



Healthcare Personnel Readiness for Telemedicine Adoption: Advancing Service Quality at X Semarang Hospital: Technology Readiness Index

Muhammad Rafli Hz¹, Widya Ratna Wulan^{2*}, Arif Kurniadi³, Oki Setiono⁴

^{1,2,3,4} Faculty of Health Science, Universitas Dian Nuswantoro

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Abstract

The use of telemedicine in Indonesia has increased rapidly with the COVID-19 pandemic. To date, there are 300,000 users. The obstacle to implementing telemedicine for small medical facilities is that telemedicine is too expensive because it requires a significant investment to build and maintain it. The purpose of this study is to describe the readiness of health workers related to the use of telemedicine as a medium to support the quality of health services at X Hospital. This study was conducted from May to June 2024. The research method used was descriptive quantitative. This study measures the readiness of health workers according to the TRI (Technology Readiness Index) method. The subjects of this study were 23 respondents selected by accidental sampling. The results showed that most respondents' optimism towards telemedicine was good (87%). However, most respondents also felt uncomfortable with the use of telemedicine (73.9%) and felt unsafe using telemedicine (87%). Hospitals should provide more in-depth training on telemedicine technology and platforms for healthcare workers.

Correspondence Address:

Faculty of Health Science,
Universitas Dian Nuswantoro
Nakula 1 Street No. 5-11
Semarang, Indonesia

E-mail:

widya.ratna.wulan@dsn.dinus.ac.id

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Introduction

The Global COVID-19 pandemic worldwide, according to these confirmed cases until April 6, 2023, reached 762,201,169 instances with 6,893,190 dead patients. There have been 13,337,398,544 vaccine doses administered. The COVID-19 virus has infected more than 400 million people worldwide. Data from the WHO Southeast Asia shows the current problem is 60,824,025, and the global death problem is 732,454 (World Health Organization, 2022). The COVID-19 pandemic in Indonesia has reached 6,751,662 cases, 6,584,006 of which have been recovered, and 161,057 have died. (Satuan Tugas Penanganan COVID-19, 2022). Moreover, there are also several medical personnel who have become victims of COVID-19 from March 2020 to April 2023, resulting in 2,087 deaths. (Pusara digital tenaga kesehatan, 2022).

The government urges the public to maintain post-COVID health protocols. Social physical distancing health protocols require health professionals to use technology to create a sense that can help provide medical services to patients through patient referral, health education, counseling and response to needs (Dosaj et al., 2021). The COVID-19 pandemic increased the use of telemedicine technology in secure virtual

communication with doctors and health professionals to minimize the spread of disease (Imlach et al., 2020).

Efforts to prevent the transmission of disease outbreaks are also carried out by minimizing non-urgent community visits to health facilities, and helping people at high risk of COVID-19 connect with official government referral health facility services. In connection with this, the government urges all health workers (including doctors, specialists, dentists, specialist dentists and subspecialist doctors) who are most at risk of contracting and the public to utilize telemedicine services. (Circular Letter Number HK.02.01/MENKES/303/2020 concerning the Implementation of Health Services Through the Utilization of Information and Communication Technology in the Context of Preventing the Spread of Corona Virus Disease 2019 (COVID-19), 2020).

Regulation of the Ministry of Health of the Republic of Indonesia number 20 of 2019 concerning the implementation of telemedicine services between health service facilities to bring special medical services closer. Many efforts have been made in remote and isolated areas, including information technology in the health sector through health-related consulting services. Specific arrangements for telemedicine services are expected to achieve safe, quality, anti-discriminatory and effective telemedicine services that prioritize patient interests and safety. (Regulation Of The Minister Of Health Of The Republic Of Indonesia Number 20 Of 2019 Concerning The Implementation Of Telemedicine Services Between Health Care Facilities, 2019).

The use of telemedicine in Indonesia is increasing rapidly. To date, with the COVID-19 pandemic, there are 300,000 users, so it is very necessary in hospitals to facilitate health services. Therefore, in looking at previous articles, no one has examined the review of telemedicine at X Hospital. Therefore, this study will discuss the Readiness of Health Workers Regarding the Use of telemedicine as a medium to support the Quality of Health Services. (Alexandra et al., 2021).

Based on the initial survey conducted at X Hospital, it is known that the hospital has not implemented or used telemedicine. Based on the COVID-19 case at X Hospital, there is a policy on maintaining distance and avoiding crowds so as not to contract COVID-19. So, a telemedicine program is needed to facilitate health-related services due to the lack of knowledge about telemedicine.

Methods

The study was a descriptive study with quantitative methods and a cross-sectional design. The research was conducted at X Hospital. Data collection was carried out in May - June 2024. The research data source is primary data, with data collection techniques using a questionnaire. The population needed for the research to be carried out is all health workers at X Hospital listed in Law No. 36 of 2014 who are actively working from May to June 2024. The sample was selected purposively and accidentally, and sampled from the population using the Slovin formula. The sample consisted of medical record staff and nursing staff willing to fill out a questionnaire, with 23 respondents consisting of 7 medical recorders and 16 nurses.

This study uses TRI (Technology Readiness Index), a model consisting of constructs that induce (optimism and innovation) and inhibit (discomfort and insecurity) the use of technology. Hypotheses were tested to assess the impact of each of the four TRI factors on intention to continue using, the main dependent variable of the technology acceptance model.

This study only uses three variables. The first is Optimism, which measures health workers' enthusiasm for telemedicine. The second is Discomfort, which measures health workers' comfort or discomfort with telemedicine. The third is Insecurity, which measures whether or not health workers are safe using telemedicine.

The data analysis process is carried out using descriptive statistics based on the characteristics of respondents and three independent variables (Optimistic, discomfort, insecurity). After processing the data, an analysis is conducted. The data in this study is analyzed quantitatively, and then the data is analyzed using the Excel computer software application. The data analysis process is carried out using descriptive statistics seen from the characteristics of health workers including age, gender, last education, length of work, and seen from 3 dependent variables, namely independent (Optimistic, Discomfort, Insecurity) so that a definite analysis is taken about optimistic, discomfort and insecurity of health workers related to telemedicine.

Results

The research was conducted in May 2024 at X Hospital Semarang. This study used a questionnaire created through the Google Forms platform. The sample data used 23 respondents who were willing to complete the questionnaire.

Table 1. Frequency Distribution of Respondent Characteristics (n=23)

| Characteristics | f (%) |
|---------------------------------|--------------|
| Age | |
| 20-29 years old | 14 (60.9) |
| 30-39 years old | 9 (39.1) |
| 40-49 years old | 0 (0.0) |
| >50 years old | 0 (0.0) |
| Gender | |
| Male | 5 (21.7) |
| Female | 18 (78.3) |
| Education | |
| Diploma | 23 (100.0) |
| Bachelor's Degree | 0 (0.0) |
| Master's Degree | 0 (0.0) |
| Occupation | |
| Medical Personnel | 0 (0.0) |
| Nursing Personnel | 16 (69.6) |
| Physical Hygiene Personnel | 0 (0.0) |
| Medical Record Personnel (PMIK) | 6 (26.1) |
| Length of employment | |
| 0-1 year | 1 (4.3) |
| 1-2 years | 12 (52.2) |
| 3-4 years | 8 (34.8) |
| More than 4 years | 2 (8.7) |
| Computing Skills | |
| Beginner | 3 (13.0) |
| Standard | 19 (82.6) |
| Professional | 1 (4.3) |
| Training or seminars | |
| Yes | 3 (13.0) |
| No | 20 (87.0) |
| Did not participate | 0 (0.0) |
| Department where employed | |
| Medical Records Unit | 9 (39.1) |
| Outpatient Unit | 7 (30.4) |
| Total | 100.0 |

Table 4.1 indicates that most respondents were aged 20–29 (60.9%), followed by 30–39 (39.1%). Most were female (78.3%), with only 21.7% male. All participants held a diploma qualification (100%). The most significant proportion worked as nursing staff (69.6%), while the remainder were in medical engineering/PMIK roles (26.1%). In terms of work experience, most respondents had 1–2 years of service (52.2%), followed by 3–4 years (34.8%), >4 years (8.7%), and 0–1 year (4.3%). Computer skills were predominantly at the standard level (82.6%), with fewer beginners (13%) and professionals (4.3%). The vast majority (87%) had never participated in telemedicine-related training or seminars, and only 13% had such exposure. Respondents were distributed across departments, with the largest group in the Outpatient Unit (39.1%), followed by the Inpatient Unit (30.4%) and the Medical Records Unit (30.4%).

Table 2. Cross Tabulation Respondent Characteristics and TRI variables (n=23)

| Characteristic | Optimism | | Discomfort | | Insecurity | |
|-----------------------------------|-----------|----------|------------|------------|------------|-----------|
| | Positive | Negative | Comfort | Discomfort | Safe | Not Safe |
| Age | | | | | | |
| • 20 – 29 y.o | 13 (56.5) | 1 (4.3) | 4 (17.9) | 10 (43.4) | 1 (4.3) | 13 (56.5) |
| • 30 – 39 y.o | 7 (30.4) | 2 (8.6) | 2 (8.6) | 7 (30.4) | 2 (8.6) | 7 (30.4) |
| Gender | | | | | | |
| • Male | 4 (17.9) | 1 (4.3) | 3 (13) | 2 (8.6) | 1 (4.3) | 4 (17.9) |
| • Female | 15 (65.2) | 3 (13) | 3 (13) | 15 (65.2) | 2 (8.6) | 16 (69.6) |
| Education | | | | | | |
| • Diploma | 21 (70) | 3 (10) | 5 (16.6) | 18 (60) | 3 (10) | 20 (66.7) |
| Occupation | | | | | | |
| • Nursing Personnel | 14 (60.9) | 2 (8.6) | 1 (4.3) | 16 (69.6) | 0 (0) | 15 (65.2) |
| • Medical Record Personnel (PMIK) | 6 (26) | 1 (4.3) | 5 (16.6) | 2 (8.6) | 3 (13) | 5 (16.6) |
| Length of employment | | | | | | |
| • 0 – 1year | 1 (4.3) | 0 (0) | 0 (0) | 1 (4.3) | 0 (0) | 1 (4.3) |
| • 1 – 2 years | 11 (47.8) | 1 (4.3) | 2 (8.6) | 10 (43.4) | 0 (0) | 12 (52.2) |
| • 2 – 3 years | 6 (26) | 2 (8.6) | 1 (4.3) | 7 (30.4) | 1 (3.3) | 7 (30.4) |
| • ≥ 4 years | 2 (8.6) | 0 (0) | 2 (8.6) | 0 (0) | 2 (8.6) | 0 (0) |
| Computing Skills | | | | | | |
| • Begginer | 2 (8.6) | 1 (4.3) | 2 (8.6) | 1 (4.3) | 0 (0) | 3 (13) |
| • Standard | 17 (73.9) | 2 (8.6) | 3 (13) | 16 (69.6) | 2 (8.6) | 17 (73.9) |
| • Profesional | 1 (4.3) | 0 (0) | 0 (0) | 1 (4.3) | 1 (4.3) | 0 (0) |

The cross-tabulation indicates that younger healthcare personnel (20–29 years) exhibit the highest optimism toward telemedicine adoption (56.5%), suggesting greater openness to new technologies. However, their relatively high discomfort (43.4%) and insecurity (56.5%) may indicate a need for targeted training and confidence-building measures to translate optimism into effective adoption.

Gender differences are evident, with female respondents demonstrating substantially higher optimism (65.2%) compared to males (17.9%), yet also reporting higher levels of discomfort (65.2%) and insecurity (69.6%). This pattern suggests that while women in this sample are more receptive to telemedicine, they may face greater perceived barriers, potentially linked to workload expectations, role-specific challenges, or limited technological exposure.

Educational background is uniform (all diploma holders), yet substantial discomfort (60%) and insecurity (66.7%) suggest that formal qualifications alone are insufficient to ensure telemedicine readiness. This underscores the importance of continuous professional development focused on digital health competencies.

Occupational role appears to influence perception. Nursing staff exhibit higher optimism (60.9%) but also greater discomfort (69.6%) and insecurity (65.2%) than medical records personnel. This may reflect direct patient-care responsibilities, where telemedicine introduces significant workflow changes and heightened accountability.

Length of work experience shows a non-linear pattern: those with 1–2 years of experience report the highest optimism (47.8%) but substantial discomfort and insecurity, whereas staff with over 4 years' experience show no insecurity. This could indicate that mid-career personnel are more adaptable but require structured support during transition.

Computer skill level strongly correlates with both optimism and insecurity. Respondents with standard skills have the highest optimism (73.9%) and insecurity (73.9%), suggesting that partial proficiency may lead to awareness of the benefits of telemedicine alongside recognition of personal skill gaps. Targeted digital literacy programs could convert this group's optimism into confident adoption.

While optimism toward telemedicine adoption is notable across subgroups, elevated discomfort and insecurity—particularly among younger, female, and mid-career staff—suggest that successful implementation at X Hospital will require structured training, role-specific onboarding, and confidence-

building interventions. Leveraging the high optimism among specific subgroups and focused capacity building could accelerate readiness and reduce resistance to adoption.

Discussion

The combination of high optimism, substantial discomfort, and significant insecurity underscores a dual challenge for X Hospital: leveraging the workforce's openness to telemedicine while addressing their apprehensions and skill gaps. The demographic profile from Table 4.1 highlights target groups for intervention—particularly younger nursing staff with standard computer skills and limited telemedicine exposure. By prioritizing structured capacity-building, investing in reliable system infrastructure, and fostering an environment of technological confidence, the hospital can enhance readiness and ensure a smooth, sustainable telemedicine integration. (Ratna Wulan et al., 2024)

Optimism of Health Workers Regarding Telemedicine

The findings indicate that 87% of healthcare workers positively viewed telemedicine. This is particularly relevant given that younger staff and those in outpatient roles—most represented in this study—are often at the forefront of patient interactions and therefore stand to benefit most from improved accessibility and efficiency. Optimism positively influenced Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), explaining 69% and 63% of their variance, respectively, alongside innovativeness, discomfort, and insecurity. (Noprianto et al., 2017).

This aligns with the Technology Acceptance Model, suggesting that fostering optimism—especially among nursing staff with standard computer skills—can significantly enhance acceptance and integration of telemedicine systems. (Ratna Wulan et al., 2024)

Discomfort of Health Workers Regarding Telemedicine

Despite high optimism, 73.9% of respondents reported discomfort in using telemedicine. Notably, this aligns with the computer skills profile from Table 4.1, where most respondents were only at a standard proficiency level. Discomfort may be exacerbated by concerns over workflow disruption, time demands, and technical challenges such as system crashes or data entry inefficiencies. Nursing staff—who form the largest occupational group—may feel these challenges more acutely given their direct patient care responsibilities. This suggests that user-centered system design, targeted training, and technical support are essential to mitigate discomfort and maintain the initial optimism toward adoption.

This is due to the statement that EMR implementation may encounter several barriers, including the complexity of the EMR system, lack of customization, concerns regarding patient records, and temporary loss of access if the computer crashes. Virus attacks, power outages, lack of time to learn, problems during data entry, more time needed during clinical encounters, and fear of losing autonomy are also barriers. (Saputra et al., 2024)

Insecurity of Health Workers Regarding Telemedicine

Based on the results of the data that has been taken, it shows that there are still many respondents who feel insecure about using telemedicine, 20 respondents (87%), and those who feel safe are three respondents (13%). Research has shown that the more insecure health professionals are, the more it will lead to reduced perceived ease of EMR. Healthcare professionals who lack confidence in the reliability of modern technology may be reluctant to adopt electronic medical records (EMRs) due to the complexity of the technology or their lack of trust in it. For example, unskilled healthcare workers who use touch screens, smaller keyboards, and mice simultaneously may make mistakes due to the complexity of using EMRs. They may also be concerned that the wireless network will expose patient information or only keep part of the record. (Noprianto et al., 2017).

These characteristics suggest a relatively young workforce that may be more adaptable to technological innovations but faces skill and exposure gaps that could influence telemedicine readiness. The predominance of standard-level computer skills indicates baseline digital competence, yet the lack of prior telemedicine training poses a barrier to confident adoption. Departmental distribution, with outpatient services as the largest group, aligns with common telemedicine use cases. This suggests that readiness-building initiatives could prioritize these units while extending to inpatient and records staff.

A high proportion of respondents (87%) reported insecurity in using telemedicine, mirroring the limited exposure to telemedicine-related training indicated. Insecurity was particularly evident among those with shorter work experience and only standard computer skills. Concerns about data security, system reliability, and operational errors—especially among less tech-confident staff—can significantly hinder adoption. Addressing these concerns through cybersecurity education, clear operational protocols, and hands-on simulation training could reduce insecurity and increase the perceived ease of use.

Conclusion

Many health workers feel optimistic about telemedicine, but some feel uncomfortable and unsafe in using it. Based on the results of a questionnaire with health workers at Rs X Semarang, it is known that the respondents' optimism towards telemedicine is classified as positive, with 20 respondents (87%), and those classified as negative, with three respondents (13%). The questionnaire results show that there are still many respondents who feel uncomfortable with telemedicine; 17 respondents (73.9%) feel uncomfortable, and six respondents (26.1%) feel comfortable. The questionnaire results show that there are still many respondents who feel unsafe to use telemedicine, 20 respondents (87%) who feel unsafe and three respondents (13%) who are safe.

Hospitals can provide more in-depth training on the use of telemedicine technology and the process of using telemedicine platforms to health workers. The government is expected to expand its reach and provide data to all health workers to better recognize the implementation of telemedicine. The government is expected to improve telemedicine-related facilities by taking proactive measures such as increasing internet connectivity, improving human resource knowledge about telemedicine, and providing professional platforms.

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Conflicts of Interest:

The authors declare no conflict of interest.

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