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Original Research | He Rangahau Motuhake

New Zealand Nurses Use and Perception of Digital Health During the COVID-19 Pandemic

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Nursing Praxis in Aotearoa New Zealand

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Globally nursing practice changed in 2020 with the outbreak of the COVID-19 pandemic and a rapid increase in the use of digital health technologies by nurses. This 2022 study is part of a wider international project investigating nurses' use and perception of digital technologies during the COVID-19 pandemic with data collected through an anonymous online survey of nurses. This paper reports on the Aotearoa New Zealand arm of the study where 191 nurses from a range of clinical settings, including acute hospital care, mental health and addiction services, and community care, completed the online survey. The majority of technologies used by nurses were online communication tools (n=48; 29.5%), electronic patient records (n=41; 25.2%), or patient monitoring/data sharing (n=40; 24.5%). Nearly two thirds of the nurses (n=62; 61%) considered they had received sufficient training to use the technology effectively. Nurses rated usability of systems using the System Usability Scale (SUS) and patient monitoring/data sharing systems and electronic prescribing achieved scores above 70, indicating good usability. However, electronic patient records had the lowest System Usability Scale score suggesting these were not found to be as easy to use as other technologies. Recommendations from this work include that nurse leaders and academics also need to consider the digital health technologies training and education needs to ensure an appropriately trained workforce. Furthermore, it is recommended that the international collaborative work continues as this may assist in planning and preparing New Zealand and international nurses for use of digital health now and for future pandemic events.

Te Reo Māori Translation

Te whakamahinga, me ngā whakaaro o ngā tapuhi o Aotearoa, o te hauora matihiko i te wā o te urutā COVID-19

Ngā Ariā Matua

I panoni ngā tikanga mahi tapuhi i te tau 2020, i te pānga o te urutā COVID-19, me te pikinga hohoro o te whakamahinga o ngā hangarau hauora matihiko e ngā tapuhi. He wāhanga tēnei rangahau mai i 2022 nō tētahi rangahau ā-ao whānui kē atu e tūhura nei i te whakamahinga me ngā whakaaro o ngā tapuhi mō ngā hangarau matihiko i te wā o te urutā COVID-19. i kohia mā ētahi raraunga mai i tētahi uiuinga ipurangi ingoa-muna o ngā tapuhi. Ka tuku pūrongo tēnei tuhinga mō te wāhanga o Aotearoa o tēnei rangahau, i whakaotingia ai te uiuinga ipurangi e ētahi tapuhi 191 mai i te huhua o ngā horopaki tiaki tūroro, tae atu ki te tiaki mate hōhipera taumaha, ngā ratonga hauora hinengaro, waranga hoki, me te tiaki hapori. Ko te nuinga o ngā hangarau i whakamahia e ngā tapuhi ko ngā taputapu whakawhiti kōrero tuihono (n=48; 29.5%), ngā rēkoata tūroro matihiko (n=41; 25.2%), te aroturuki tūroro matihiko/whakawhiti raraunga matihiko rānei (n=40; 24.5%). Tata ki te rua hautoru o ngā tapuh i kī (n=62; 61%) i rahi anō ngā whakangungu i a rātou i whai hua ai tā rātou whakamahi i aua hangarau. I whakatau ngā tapuhi i te ngāwari o ngā pūnaha ki te whakamahi mā te whakamahi i te Inenga Ngāwaritanga Whakamahi Pūnaha [System Usability Scale] (SUS) ā, i tohua ngā pūnaha arotake tūroro/

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whakawhiti raraunga me te whakahau rongoā matihiko ki ngā tatau neke atu i te 70, heoi anō, he tohu tēnei he pai te ngāwari o te whakamahi. Ahakoa tērā, ko ngā pūkete tūroro matihiko i pāpaku rawa te Inenga Ngāwaritanga Whakamahi Pūnaha [System Usability Scale], ā, te āhua nei kāore ēnei i rite ki tērā atu hangarau ki te whakamahi. Ko ngā tūtohu whai muri i ēnei mahi, kia āta whakaaro ngā kaihautū tapuhi me ngā kairangahau mō te taha whakangungu hangarau hauora matihiko, me ngā hiahia akoranga, kia tika ai te whakaputa ohu kaimahi i āta whakangungua. Waihoki, ko te tūtohu kia haere tonu ngā mahi pāhekoheko ā-ao nā te mea mā konei ka pai ake te whakamahere me te whakatikatika i ngā tapuhi o Aotearoa, o te ao hoki mō te hauora matihiko o nāianei, me ngā urutā o raurangi.

INTRODUCTION

Healthcare changed in 2020 when the COVID-19 pandemic swept the world. Aotearoa New Zealand, like most other countries, entered into over two years of various stages of lockdowns, restrictions and border controls (Kvalsvig & Baker, 2021). Internationally the COVID-19 pandemic highlighted that digital health could be employed as an effective tool to support healthcare delivery to counter the challenges of viral infection prevention and control, including staff deployment, the need to isolate patients, and protect healthcare staff, including nurses (Reich & Elward, 2022; Shen et al., 2021; Shuster & Lubben, 2022; Taylor et al., 2020; Wang et al., 2021). However, little is understood about New Zealand nurses' use and perception of digital health. Providing insight into nurses' preparedness and concerns, could inform future planning for pandemic events.

Globally, the COVID-19 pandemic produced rapid changes in the delivery of health services (Shuster & Lubben, 2022). In the early stages of the pandemic, the healthcare systems in many countries were completely disrupted and stretched beyond capacity while trying to meet the complex healthcare requirements of COVID-19 patients (Gostin et al., 2020; Haileamlak, 2021). The use of digital health technologies, such as shared electronic health records, video conferencing consultations, digital patient monitoring and coordination of patient care, rapidly accelerated as a result of the COVID-19 pandemic (Lee et al., 2022). One aspect of digital health that epitomises the changes wrought by COVID-19 was the increased use of telehealth, which is defined as the delivery of healthcare services using digital tools in situations where distance is a factor (Monaghesh & Hajizadeh, 2020). Telehealth reduced the burden of physical presence of patients and healthcare professionals during the high-risk phase of COVID-19 (Pienaar et al., 2021; Taylor et al., 2022). A further example of a digital health initiative was the introduction of "Hospital in the Home" (HITH) model of care which combined secondary care oversight with nursing and allied health community-based care using patient monitoring so that patients in Aotearoa New Zealand could receive on-going care at home (Westbrooke, 2024).

The impact of COVID-19 on the nursing workforce cannot be underestimated (Jackson et al., 2020). COVID-19 not only accelerated the use of digital technologies, defined here as the use of computing platforms, software, sensors and connectivity for healthcare related uses (Food and Drug Administration (FDA), 2025), it also brought about changes in the role of nurses (Isidori et al., 2022). A scoping review of literature from 2011-2021 that explored the role and experiences of nurses use of digital health technologies, including during the first phase of the COVID-19 pandemic, highlighted that nurses needed to be flexible; use enhanced communication skills to adapt to digital and virtual interactions; and that training and nursing leadership was important to support the use of new technologies (Isidori et al., 2022).

A 2020 survey of New Zealand nurses (n=220) during the first nationwide lockdown indicated that nurses use of technology had increased but they reported issues around access, including access to people, support, resources, connectivity, and challenges with existing information systems (Collins & Honey, 2021). While access to peers and colleagues improved as a result of digital health implementation, access to quality support, the need for better connectivity, and having access to the necessary resources, were all highlighted as areas of concern (Collins & Honey, 2021). However, this 2020 survey reflected only the experiences of a sample of nurses in the initial months of Aotearoa New Zealand's COVID-19 response. This 2022 survey of nurses provided further knowledge of nurses' use and perception of digital technologies later in the COVID-19 pandemic.

METHODS

The aim of this 2022 study was to explore nurses' use and perception of digital technologies during the COVID-19 pandemic. The authors were invited to collaborate in this study because of nursing connections developed through the International Medical Informatics Association Nursing Informatics group (IMIA NI). This study was undertaken as part of an international project, where each country used the same survey tool. Only the results from Aotearoa New Zealand are reported here. Ethical approval for the Aotearoa New Zealand arm of the study was obtained from the University of Otago (ref. 22/070), which included ethical approval from the Ngāi Tahu Research Consultation Committee (ref. 6043_23423).

The survey tool

The questionnaire was designed by UK academics and nurses (Dowding et al., 2023) based on the non-adoption, abandonment, scale-up, spread, and sustainability (NASSS) framework (Greenhalgh et al., 2017). The survey took the form of a questionnaire that included fixed responses and open-ended questions. Items with fixed responses included

questions such as "Have you received enough training to use the technology effectively?" with response options provided of "yes", "no" or "somewhat". The NASSS framework was used as it supports exploration across seven domains including: the condition or illness, technology, value proposition, adopter (which can be healthcare professionals, patients and/or carers, and the organisation), the wider context, and embedding and adaptation to technology (Greenhalgh et al., 2017). Nurses were also asked to consider their experience and the usability of up to three digital technologies they had encountered during the pandemic with usability assessed through the System Usability Scale (SUS) (Brooke, 1996). The SUS comprises 10 questions asking respondents to rate statements about their use of the technology or system from "Strongly Agree", "Somewhat Agree", "Neither Agree nor Disagree", "Somewhat Disagree" to "Strongly Disagree." SUS generates scores from 0 to 100, with higher scores indicating better usability of that particular piece of technology or system. Typically, a SUS score above 70 indicates good usability (Bangor et al., 2009). Finally, there were some questions about their attitude to the use of digital health and demographic questions, which in Aotearoa New Zealand was limited to the region they worked in and their area of practice.

The survey was created and delivered using Qualtrics (www.qualtrics.com) which allowed for anonymous participation from nurses anywhere in the country. Distribution used a snowball method (Polit & Beck, 2017) which has been recognised as a particularly useful method during a pandemic (Pocock et al., 2021). This involved a recruitment email being sent to the professional networks of two of the authors and the same message being shared via social media, including the Health Informatics New Zealand Nursing and Midwifery Special Interest Group (HiNZ-NMI), the Clinical Informatics Leadership Network (CiLN), and through social media channels (LinkedIn, Facebook, and Twitter), with nurses being asked to consider participating and to pass the invitation on to other nurses. We did not perform a priori sample size calculation due to the exploratory nature of the study. The criteria for inclusion were a New Zealand registered nurse who had worked clinically during the pandemic. Participants indicated consent when commencing the online Qualtrics survey questionnaire, and this was confirmed when the questionnaire was submitted. The questionnaire was anonymous and to protect the anonymity of participants minimal personal information was collected.

Data analysis

The data from the online questionnaire was collated automatically by Qualtrics. It was then transferred to an Excel spreadsheet for further analysis. For the close-ended questions, responses were summarised using descriptive statistics, for example frequency and percentages. Open-ended responses were collated. The SUS scores were calculated based on Brooke's method, wherein the SUS Score equals (X + Y) x 2.5; where X denotes the sum of scores for all odd-numbered questions minus 5, while Y represents 25 minus the sum of scores for all even-numbered questions (Brooke, 1996). In total 191 questionnaires were submitted, however only 163 (85%) were fully completed and provided information regarding at least one technology. The SUS questionnaire component was not completed by 35 participants, meaning results from 128 respondents were available for analysis for that section. We further applied analysis of variance (ANOVA) to determine if there were statistically significant differences in SUS scores between the different technology types.

Table 1. Summary of nurse's area of practice (n=191)

Area of practice	n (%)
Community nursing	34 (17.8)
Surgical and perioperative care	27 (14.1)
Mental health and addiction services	21 (11.0)
Nursing administration, management & education	17 (8.9)
Intensive care/cardiac care	16 (8.4)
Medical	16 (8.4)
Obstetrics, maternity and child health, neonatology	16 (8.4)
Oncology	10 (5.2)
Accident and emergency	9 (4.7)
Assessment & rehabilitation	3 (1.6)
Other	22 (11.5)
TOTAL	**191**

RESULTS

Participants worked in different clinical settings (Table 1) and were located throughout Aotearoa New Zealand. The most common areas of practice were in community nursing (n=34; 17.8%), surgical and perioperative care (n=27; 14.1%) and other areas of practice (n=22; 11.5%). Other areas of practice included managed isolation and quarantine (MIQ) and infection prevention and control.

When asked if their access to technology had changed since the beginning of the COVID-19 pandemic, the majority of nurses (n=118; 70%) responded "yes".

Types of technology

Nurses were asked what specific technologies they were using and these are reported based on their primary function (Table 2), with the most common being online communication (n=48; 29.5%), accessing electronic patient records (n=41; 25%), and patient monitoring/data sharing (n=40; 24.5%). Online communication included zoom meetings; communication between patients and staff as well as between staff; video calls, landline and mobile calls, through an app or other form of communication technology. Patient monitoring and data sharing included responses such as monitoring vital signs, access to ordering tests, the national

Table 2. Technology types in use by nurses

Type of Technology (main function)	n (%)
Online communication	48 (29.5)
Electronic patient records	41 (25.2)
Patient monitoring/data sharing	40 (24.5)
Information System	14 (8.6)
Virtual appointments	12 (7.4)
E-prescribing	8 (4.9)
Total	**163**

contact tracing system that was used during the COVID-19 pandemic, and contact tracing. Electronic(E)-prescribing included electronic prescription and medication administration. Nurses were asked if the technology was already in place prior to COVID-19 or if it was new to the organisation. Half of the technology was already in place (n=59; 50%), with 37% (n=44) being new, and the nurses were unsure for the other technologies. When questioned who the target users for the technology were, most were reported as being for nurses (n=112; 36%), with doctors (n=91; n=29%) and administrative staff (n=57; 18%) being the next most common target users; trailed by technologies for patients (n=30; 10%) and carers (n=17; 5.5%).

Factors impacting technology use

Nurses were asked, "Have you received sufficient training to use the technology effectively?" and the majority (n=62; 61%) said yes; with a further 31 (30%) reporting "somewhat", and 9 (8%) considering they did not have sufficient training. Nurses were also asked, apart from training needs, if there were factors that impacted how they and other staff use the technology, with nearly three quarters (n=74; n= 73%) responding "yes". Participants also had the opportunity to respond in free text to this same question. The responses are themed into three categories and presented in Table 3.

Usability of technology systems

Nurses were then asked to rate the usability of specific technology they had used using the SUS rating scale, however, this was not completed by 35 participants, meaning results from only 128 respondents were available for analysis (Table 4).

The scores generated exhibited variability among the technology types, as shown in Table 4 and shown graphically in Figure 1. Among these patient monitoring/data sharing systems and E-prescribing had mean SUS scores above 70, while electronic patient records had the lowest mean SUS score at 65.2. Notably, there were significant SUS score ranges within each technology type. For instance, the SUS score for patient monitoring/data sharing ranged from 42.5 (indicating very poor usability) to 100 (indicating optimal usability). We found no statistically significant differences in SUS scores between the technology types. A statistical test was conducted to compare the scores across different technology types. The results were $F(5, 127) = 1.56$, $p = 0.18$. The F value represents the ratio of variability between groups compared to within groups. The numbers in parentheses (5, 127) indicate the degrees of freedom for the groups being compared. The p-value of 0.18 tells us that the result is not statistically significant, meaning there is no strong evidence to suggest that the usability scores differ across the technology types, indicating that the perceived usability of these digital technologies is similar across the different types.

DISCUSSION

The United Nations, citing the WHO Director-General, cautions that nations must strengthen their response to disease and prepare for future pandemics and other global threats (United Nations, 2023). This study, undertaken in 2022 towards the end of the worst of the impact of COVID-19 in Aotearoa New Zealand, provides a baseline understanding of nurses' use of and perception of digital health at that time. The implications for nurses are potentially significant as the results can be used to guide the development, refinement and implementation of digital health technologies now and in preparation for the next pandemic.

This study found nurses were adaptable to the significant changes that occurred and that while the majority (70%) had experienced a change in their access to technology, half reported the technology they used was already in place before the pandemic started. Nurses found the easiest to use digital health tools were for patient monitoring/data sharing and E-prescribing. Nurses are significant users of remote patient monitoring, for example in hospital in the home models of care and, therefore, their satisfaction and usability of these systems needs to be at a high level. The use of such digital health technologies shows considerable promise by promoting effective and efficient care, are considered safe, and can decrease costs to the healthcare system (Westbrooke, 2024; Whitehead & Conley, 2023).

While patient monitoring/data sharing and E-prescribing were found to be relatively easy to use, the finding that electronic patient records were reported as the least easy-to-use technology, is important. Electronic patient records were the second most common form of technology reported as used by nurses in this study, but results show that it scored the lowest in terms of usability. Such technology is fundamental to the effectiveness of other digital health technologies. For example, Patel et al. (2023) suggested that remote patient monitoring for people with COVID-19 is not only safe, but it can also contribute to shorter hospital stays. However, the effectiveness of care requires sharing patient information through electronic patient records and if users struggle with such technology, then the opportunities for remote patient monitoring are diminished (Westbrooke, 2024).

The introduction of E-prescribing in Aotearoa New Zealand was accelerated during COVID-19 to reduce the risk of contact between health professionals and patients (Imlach et al., 2021), following an international trend (Lynch & O'Leary, 2021). This study found nurses consid-

Table 3. Factors that impact on how staff use the technology

Factor that impacted on staff using the technology	Example responses from participants
Digital literacy	• Varied IT capability of the team. • Varied levels of computer literacy. • Primarily varied levels of computer literacy, but also not all staff are trained for all levels of functionality. • Varied levels of computer literacy usually related to the older cohort of nurses. • Computer literacy comes into decisions to use - have heard others 'blaming' the technology and I think it is more about their literacy.
Confidence of staff to use the technology	• Some of the staff are not confident with the technology. • As with any new system there was a process of familiarisation and support required. • Confidence in using technology at work (even if use technology a lot in private life, they don't always translate this to work technology). • Time poor to learn new systems • IT skills and willingness to learn new systems.
System issues	• System can be slow. Easy to lose progress if not used consistently. Wi-Fi dependent. • Not enough support equipment in clinical environments such as speakers and cameras. If you needed help you have to wait a long time to talk to IT. • It is painfully slow, and very buggy. Would often crash. Some functions within the program would not work as they should. • It could be tricky to use and using between organisations.

Table 4. Technology types in use by System Usability Scale *complete* and System Usability Scale *missing

	n (%)	
Type of Technology (main function)	**SUS (complete)**	**SUS (missing)**
Online communication	35 (27.3)	13 (37.1)
Electronic patient records	32 (25.0)	9 (25.7)
Patient monitoring/data sharing	34 (26.6)	6 (17.1)
Information System	11 (8.6)	3 (8.6)
Virtual appointments	11 (8.6)	1 (2.9)
E-prescribing	5 (3.9)	3 (8.6)
Total	**128**	**35**

Table 5. System Usability Scale scores by technology type ranked by mean System Usability Scale score

Type of Technology (main function)	Range	Mean SUS score (SD)
Patient monitoring/data sharing	42.5-100.0	76.7 (16.0)
E-prescribing	57.5-90.0	73.3 (15.1)
Online communication	32.5-100.0	69.4 (16.4)
Virtual appointments	22.5-95.0	67.3 (21.2)
Information system	27.5-100.0	65.5 (21.2)
Electronic patient records	32.5-100.0	65.2 (20.9)

ered the technology related to E-prescribing easy to use. Post COVID-19, E-prescribing has continued and although the cost to patients has been reported as a barrier it is offset by the extra convenience of prescriptions being able to be sent electronically to a pharmacy (Imlach et al., 2021).

While this 2022 study found most nurses (91%) considered they had sufficient or somewhat sufficient training to use the technology effectively, this is contrasted by our previous 2020 survey of nurses which reported issues in terms of access to resources and support (Collins & Honey, 2021). Training is well recognised as essential for engagement with digital health (Isidori et al., 2022; Lee et al., 2022), including for using electronic patient records (Alhur, 2023). Training is noted as especially needed before times of crisis, such as the COVID-19 pandemic (Shuster & Lubben, 2022). Changes to the Nursing Council of New Zealand (NCNZ) new *Standards of competence for registered nurses* in 2025 requires nurses to demonstrate their "digital capability"

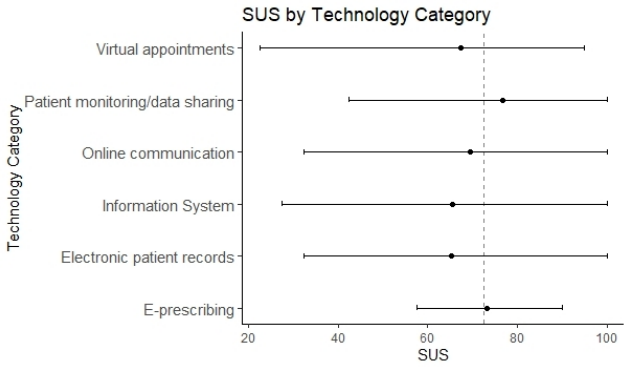

Figure 1. System Usability Scale score with 95% confidence intervals by technology type

*Vertical dashed line is at SUS=72.5

(NCNZ, 2025, p. Descriptor 4.8). In our recent editorial (Honey & Collins, 2025), we identified the imperative for nursing education providers and healthcare organisations to determine the education and training required for nurses to optimally use digital health technologies.

Limitations and future research

Limitations of this study include that only nurses interested or comfortable using technology may have responded. Although a priori sample size calculation was not conducted for this study, the sample of 191 responses were considered sufficient, which is supported by a similar United Kingdom study with 55 responses that yielded valuable insights (Dowding et al., 2023). Also, a survey reports only on one point in time. Therefore, repeating this survey in five years is recommended to again explore nurses' adoption of digital health initiatives and what issues remain. Five years is recommended, as recent changes at the government level indicate a change in funding for data and digital initiatives (McBeth, 2024). Demographic data was not collected and this study is unable to comment on whether or not this was a representative sample of the nursing workforce. Future surveys should include demographic data, including age, ethnicity, year of registration, and postgraduate education.

This study found a range of SUS scores and while a mean SUS score above 70 indicates good usability (Bangor et al., 2009), just focusing on the mean may ignore potential opportunities to improve system usability. Future qualitative research is needed to explore barriers and solutions for supporting use of all digital health systems and their interconnectedness. Further research should consider the impact and experiences of digital health technologies from a patient's perspective and how digital health technologies affect interprofessional communication and care. Further, these Aotearoa New Zealand results may be better understood in comparison to other countries. Collaborative research is in progress and may assist in forming an international view of what is needed for planning and preparing nurses for use of digital health now and in future pandemic events.

CONCLUSION

This study has shown that there was a range of technologies used by nursing in the day-to-day delivery of patient care in Aotearoa New Zealand during the COVID-19 pandemic and generally the usability of those technologies, particularly patient monitoring/data sharing and E-prescribing, were adequate. The data collected supports the trend towards increased remote patient monitoring/data sharing and E-prescribing platforms as an adjunct to patient care. However, nursing satisfaction of these technologies does need to be considered, and barriers removed, if the technology is going to be used to its full capacity.

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Conflict of Interest

None

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