\alpha/2} * (N-1) + p * (1-p)]}$); Population size (for finite population correction factor) $(N)=200$; Hypothesized % frequency of outcome factor in the population $(p)=50\%$; Confidence limits as % of 100 $(d)=5\%$; Design effect (for cluster surveys- $DEFF)=1$).²²

DATA QUALITY AND COLLECTION

The researchers visited the hospital clinics and informed the doctors and nurses working in these clinics about the study. After provision of information, physicians and nurses were invited to participate in the study and the data collection tools were then sent to physicians and nurses working in the relevant units through WhatsApp groups which have used by the

physicians and nurses for communication and, sharing job-related information in daily practise.

DATA COLLECTION TOOL

A five-part data form developed by the authors by searching the literature and considering clinical experience was employed.^{7,9,23} The first part consisted of six questions involving descriptive characteristics (age, sex, education level, occupation, length of time in the profession, and unit). The second part contained two questions regarding in-service educational activities during the COVID-19 pandemic. The third part consisted of questions regarding ICT tools employed to access up-to-date information regarding the COVID-19. The questions in the fourth part inquired into daily length of use of ICT tools before and during the pandemic for the purpose of accessing information about clinical applications, and the final part consisted of questions about the ICT tools and academic databases employed regarding the management of COVID-19 cases. The content of the form was assessed by six members of the teaching staff consisting of nurses and doctors in the university where the research was performed. The comprehensibility of the form was examined in a pre-evaluation involving 15 healthcare workers. No problems were encountered during that examination, and the responses given by the healthcare workers taking part in the pre-evaluation were not included in the final analysis. The form was converted to online format using Google forms software and was sent to the healthcare workers constituting the research population via Whatsapp.

ETHICS COMMITTEE APPROVAL

Approval for the study was granted by the Karadeniz Technical University Local Ethics Committee with 24237859-484 number, 24/07/2020 date. To carry out the study, legal permission with 2020-05-14T00-50-42 number was obtained from the Ministry of Health. In addition, the first part of the online form contained an explanatory section about the study and its purpose. Participants were asked to indicate voluntary involvement by clicking on the “I agree to participate” box. The study was conducted in accordance with the Helsinki Declaration Principles.

STATISTICAL ANALYSIS

IBM Statistical Package for Social Sciences software was used for data analysis (IBM SPSS; Armonk, NY, USA). Compatibility with normal distribution was assessed using the Kolmogorov Smirnov test. The chi-square and Wilcoxon signed rank tests were applied at data analysis. Descriptive data were expressed as number and percentage. Statistical significance was set at $p < 0.05$ at a 95% confidence interval.

RESULTS

One hundred fifty-one health workers, consisting of nurses and physicians, took part in the research. Fourteen participants were excluded due to incompatibility with the inclusion criteria. The forms submitted by three individuals could not be included in the analysis due to missing data. The study was thus completed with data from 134 healthcare workers.

Table 1 shows the descriptive characteristics of the healthcare workers taking part in the study. The mean age of the healthcare workers in the study was 31.2 ± 6.70 , and the mean work experience was 7.7 ± 6.67 years. In addition, 49.3% of participants were educated to bachelor's degree level, 73.9% were women, and 56.0% were nurses. We also found that 34.3% of the healthcare workers in this study were working in a non-COVID-19 unit during the "peak" of the pandemic.

The in-service educational activities most frequently attended by the healthcare worker in the study involved personal protective equipment (PPE) use (91.8%), isolation measures (56.0%), and modes of transmission of COVID-19 infection (46.3%). Isolation measure sessions were more frequently attended by nurses, while physicians more frequently attended educational activities regarding airway procedures, definite case criteria, swab sample collection, triage procedures, and treatment

TABLE 1: Healthcare workers' descriptive characteristics (n=134).

	Physicians (n=59)	Nurses (n=75)	Total (n=134)
Demographic characteristics			
Sex, n (%)			
Female	31 (52.5)	68 (90.7)	99 (73.9)
Male	28 (47.5)	7 (9.3)	35 (26.1)
Age, n (%)			
<30	41 (69.5)	30 (40.0)	71 (53.0)
≥ 30	18 (30.5)	45 (60.0)	63 (47.0)
Education level, n (%)			
High school	-	17 (22.7)	17 (12.7)
Associate degree	-	13 (17.3)	13 (9.7)
Bachelor's degree	30 (50.8)	36 (48.0)	66 (49.3)
Postgraduate degree	29 (49.2)	9 (12.0)	38 (28.4)
Years worked in the profession, n (%)			
<5	49 (83.1)	9 (12.0)	58 (43.3)
5-9	10 (16.9)	27 (36.0)	37 (27.6)
≥ 10	-	39 (52.0)	39 (29.1)
Unit in which the participant worked during the pandemic*, n (%)			
Suspected COVID-19 patient unit	23 (26.7)	29 (34.9)	52 (30.8)
Definitely diagnosed COVID-19 patient unit	10 (11.6)	6 (7.2)	16 (9.5)
COVID-19 intensive care	6 (7.0)	1 (1.2)	7 (4.1)
Non-COVID-19 patient unit	27 (31.4)	31 (37.3)	58 (34.3)
Emergency department	15 (17.4)	4 (4.8)	19 (11.2)
Non-COVID-19 intensive care	5 (5.8)	12 (14.5)	17 (10.1)

*Numbers were folded due to participants working in more than one unit.

methods ($p<0.05$). No statistically significant difference was observed between the groups in terms of attendance of other in-service education activities ($p>0.05$).

The methods most frequently employed during in-service educational activities were face-to-face information transmission (74.6%), WhatsApp groups established in-house (59.7%) and information transmission via institutional personal web-pages (41.8%). In-house training where simulation techniques were used were attended more by physicians than by nurses ($p<0.05$). No significant difference was observed between the groups in terms of other techniques employed during in-service education activities ($p>0.05$) (Table 2).

The tool regarded as most useful by physicians and nurses for obtaining up-to-date information about the COVID-19 disease during the pandemic was the official Health Ministry web site (76.4% and 71.4%, respectively) and WhatsApp was the application, which was considered the most beneficial (28.0% and 32.8%, respectively). Rate of finding newspapers, scientific journals, news portals, World Health Organization (WHO) webpage, and television programs useful to access up-to-date information about COVID-19 disease during the pandemic was greater

among nurses than among physicians ($p<0.05$). The rate of finding academic databases useful was higher in physicians ($p=0.030$). No statistically significant difference was observed between nurses and physicians in terms of use of other ICT tools to access up-to-date information about COVID-19 disease during the pandemic ($p>0.05$) (Table 3).

The academic databases most employed by healthcare workers to access up-to-date information during the COVID-19 pandemic were Google Scholar (44.8%), PubMed (44.0%), and MEDLINE (20.9%). Physicians used the PubMed and MEDLINE databases more frequently than nurses ($p<0.05$). No significant difference was observed between the professional groups in terms of use of other academic databases ($p>0.05$) (Table 4).

Table 5 shows the length of use by healthcare workers of ICT tools (smart phone, television, laptop computer, table top computer) and applications (youtube, news pages, facebook, twitter, whatsapp) to obtain information about clinical practices before and during the COVID-19 pandemic. The length of use of ICT tools and applications to obtain information about clinical practises increased significantly during the COVID-19 pandemic compared to before the pandemic ($p<0.05$) (Table 5).

TABLE 2: In-house training activities characteristics participated by healthcare workers during the COVID-19 pandemic (n=134).

	Physician (n=59)	Nurse (n=75)	Total (n=134)	p value
Education subjects*. n (%)				
Use of personal protective equipment	54 (91.5)	69 (92.0)	123 (91.8)	1.000
Airway procedures	40 (67.8)	20 (26.7)	60 (44.8)	0.000
Modes of transmission	24 (40.7)	38 (50.7)	62 (46.3)	0.250
Isolation precautions	26 (44.1)	49 (65.3)	75 (56.0)	0.014
Identification of suspicious cases	23 (39.0)	18 (24.0)	41 (30.6)	0.093
Definite case criteria	20 (33.9)	9 (12.0)	29 (21.6)	0.004
Swab specimen collection	32 (54.2)	-	32 (23.9)	0.000
Triage procedures	13 (22.0)	6 (8.0)	19 (14.2)	0.039
Treatment methods	12 (20.3)	5 (6.7)	17 (12.7)	0.036
Methods employed during in-house training activities*, n (%)				
Face-to-face information transmission	49 (83.1)	51 (68.0)	100 (74.6)	0.074
WhatsApp groups established in-house	38 (64.4)	42 (56.0)	80 (59.7)	0.419
Simulation-based education	33 (55.9)	17 (22.7)	50 (37.3)	0.000
Information transmission via institutional personal web-pages	20 (33.9)	36 (48.0)	56 (41.8)	0.142
Video conference	12 (20.3)	8 (10.7)	20 (14.9)	0.188

*Numbers exceed the total number of participants since more than one option could be selected.

TABLE 3: Information communication technology tools and applications employed by healthcare workers to access COVID-19 disease related information (n=134).

	Physicians			Nurses			p value
	Very useful	Quite useful	Not useful	Very useful	Quite useful	Not useful	
ICT applications							
WhatsApp	14 (28.0)	33 (66.0)	3 (6.0)	21 (32.8)	35 (54.7)	8 (12.5)	0.401
Telegram	-	17 (47.2)	19 (52.8)	3 (5.9)	25 (49.0)	23 (45.1)	0.390
Instagram	5 (11.1)	27 (60.0)	13 (28.9)	12 (18.8)	35 (54.7)	17 (26.6)	0.546
Twitter	9 (20.5)	20 (45.5)	15 (34.1)	12 (21.1)	29 (50.9)	16 (28.1)	0.800
Facebook	3 (7.3)	14 (34.1)	24 (58.5)	6 (10.0)	29 (48.3)	25 (41.7)	0.248
Linkedin	1 (2.9)	14 (40.0)	20 (57.1)	3 (6.3)	13 (27.1)	32 (66.7)	0.400
ICT tools							
HM webpage	42 (76.4)	11 (20.0)	2 (3.6)	50 (71.4)	18 (25.7)	2 (2.9)	0.771
WHO webpage	35 (76.1)	9 (19.6)	2 (4.3)	35 (58.3)	24 (40.0)	1 (1.7)	0.045
Academic databases	34 (72.3)	12 (25.5)	1 (2.1)	28 (50.9)	20 (36.4)	7 (12.7)	0.030
Search engine	25 (51.0)	17 (34.7)	7 (14.3)	29 (46.8)	25 (40.3)	8 (12.9)	0.831
News portals	1 (2.1)	26 (55.3)	20 (42.6)	30 (45.5)	31 (47.0)	5 (7.6)	0.000
IIN	14 (28.0)	32 (64.0)	4 (8.0)	22 (39.3)	27 (48.2)	7 (12.5)	0.258
TV programs	2 (3.8)	28 (53.8)	22 (42.3)	28 (38.4)	32 (43.8)	13 (17.8)	0.000
Newspapers	1 (2.3)	18 (40.9)	25 (56.8)	8 (12.9)	41 (66.1)	13 (21.0)	0.000
Scientific journals	2 (5.1)	13 (33.3)	24 (61.5)	6 (10.5)	32 (56.1)	19 (33.3)	0.027
Forum sites	3 (7.1)	21 (50.0)	18 (42.9)	9 (16.1)	29 (51.8)	18 (32.1)	0.298

ICT: Information communication technology; HM: Health ministry; WHO: World Health Organization; IIN: Institutional Information Network is a information network established between the Ministry of Health, Health Directorate, Chief Physician's Office, Departmental Office, physicians and nurses.

TABLE 4: Academic databases used by healthcare workers during the COVID-19 pandemic.

	Physicians, n (%)	Nurses, n (%)	Total, n (%)	p value
Google Scholar	23 (38.3)	37 (61.7)	60 (44.8)	0.232
PubMed	47 (79.7)	12 (20.3)	59 (44.0)	0.000
MEDLINE	18 (64.3)	10 (35.7)	28 (20.9)	0.027
Web of Science	5 (41.7)	7 (58.3)	12 (9.0)	1.000
TR Dizin	5 (45.5)	6 (54.5)	11 (8.2)	1.000

The ICT tool most commonly employed by health workers to access information about COVID-19 case management related topics was the official Ministry of Health web site. This was followed by WhatsApp, which was used to obtain information about isolation precautions, swab specimen collection, and PPE use, while greater use was made of academic databases than other tools regarding all other subjects (Table 6).

DISCUSSION

The length of use of ICT tools and ICT applications by healthcare workers to obtain information about clinical applications during the COVID-19 pandemic increased significantly compared to before pandemic. The in-house training activities most benefited

by the healthcare workers in the study were training on PPE use, isolation measures and ways of transmission of COVID-19 infection, respectively. Among the most employed ICT tools, which were used by healthcare workers in order to get information about COVID-19 disease, Health Ministry's official website were in the first place, followed by HWO official website in second place, and WhatsApp was the most benefited ICT application. The academic databases most employed by healthcare workers during the COVID-19 pandemic in order to access professional information were Google Scholar, PubMed and MEDLINE.

The in-house activities of which the healthcare workers in the study made the greatest use were train-

TABLE 5: Length of use of information communication technology tools and applications before and during the COVID-19 pandemic for professional purposes.

	Before the pandemic,		During the pandemic n (%)				p value
	n (%)	none	<1 h	1-3 h	3-5 h	>5 h	
ICT tools							
Smart phone (n=127)	None	3 (2.36)	0 (0)	0 (0)	1 (0.79)	0 (0)	<0.001
	<1 h	0 (0)	11 (8.66)	13 (10.24)	3 (2.36)	0 (0)	
	1-3 h	0 (0)	3 (2.36)	39 (30.71)	15 (11.81)	4 (3.15)	
	3-5 h	0 (0)	0 (0)	3 (2.36)	14 (11.02)	7 (5.51)	
	>5 h	0 (0)	1 (0.79)	0 (0)	0 (0)	10 (7.87)	
Television (n=126)	none	15 (11.9)	12 (9.52)	6 (4.76)	0 (0)	0 (0)	<0.001
	<1 h	1 (0.79)	15 (11.9)	25 (19.84)	5 (3.97)	1 (0.79)	
	1-3 h	0 (0)	5 (3.97)	22 (17.46)	12 (9.52)	1 (0.79)	
	3-5 h	0 (0)	0 (0)	0 (0)	5 (3.97)	1 (0.79)	
	>5 h	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Laptop computer (n=116)	none	29 (25.0)	8 (6.9)	0 (0)	0 (0)	0 (0)	<0.001
	<1 h	2 (1.72)	27 (23.28)	16 (13.79)	1 (0.86)	1 (0.86)	
	1-3 h	0 (0)	0 (0)	15 (12.93)	10 (8.62)	1 (0.86)	
	3-5 h	0 (0)	0 (0)	0 (0)	2 (1.72)	2 (1.72)	
	>5 h	0 (0)	0 (0)	0 (0)	0 (0)	2 (1.72)	
Table top computer (n=108)	none	56 (51.85)	3 (2.78)	0 (0)	0 (0)	0 (0)	0.033
	<1 h	3 (2.78)	23 (21.3)	9 (8.33)	1 (0.93)	0 (0)	
	1-3 h	0 (0)	2 (1.85)	7 (6.48)	1 (0.93)	0 (0)	
	3-5 h	0 (0)	0 (0)	0 (0)	2 (1.85)	0 (0)	
	>5 h	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.93)	
ICT applications							
Youtube (n=109)	none	18 (16.51)	3 (2.75)	1 (0.92)	2 (1.83)	0 (0)	<0.001
	<1 h	0 (0)	31 (28.44)	20 (18.35)	2 (1.83)	0 (0)	
	1-3 h	1 (0.92)	1 (0.92)	21 (19.27)	3 (2.75)	1 (0.92)	
	3-5 h	0 (0)	0 (0)	1 (0.92)	4 (3.67)	0 (0)	
	>5 h	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
News pages (n=120)	none	9 (7.5)	7 (5.83)	2 (1.67)	1 (0.83)	0 (0)	<0.001
	<1 h	4 (3.33)	31 (25.83)	37 (30.83)	5 (4.17)	0 (0)	
	1-3 h	1 (0.83)	4 (3.33)	9 (7.5)	6 (5)	1 (0.83)	
	3-5 h	0 (0)	1 (0.83)	0 (0)	2 (1.67)	0 (0)	
	>5 h	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Facebook (n=111)	none	47 (42.34)	7 (6.31)	2 (1.8)	0 (0)	0 (0)	<0.001
	<1 h	0 (0)	31 (27.93)	12 (10.81)	1 (0.9)	0 (0)	
	1-3 h	0 (0)	3 (2.7)	3 (2.7)	2 (1.8)	0 (0)	
	3-5 h	0 (0)	0 (0)	0 (0)	2 (1.8)	1 (0.9)	
	>5 h	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Twitter (n=103)	none	48 (46.6%)	8 (7.77)	2 (1.94)	0 (0)	0 (0)	<0.001
	<1 h	1 (0.97%)	20 (19.42)	12 (11.65)	0 (0)	0 (0)	
	1-3 h	0 (0)	0 (0)	11 (10.68)	0 (0)	0 (0)	
	3-5 h	0 (0)	0 (0)	0 (0)	1 (0.97)	0 (0)	
	>5 h	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
WhatsApp (n=120)	none	3 (2.5%)	2 (1.67)	2 (1.67)	1 (0.83)	0 (0)	<0.001
	<1 h	1 (0.83%)	31 (25.83)	24 (20)	4 (3.33)	0 (0)	
	1-3 h	0 (0)	1 (0.83)	25 (20.83)	10 (8.33)	2 (1.67)	
	3-5 h	0 (0)	1 (0.83)	1 (0.83)	4 (3.33)	2 (1.67)	
	>5 h	0 (0)	0 (0)	0 (0)	1 (0.83)	5 (4.17)	

ICT: Information communication technology.

TABLE 6: Sources of information used by health workers on the subject of COVID-19 case management.*

	Youtube n (%)	Facebook n (%)	Twitter n (%)	WhatsApp n (%)	Forum sites n (%)	Academic databases n (%)	Instagram n (%)	HM web site (n %)
Isolation methods	25 (18.7)	9 (6.7)	10 (7.5)	58 (43.3)	4 (3.0)	49 (36.6)	8 (6.0)	112 (83.6)
Modes of transmission	13 (9.7)	7 (5.2)	4 (3.0)	32 (23.9)	8 (6.0)	42 (31.3)	7 (5.2)	107 (79.9)
PPE use	26 (19.4)	5 (3.7)	2 (1.5)	43 (32.1)	6 (4.5)	36 (26.9)	4 (3.0)	104 (77.6)
Treatment methods	6 (4.5)	3 (2.2)	6 (4.5)	36 (26.9)	3 (2.2)	53 (39.6)	2 (1.5)	104 (77.6)
Definite case criteria	8 (6.0)	4 (3.0)	3 (2.2)	27 (20.1)	6 (4.5)	34 (25.4)	2 (1.5)	103 (76.9)
Suspected case identification	8 (6.0)	3 (2.2)	2 (1.5)	25 (18.7)	3 (2.2)	31 (23.1)	1 (0.7)	103 (76.9)
Evaluation of health workers in contact with cases	10 (7.5)	5 (3.7)	4 (3.0)	31 (23.1)	4 (3.0)	34 (25.4)	2 (1.5)	96 (71.6)
Airway applications	17 (12.7)	3 (2.2)	2 (1.5)	27 (20.1)	4 (3.0)	33 (24.6)	2 (1.5)	94 (70.1)
Follow-up involving contact	10 (7.5)	5 (3.7)	3 (2.2)	25 (18.7)	3 (2.2)	34 (25.4)	2 (1.5)	93 (69.4)
Swab sample collection	22 (16.4)	3 (2.2)	2 (1.5)	32 (23.9)	3 (2.2)	27 (20.1)	1 (0.7)	92 (68.7)
Patient follow-up at home	9 (6.7)	5 (3.7)	4 (3.0)	22 (16.4)	4 (3.0)	30 (22.4)	1 (0.7)	90 (67.2)
Triage	6 (4.5)	4 (3.0)	2 (1.5)	25 (18.7)	4 (3.0)	27 (20.1)	2 (1.5)	88 (65.7)

*More than one option could be selected; HM: Health Ministry Turkish Ministry of Health; PPE: personal protective equipment.

ing seminars on the subjects of PPE use, followed by isolation procedures, and modes of COVID-19 infection transmission. Educating healthcare workers on these three subjects is one of the strategic actions contained the guideline for updating the health system to cope with COVID-19 published by WHO.²⁴ It is reported that in-service training programs are effective and productive activities for healthcare professionals to keep up with the dynamic developments in medical science.²⁵ Considering that the COVID-19 infection spreads very rapidly and it is vital to develop both knowledge and skills for the preparation of healthcare workers to combat the pandemic, in-service training activities have become even more important in this process. This study results show that healthcare workers benefited from in-house training activities in addition to ICT tools in preparing to combat the pandemic. In the study, it was also determined that after face-to-face training within the scope of in-service training activities, the method that healthcare workers most benefited from was in-house WhatsApp groups, and information was shared within the scope of in-service training through corporate personnel web-pages. Considering these results it can be concluded that these methods can be benefited alternatively to meet the training needs of the personnel by avoiding the risk of contamination caused by face-to-face in service training during pandemic periods.

Nurses made greater use than physicians of newspapers, scientific journals, WHO publications,

and television programs to obtain information about COVID-19 disease during the pandemic and also regarded these as more useful. To the best of our knowledge, no previous studies have investigated the ICT tools used by healthcare workers to obtain information during the COVID-19 pandemic. However, similarly to the results of the present study, Zigdon et al. found that nurses employed television programs and news portals to access professional information.²⁶ The results of this study show a higher rate of use of academic sources of information among physicians than among nurses. Studies not performed during the pandemic have also reported that physicians make greater use of academic information sources than nurses.^{7,27} Since this research was conducted in a university hospital, a large proportion of the physicians taking part were educated to postgraduate level and were still receiving postgraduate education. Consequently, the data yielded by the study may be associated with the use of academic databases being an important requirement of postgraduate education. Another factor involved in the lower rate of use among nurses may be the English language barrier for accessing academic databases.

In the study, it was found that the academic databases in which the physicians most frequently used during the COVID-19 pandemic period were PubMed (79.7%) and MEDLINE (64.3%), and the frequency of using these databases was significantly higher than nurses (respectively 44.0% and 20.9%).

Similarly, Chiu et al. reported a significantly higher rate of use of MEDLINE among physician during the pandemic compared to nurses.²⁷ However, in studies not performed during the pandemic, Leo et al. and Novak et al. described PubMed (19.7% and 10.8% respectively) as the academic database most employed by physicians.^{23,28} The rates of use of academic databases in the present study were generally higher than those in other studies in the literature. This may be due to the demographic characteristic of the research sample and to increase information requirements among healthcare workers during the COVID-19 pandemic.

In the study, it was determined that the duration of healthcare workers to use ICT tools and ICT applications in order to obtain information about clinical practices during the COVID-19 pandemic period increased significantly compared to before the pandemic. We encountered no previous research reporting findings concerning the length of use of ICT tools among healthcare workers solely in order to access clinical information. In order to be able to maintain patient care without interruption and to bring the outbreak under control during the COVID-19 pandemic, healthcare workers need to be able to obtain accurate information on such subjects as the characteristics of the disease agent, modes of transmission, diagnostic criteria, treatment algorithms, and care pathways, and to be able to monitor up-to-date changes.^{13,24} However, COVID-19 is a new disease, and it has not been possible to access books with high scientific validity on its diagnosis, treatment, and transmission routes. Information on the disease and its management was obtained during the pandemic period when the virus spread rapidly and ICT tools were used to deliver the obtained information to healthcare professionals worldwide.^{29,30} It is thought that the increase in the time span of ICT use by the healthcare professionals identified in the study to access professional information is due to this situation.

In this study, it was ascertained that the ICT tools used by healthcare professionals to obtain information on current issues related to COVID-19 disease during the pandemic period and found the most “useful” were respectively official websites of the Ministry of Health and the WHO. In a study per-

formed during the COVID-19 pandemic, Nemati et al. reported that the sources of information for the most of the nurses were WHO and the Ministry of Health.³¹ The findings of that study are consistent with those of the current research. On the other hand, in the study conducted the before-pandemic period, it was found that physicians and nurses mostly used search engines to obtain professional information.²¹ Similarly, in studies carried out with nurses, it was determined that the ICT tool most used by nurses to access news and up-to-date information and to access professional information was found to be search engines.^{8,9,32} In the current study, search engines ranked fourth among the information sources used and regarded as useful by physicians and third by nurses. During the COVID-19 pandemic, the Ministry of Health published guidelines on case definitions and treatment algorithms and updated them according to changing scientific information, allowing access on the official website.²⁹ Using search engines for research purposes has some difficulties and drawbacks, such as being time-consuming and misleading.³³ Considering the virus spreading rapidly and the fact that healthcare workers provide services under difficult conditions, it can be thought that healthcare professionals prefer the Ministry of Health publications in order to provide rapid access to reliable information.

The WhatsApp was the ICT application that healthcare professionals found the most “useful” in order to obtain information on current issues related to COVID-19 disease during the pandemic period. In recent years, it has been reported that the use of WhatsApp has become increasingly common in clinics for purposes such as sharing scientific information and documents, communicating about clinical situations, and sharing clinical photos or videos.³⁴ The use of WhatsApp during the pandemic period provides an important advantage because it eliminates the risk of contamination caused by face-to-face communication. Its other advantage is instantly transmitting up-to-date information to very large groups.³⁵ The results obtained from the study show that WhatsApp is a method that can be preferred by providing ease of use in conveying the information healthcare workers need in emergency situations such as a pandemic.

CONCLUSION

The COVID-19 pandemic has significantly impacted both healthcare delivery and information access techniques. In this period, access to up-to-date and evidence-based information has become an important new problem area for healthcare providers. During this period, healthcare professionals' ICT tools and applications using time to obtain professional information increased significantly compared to before. In this process, the official website of the Ministry of Health ranked first place, while WHO's website was second as ICT tools for gathering information about COVID-19 disease for physicians and nurses. In addition, WhatsApp was the ICT application most used and benefited by healthcare professionals. WhatsApp application and corporate staff web pages were also used in addition to traditional methods for information sharing in in-house training activities. The results obtained from the study show that healthcare professionals preferred information, algorithms and guidelines that had been inspected by official institutions to meet their information needs during the pandemic period. The study also shows that informal communication platforms such as WhatsApp were used to quickly share professional information during pandemic when face-to-face training was inconvenient. It is important to develop standards for the use of such unofficial ICT platforms as information transfer tools in disaster situations. This study provide us with im-

portant clues about where we are going in terms of accessing and transferring information, and communication in health service delivery in disaster situations. However, further research is needed to clearly demonstrate whether there is a paradigm shift regarding ICT usage by healthcare workers and the effectiveness of these tools during the pandemic period.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Abdülkadir Gündüz, Perihan Şimşek, Aleyna Zihni; **Design:** Perihan Şimşek, Aleyna Zihni, Sema Bayrak, Abdülkadir Gündüz; **Control/Supervision:** Abdülkadir Gündüz; **Data Collection and/or Processing:** Sinan Paslı, Sema Bayrak, Aleyna Zihni, Perihan Şimşek; **Analysis and/or Interpretation:** Perihan Şimşek, Abdülkadir Gündüz; **Literature Review:** Sinan Paslı, Aleyna Zihni, Sema Bayrak, Perihan Şimşek; **Writing the Article:** Perihan Şimşek, Abdülkadir Gündüz, Aleyna Zihni, Sema Bayrak; **Critical Review:** Abdülkadir Gündüz.

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