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Original Article

Beyond the pandemic: evaluating the health care workforce's readiness for sustained use of virtual care after COVID-19

Angela McLoughlan[1], Adam Semciw[2,3], Ron Borland[4], Brian Oldenburg[5,6], Alison Beauchamp[7,8], Hanife Mehmet[3], Rebecca Jessup[2,3,7*]

[1]Rehabilitation Services, Barwon Health, Geelong, Australia
[2]Department of Physiotherapy, Podiatry, Prosthetics and Orthotics, School of Allied Health Human Services and Sport, La Trobe University, Bundoora, Australia
[3]Division of Allied Health, Northern Health, Melbourne, Australia
[4]Faculty of Health, School of Psychology, Deakin University, Burwood, Australia
[5]Department of Public Health, School of Psychology and Public Health, La Trobe University, Bundoora, Australia
[6]Baker Heart and Diabetes Institute, Melbourne, Australia
[7]School of Rural Health, Monash University, Warragul, Australia
[8]Monash Victorian Heart Institute, Monash University, Clayton, Australia

Abstract

Background and aims: This study aimed to investigate healthcare professionals (HCPs) preparedness to continue using telehealth beyond the COVID-19 pandemic, to examine the perceived ability of HCPs to appraise the reliability of online information sources (digital literacy) and, to examine whether a relationship exists between this and preparedness to continue using telehealth.

Methods: Single-site cross-sectional survey of HCPs in an outpatient and community therapy setting. The survey was based on a rapid literature review guided by the Theory of Planned Behaviour and Technology Acceptance Model. Descriptive statistics were used to summarise participant demographics, preparedness for telehealth, and digital literacy (based on confidence in appraising online information). Multivariable logistic regression assessed the associations between preparedness to continue using telehealth, the ability to evaluate online information sources, and demographic variables.

Results: A total of 783 HCPs were invited, 310 responded, with 287 participants included in the final analysis (37% response rate excluding incomplete surveys). The analysis shows that 54.8% of participants preferred to return to in-person care. Preparedness to continue telehealth varied by profession and clinical activity, with medical professionals and script provision showing the highest readiness for continued telehealth use and allied health professionals the least likely to continue using telehealth (36%). Most (89%) of HCPs felt confident identifying reliable online information sources and there was no relationship between perceived ability to evaluate online information and preparedness to use telehealth.

Conclusion: Results suggest hesitancy amongst allied staff toward continued telehealth use post the pandemic, which may be due to the type of care they provide. Future studies on technologies that support HCPs in providing more intensive virtual care would be of benefit.

Keywords: Telehealth, Healthcare workforce, Technology readiness, Digital literacy, COVID-19, Digital health

***Corresponding Author:**
Rebecca Jessup,
Email: Rebecca.jessup@nh.org.au

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Introduction

The rising costs of healthcare in high-income countries are reaching levels that will soon be unsustainable (1). Maintaining or improving patient outcomes in the face of increasing demand requires re-evaluating healthcare delivery models towards more efficient ways to deliver healthcare. Central to this transformation will be an acknowledgment of the essential contribution virtual models of healthcare will play in healthcare provision in the 21st century (2).

eHealth is a broad term encompassing information and communication technologies to support healthcare provision (3). The World Health Organization (WHO) has emphasized the central role of eHealth in increasing capability and sustainability within the healthcare sector (2). The COVID-19 pandemic has provided further justification for the prioritization of eHealth, with the additional benefit that technologies such as telehealth

reduce the risk of COVID-19 transmission. Telehealth is healthcare services delivered over a distance using information and communication technology (4). For this study, the term "*telehealth*" refers to telephone and videoconference platforms collectively.

Globally, telehealth practices have expanded markedly in response to the COVID-19 pandemic, with ongoing efforts to increase their scope and reach (5). Despite the challenges associated with the use of telehealth by patients, such as limited access and lack of knowledge in the use of technology, a variety of benefits have been identified, including improvements in communication with providers, medication adherence, and a decrease in waiting and travel time (6). However, the readiness of healthcare professionals (HCPs) to adopt and use telehealth services regularly is an issue that warrants serious and urgent attention.

Technology readiness refers to an individual's preparedness to adopt and use new technologies to achieve goals (7). A growing body of research indicates that variances in the adoption of technology are driven by an individual's technology readiness (7,8). While the COVID-19 pandemic has resulted in widespread adoption of telehealth (9), continued use beyond the pandemic will be impacted by the technology readiness of HCPs.

Research suggests that technology readiness among HCPs is associated with profession (10), age (11), gender, and prior experience with technology (12). In addition, technology readiness is related to digital health literacy, defined as the capacity of individuals to confidently find, understand, and appraise health information from electronic health sources to address or solve a health problem. Therefore, the ability of HCPs to find and use reliable evidence for their practice is likely related to their likeliness of adopting technology as part of their healthcare delivery (13). Research suggests wide health workforce variation in confidence and skills seeking accurate health-related information from electronic sources to support healthcare decisions (14).

The Northern Health outpatient and community therapy setting in Australia comprises a wide variety of multidisciplinary adult and pediatric services, including outpatient specialist clinics and community rehabilitation. These services rapidly shifted to telehealth during the COVID-19 pandemic. Healthcare services within this setting are provided by medical, nursing, and allied health professionals. The primary aim of this study was to investigate the preparedness of HCPs to continue delivering care via telehealth beyond the COVID-19 pandemic. The secondary aims were to i) examine the self-reported ability of HCPs to evaluate the reliability of online information sources used to support patient care and ii) investigate whether a relationship exists between this perceived ability and an individual's preparedness to continue providing care via telehealth.

Methods

Study design

We conducted a single-site cross-sectional survey of HCPs in outpatient and community therapy services. This study is reported following the Consensus-Based Checklist for Reporting of Survey Studies (15).

Setting and sample

Northern Health is the primary provider of public hospital services in Melbourne's outer north region (16). The Northern Health catchment is characterized by higher levels of culturally and linguistically diverse residents, higher unemployment rates, and lower levels of education compared to state and national averages (17).

The sample of allied health surveyed included allied health assistants, psychologists, dietitians, exercise physiologists, occupational therapists, orthoptists, pastoral carers, physiotherapists, podiatrists, social workers, and speech pathologists.

Recruitment and consent process

All HCPs undertaking clinical roles within Northern Health's outpatient and community therapy setting (n = 783) were invited to participate via email. Completion of the online survey (REDCap®) indicated implied consent. The survey was open for seven weeks during the COVID-19 pandemic from 27 October 2020 to 14 December 2020. To improve response rates, potential participants were sent a pre-notification email and two reminder emails post-survey distribution (18). Identifiable information was collected to prevent multiple participation by individuals.

Sample size

We sent the survey to all eligible participants (N = 783). Using a conservative estimate of variance ($P = 0.50$), a 95% confidence level with a ± 5% margin of error, a minimum response of 258 (33%) was considered adequate to be representative (19).

Measure

The survey used researcher-generated questions based on a rapid review of the literature and guided by two theoretical frameworks: the theory of planned behavior (20) and the Technology Acceptance Model (21). The use of these frameworks ensured content validity. In addition, the survey questions were created by experienced clinician-researchers (RJ and AS) and survey design experts (RB and BO) to ensure face validity. Minor survey modifications were completed after pilot testing with three users. The survey consisted of four questions. Question 1: I have had experience using telehealth (telephone and videoconference) to provide - triage and screening, detailed assessment, provision of scripts, detailed advice about treatment options, provision of a treatment plan, and follow-up. The scoring of the answers for telehealth experience across the six specified clinical activities are as follows: none (score 1), limited (score 2), extensive (score 3), and not relevant to my role (score 4);

the scores were dichotomized into experienced (response options: limited or extensive) versus not experienced (response option: none). Question 2: when conditions return to normal following the COVID-19 pandemic, would I like to continue delivering care via telehealth (phone or videoconferencing) instead of face-to-face? – with six options provided (refer to supplementary material Table S1). Question 3: I can tell the difference between reliable and unreliable online health information sources; with response options: always, most of the time, about half the time, sometimes, never. Question 4: In my role, I use the following electronic sources to find information to support patient care - a total of 11 options were provided indicating which online information sources they use to support patient care, including Access Medicine, Australian Government Department of Health, Better Health Channel, BMJ Best Practice, Google, Google Scholar, Therapeutic Guidelines (tg.org.au), Up to date, Web of Science databases (e.g., Medline), Hospital Intranet and Other. The scoring of each option is as follows: always (score 1), most of the time (score 2), about half of the time (score 3), sometimes (score 4), and never (score 5). The final survey (excluding demographics) is provided as Table S1 (See Supplementary file 1).

The primary outcome of this study was the preparedness of HCPs to continue using telehealth beyond the COVID-19 pandemic, and the secondary outcome was the perceived ability of HCPs to evaluate the reliability of online information sources.

We defined high preparedness as HCPs who intended to continue providing telehealth to half or more of their patients beyond the COVID-19 pandemic (cut point of ≤ 3 out of 5). We defined high perceived digital health literacy as HCPs who reported they could identify reliable online information sources most or all of the time (cut point of ≤ 2 out of 5). We defined less reliable online information sources as those that are not screened for quality, where there is uncertainty regarding search parameters, and where there is a lack of transparency in coverage (i.e., Google and Google Scholar) (22). 'Don't know' responses for the primary outcome were excluded from the analysis (demographic information of these participants is provided as Table S2). Demographic variables collected through self-report included age, gender, highest level of education, years of professional experience, frequency of internet use, training in telehealth, and telehealth experience (telephone and videoconference).

Analysis

Analyses were completed using Jamovi version 1.6.23. Descriptive statistics were used to provide an overview of participant demographic characteristics, preparedness to continue using telehealth, and perceived ability to evaluate the reliability of online information sources.

Associations were assessed via multivariable logistic regression. Preparedness to continue using telehealth and perceived ability to evaluate the reliability of online information sources were allocated as outcome variables. In contrast, demographic variables of age, gender, profession, and telehealth experience across the six specified clinical activities were defined as independent variables. The multivariable logistic regression analysis results were presented as odds ratios (OR).

A chi-square test was completed to determine the distribution of males and females across different professions. A Shapiro-Wilk normality test was completed to examine age distributions across professions. A non-parametric Kruskal-Wallis one-way analysis test was completed to investigate differences in age distributions across professions. An alpha of 0.05 was used to determine significance.

Results

A total of 310 staff participated, with 287 (37% response rate) completed surveys included in the final analysis.

Median age was 37.5 years (range 23-71) (Table 1). Allied health provided the most responses (58.2%), followed by medical (30.7%) and nursing (11.1%), which was representative of the distribution of the workforce across outpatient and community therapy services. The demographic characteristics of the participants excluded from the data analysis ($n = 23$) were comparable to those included and are presented as Table S3.

Over half of participants (54.8%) reported they would prefer to return to providing in-person care with most or all of their patients beyond the COVID-19 pandemic. The low level of preparedness to continue using telehealth was not related to telehealth experience or the perceived ability of participants to find and understand health information to support patient care online (Supplementary file 1, Table S4 and Table S5). Participants using telehealth to provide scripts showed the highest preparedness rates to continue using telehealth (59%). Continued telehealth use was less likely across the five other clinical activities (43%-50%).

One-third of participants (n = 82) reported needing to provide a follow-up in-person care appointment for more than half of their patients seen for a telehealth appointment. Of these, 61 (82%) were allied health, 10 (12%) medical, and 9 (11%) nursing.

Figure 1 provides an overview of the preferred online information sources for health-related information by profession. The hospital intranet (89%) and Google (82%) were reported as the most frequent sources of information, particularly amongst allied health (94%/85%) and nursing (95%/86%). In contrast, medical were found to use Therapeutic Guidelines (an Australian point-of-care clinical resource) (94%) and UpToDate (an electronic clinical resource tool) (91%) most frequently.

After adjusting for age, gender, and telehealth experience, medical and nursing were found to have a significantly higher likelihood of continued telehealth use than allied health, with medical and nursing reporting at least three and at least six times greater odds, respectively

Table 1. Demographic characteristics of the sample population (n = 287)

Independent variable	*n*	Participants that responded (%)
Age (years)		
20-29	50	21.0
30-39	80	33.6
40-49	62	26.0
>50	46	19.3
No response	49	
Gender		
Female	212	73.9
Male	75	26.1
Healthcare profession		
Nursing	32	11.1
Medical	88	30.7
Allied health	167	58.2
Experience using telehealth across clinical activity		
Triage and screening (*n* = 219)	160	73.0
Detailed assessment (*n* = 254)	224	88.2
Provision of scripts (*n* = 157)	84	53.5
Advice about treatment options (*n* = 246)	208	84.5
Provision of a treatment plan (*n* = 248)	217	88.2
Follow-up (*n* = 258)	236	91.5
Highest level of education		
Certificate/Diploma	22	7.9
Bachelor	146	52.9
Grad Certificate	33	12.0
Masters	65	23.6
Doctorate	10	3.6
No response	11	
Years of professional experience		
≤5	43	21.1
6-9	32	15.7
10-19	75	36.8
20-29	34	16.7
>30	20	9.9
No response	83	
Frequency of internet use		
Weekly	2	1.1
Daily	173	98.8
No response	112	
Prior attendance at a telehealth education training session		
≤6 months	37	21.1
>6 months	39	22.3
Have not completed telehealth training	99	56.6
No response	112	

Note: Percentages may not add up to 100% due to rounding.

(Table 2, Table S4). These associations were significant across all six clinical activities (medical $P \leq 0.009$; nursing $P \leq 0.023$). Consistent for both medical and nursing, the clinical activities found to have the most incredible odds of continued telehealth use were the provision of scripts (medical OR: 5.9, 95% CI [1.7,20.7]; nursing OR: 9.1, 95% CI [1.4,60.3]), and detailed assessment (medical OR: 4.9, 95% CI [2.1,11.9]; nursing OR: 9.8, 95% CI [2.3,41.8]). Profession, age, gender, and telehealth experience explained approximately 6.5%-10% of the variability (R^2) in preparedness to continue using telehealth across the six clinical activities.

No association was found between the perceived ability to evaluate the trustworthiness of online information sources and demographic variables (Table 3, Table S5). For participants in which triage and screening were relevant to their role, a significant association was found in univariate analysis between gender and perceived ability to evaluate online information sources ($P = 0.036$). However, this was insignificant in the adjusted multivariable model ($P = 0.065$). Profession, age, gender, and telehealth experience explained approximately 2.5%–5% of the variability (R^2) in the perceived ability to evaluate online information sources across the six clinical activities. No significant association was found between preparedness to continue using telehealth with perceived ability to evaluate online information sources and demographic variables (Supplementary file 1, Table S6).

Discussion

This study found that more than half of HCPs would prefer to return to in-person care beyond the COVID-19 pandemic, with medical staff the most likely to continue to deliver care virtually (60%) and allied health the least likely (36%). There was no association between continued telehealth use and age, gender, telehealth experience, or perceived ability to evaluate the reliability of online information sources.

The results from our study suggest a hesitancy toward continued telehealth use amongst some HCPs. While limited research explicitly examines preparedness to continue using telehealth beyond the COVID-19 pandemic, some international research has found the intention to use telehealth technology low amongst HCPs (12). Other research has found it to be moderate (23-27) or high (10,28,29). Comparable to this study, research has found the profession to be significantly associated with the perceived usefulness of technology (10). In contrast, other research has found no relationship with the profession but has found age (11), gender, or experience with using telehealth to be associated (12). The pattern of hesitancy provides a clear indication that the nature of the goals of the consultation is likely to affect the acceptance of telehealth. Some components of healthcare delivery are more complex if you can't see or take physical measures of the patient.

Of the international research published to date, no consistent instrument has been used to measure

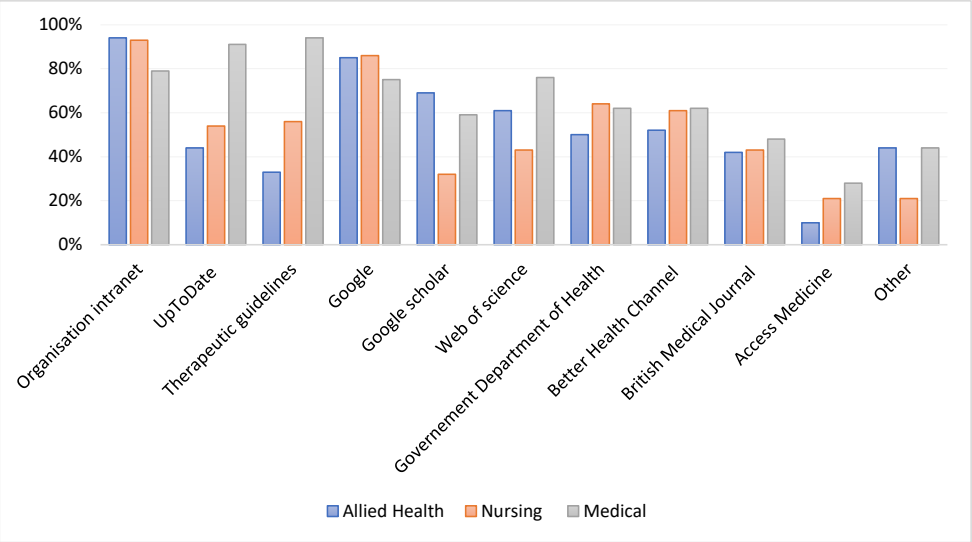

Figure 1. Preferred online information source by profession

Table 2. Association of preparedness to continue using telehealth with demographic variables using multivariable logistic regression presented as OR.

	Gender	Age (years)	Telehealth experience	Profession (nursing)	Profession (medical)	R^2 (%)
Triage and screening	0.64	0.97	0.79	8.05	3.04	6.5
Detailed assessment	0.73	0.97	1.66	9.84	4.94	9.5
Provision of scripts	0.39	0.95	1.04	9.06	5.93	10.2
Detailed advice about treatment options	0.69	0.98	1.75	7.52	4.08	7.9
Provision of a treatment plan	0.72	0.98	1.77	8.27	4.32	7.8
Follow-up	0.66	0.98	1.99	6.06	4.34	7.7

Table 3. Association of perceived ability to evaluate the reliability of online information sources with demographic variables using multivariable logistic regression presented as OR.

	Gender	Age (years)	Telehealth experience	Profession (nursing)	Profession (medical)	R^2 (%)
Triage and screening	2.84	1.01	1.57	1.97	2.34	4.4
Detailed assessment	0.43	0.98	1.01	2.52	3.31	4.3
Provision of scripts	0.55	0.98	1.04	1.59	2.53	2.4
Detailed advice about treatment options	0.43	0.99	1.06	1.84	2.57	3.2
Provision of a treatment plan	0.47	0.99	1.32	1.86	2.47	3.0
Follow-up	0.47	0.98	1.80	2.59	3.39	4.7

technology readiness within the healthcare workforce, and this may have contributed to the differences found across studies (10,12,23-25,28). Another explanation may relate to differences in the settings and sample populations studied. Some research has examined the technology readiness of HCPs across a range of care settings (23,27-29), whereas other research has focused specifically on HCPs within inpatient (12,25) or community settings (10,24,26).

Our study indicates that telehealth integration varies across professions, with medical staff finding it particularly advantageous for diagnoses and prescribing, in contrast to traditional in-person care interactions. A potential factor contributing to the reluctance of allied health to continue telehealth provision may be a perceived need to have physical contact as part of care delivery, a finding supported by other studies (25,30). For telehealth to be effectively established within a multidisciplinary setting, the needs and preferences of all user groups and the nature of the tasks (e.g., scripts versus mobilization) should be considered (25). Other potential factors influencing hesitancy amongst HCPs for continued telehealth use may be the readiness of healthcare organizations to facilitate this model of care and patient preferences for in-person care consultation.

To broaden the nature and scope of care delivery via telehealth, healthcare organizations may benefit from investing in technologies that can make telehealth approaches equivalent or even superior to in-person care. Simulation-based innovations (e.g., virtual reality/augmented reality-enabled applications on portable devices) are emerging tools within the healthcare sector

that provide opportunities to supplement traditional in-person care (31-34). Simulation-based technologies will likely enhance telehealth care as they enable patients to be treated virtually, with performance data transmitted to the treating HCPs to monitor progress and provide feedback.

Most participants (89%) in this study reported they could identify reliable online information sources most or all of the time. This finding contrasts with other self-report studies that have found many HCPs lack confidence in appraising health information sources and applying the information to patient care (35-37). Interestingly, while participants in our study felt confident in their ability to evaluate online information sources, many reported using sources that are considered to be less reliable. Further training within the healthcare workforce may be required to build capability in evaluating and critiquing online information sources used to support patient care (38,39). Our finding that the hospital intranet was a primary source of trustworthy information also suggests that there is both a responsibility and an opportunity for healthcare organizations to provide staff with access to up-to-date clinical guidelines to guide their care, as well as provide links to other trustworthy sources of information on the internet.

Our study has several strengths and limitations. The response rate (37%) was comparable with related international research (mean 25.7%, range 4.5%–53%) (10-12,23,24,26-29). This is a single-site study, and findings may not be generalizable to other care settings. However, the population sample across professional groups provides a good representation of Northern Health's outpatient and community therapy workforce, and this workforce seems unlikely to differ significantly from similar hospitals. While our survey has been assessed for face and content validity, an assessment of construct validity using exploratory or confirmatory factor analysis might also be helpful. Finally, while several strong associations with demographic characteristics were identified, an R^2 value of 6.5%-10% indicates that considerable variability remains in determining an individual's preparedness for continued telehealth use. Further research is required to explore the influence of other variables not accounted for within this study. It would be of additional benefit if this research comprised multiple hospitals and a more excellent cohort of participants across all professional groups.

Conclusion

More than half the HCPs participating in this study reported that they would prefer to return to in-person care beyond the COVID-19 pandemic. Nursing and medical professionals were more likely than allied health professionals to want to continue telehealth use. We also found that nursing and allied health professionals were more likely to seek information to support patient care from unreliable online sources. These findings will be of value to policymakers, educational institutions, and healthcare organizations in the development of targeted training, as well as the engagement of the healthcare workforce in the use of telehealth technology to support patient care. In addition, new methods that use technology that address some of the current limitations of virtual models for HCPs who primarily provide 'hands-on care' might allow greater adoption of virtual care.

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Authors' Contribution

Conceptualization: Rebecca Jessup, Ron Borland, and Brian Oldenburg.
Data curation: Angela McLoughlan.
Formal analysis: Angela McLoughlan, Adam Semciw, Hanife Mehmet, and Rebecca Jessup.
Investigation: Angela McLoughlan, Adam Semciw, Hanife Mehmet, and Rebecca Jessup.
Methodology: Adam Semciw, Rebecca Jessup, Ron Borland, and Brian Oldenburg.
Project administration: Angela McLoughlan.
Software: Angela McLoughlan, Adam Semciw, Ron Borland, Brian Oldenburg, Alison Beauchamp, Hanife Mehmet, Rebecca Jessup.
Supervision: Adam Semciw and Rebecca Jessup.
Visualization: Adam Semciw and Angela McLoughlan.
Writing–original draft: Angela McLoughlan.
Writing–review & editing: Angela McLoughlan, Adam Semciw, Ron Borland, Brian Oldenburg, Alison Beauchamp, Hanife Mehmet, Rebecca Jessup.

Competing Interests

The authors declare that there is no conflict of interest.

Ethical Approval

This study was approved by the NH Human Research Low-Risk Ethics Committee (study no. 65870). Privacy and confidentiality were maintained throughout the study, with results aggregated and reported concerning proportions and percentages of the data set to maintain participant anonymity. All staff participants provided Informed consent for publication with completion of the survey, which was made explicit in the survey explanatory statement. The method of consent was approved by the ethics committee.

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Supplementary files

Supplementary file 1 contains Tables S1-S6.

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