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The Development of Digital Health Care in Vietnam Post Covid-19 Pandemic from Nurses' Perspective

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Thesis abstract

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Covid-19 has been a motivation for many low- and middle-income countries like Vietnam to adopt digital health systems to make an improvement in their healthcare system as the advancement of technologies is undoubtedly offering tremendous support to healthcare professionals, boosting efficiency and effectiveness of care. The purpose of the thesis is to describe nurses' experiences of the digitalization of Health system in Vietnam after the Corona virus pandemic. The aim of the thesis is to get more information regarding the development of national digital healthcare post COVID19 pandemic and Vietnamese nurses experiences with healthcare digitalization.

Based on the relevant literature of Vietnam's digital health and an empirical study with 3 Vietnamese nurses, the results of this qualitative study have drawn out the answer for digital health landscape of Vietnam post Covid-19 pandemic. Beside enormous benefits they have brought, the findings strongly emphasize on the urgent need for a national integrated system that is expected to help Vietnamese healthcare services to be more efficient and effective. Strengthening digital literacy and improving infrastructure are among the drawbacks. Despite those outstanding constraints, digital health is expected to offer a significant contribution to Vietnam's health system in the post Covid-19 era.

[1] Keywords: Digital health, eHealth, Vietnam, nursing, Covid-19

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Terms and Abbreviations

CINAHL	Cumulative Index to Nursing & Allied Health
MeSH	Medical Subject Heading
WHO	World Health Organization
EHR	Electronic Health Record
HIS	Hospital Information Systems
SARS	Severe Acute Respiratory Syndrome
ICTs	Information and Communication Technologies
EPRS	European Parliamentary Research Service
MedAI	Medical Artificial Intelligence
MoH	Ministry of Health
VSSID	Vietnam Social Security Identification

1 INTRODUCTION

Digital transformation defined by Gong and Ribiere (2021): "*A fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity (…) and redefine its value proposition for its stakeholders.*" Digital health, according to the World Health Organization, is the cost-effective and secure application of information and communications technologies to support health and health-related fields, namely healthcare services, health surveillance, health literature, and health education, knowledge, and research.

In addition to the rapid advancement of technologies and Internet of Things, demands for healthcare is growing as the world is facing an aging population. In accordance to NASDAQ statistics (2023), estimated annual rate of digital health market is aproximately 25 percent over five-year period from 2019 to 2025 with the participation of tech giants and retailers such as Amazon, Apple, Alphabet, Walmart, and also healthtech start-ups. Total investor funds of digital health industry worldwide has remarkably risen to $22.9 billion in 2020, starting from $1.1 billion in 2010. Notably, the figure doubled to $44.8 billion in 2021 owing to the recent pandemic.

The Covid-19 pandemic and its devastating impact have challenged governments to make prompt actions to contain it. As a consequence, these have led major changes in the way healthcare systems worked and the increasing adoption of digital tools for remote delivery of healthcare services such as telemedicine, teleconsultation, mobile health applications; transmission and analytics of data with the help of big data and AI; an electronic health record (EHR) as patient summaries to give caregivers more precise and essential information for more effective treatment (Negreiro, 2021). The exposure of gaps in healthcare systems during the global outbreak has also highlighted unsolved major limitations. The key limitations are varied from a lack of effective control of digital health development and implementation, limited infrastructure, personnel capability for digital health applications and the digital knowledge of the consumers as the progress of digitalization adoption between countries are uneven (Negreiro, 2021). Despite a number of issues, digital health is predicted to help reduce pandemic transmission, improve pandemic control efficacy, and contribute to the post-covid era's major health system transition (Alam, 2020).

At the beginning of the pandemic, when the health care systems of the most powerful countries in the world failed to contain the spread of Corona virus, Vietnam performed outstanding work against the pandemic cutting a swath through the globe. According to a global study by Dölitzsch & Clapham (2020) about Covid-19 on how people ranked their governments' response to the pandemic, Vietnam has a history of successfully managing pandemics: it was the first country recognized by the World Health Organization (WHO) to be SARS-free in 2003 and many interventions Vietnam pioneered during the SARS epidemic are being used to respond to Covid-19. After the third wave emerged from Da Nang city and quickly brought it to its knees, with a much more severe impact than the previous waves, besides the flight ban and mission against the pandemic, Vietnam has started to implement a variety of digital health technologies to improve Covid-19 surveillance, risk communication, diagnosis, and treatment.

As the interest of this research work is to find out the development of digitalization in health and health-related areas specifically in Vietnam post pandemic era and how it supports Vietnamese nurses in care delivery, the differences between the previous ways of assessing medical data since the first day of the digitalization implementation will be examined together with an empirical study from Vietnamese nurses' experiences.

For social relevance, this research offers Vietnamese medical professionals, health executives and Vietnamese government agencies insights of digital health development in general and a review of Vietnam's current digital health landscape in order to find solutions to utilize the digital potential in transforming Vietnam's health information system in the future.

The purpose of the thesis is to describe nurses' experiences of the digitalization of Health system in Vietnam after the Corona virus pandemic.

The aim of the thesis is to get more information regarding the development of national digital healthcare post COVID19 pandemic and Vietnamese nurses experiences with healthcare digitalization.

The study is conducted to answer the following question:

What kind of experiences that nurses have of the development of digital healthcare system in Vietnam Post-Covid19?

2 OVERVIEW OF DIGITAL HEALTH DEVELOPMENT

Pre-reading was done to have an overview and structuralized the outline of this research work. The data, after being collected, will be narrowed down from general to specific digital health implementation during and after the Covid-19 pandemic.

In order to gain full understanding of the topic and research direction, the author utilized several search engines and academic sources such as Google Scholars, Emeralds, SeAMK Finna. All literature and scientific articles in terms of Digital Health in the context of nursing used in this thesis are limited to recent publications from 2010 to the latest. Relevant sources will be taken from books, scientific articles, medical journals, and a combination of terms to search from the database - CINAHL Subject Headings and MeSH. Due the limitation of initial search results, literature search was broadened to non-academic publications and case reports.

The terms and key concepts for searching on databases has been narrowed down as following in order to focus on the main topic and to find reliable academic sources.

- The concepts of Digital Health
- Digital Health to Covid-19 Pandemic
- Digital Healthcare post-pandemic
- Digitalization in Vietnam’s healthcare sector
- Challenges for Digital Health Implementation

2.1 The concepts of Digital Health

Digital Health first introduced back in early 90s for the use of health information and libraries (Gomes & Romão, 2020). With the wide spread of the Internet worldwide and later on the development of computer sciences and informatics, digital health has continuously gained an enormous attention from medical professionals, healthcare businesses, developers and researchers. The revolution of hardware and software in 2000s started to make a strong presence in healthcare systems, for example, all healthcare-related data are now being digitalized replacing the traditional paper-based technique. Many middle- and low-income countries started to shifting from paper-based system to computer-based clinical documentation handling that increase productivity and reduce duplication of services. Moreover, it also provides support to complex acitivities at strategic and operational levels.

The term ‘digital health’ was often understood with the common concept that is utilizing a wide range of new technologies in support of health and health-related field (Shin, 2019). According to the study of Kostkova (2015), Digital Health is defined as: “the use of information and communication technologies to improve human health, healthcare services, and wellness for individuals and across populations.” In a similar manner, Cormann’s explanatory statement for the Australian Digital Health Agency regarding digital health: “any application of information and communication technologies in order to improve healthcare and health outcomes.” (Cormann, 2016). Ericksen (2018) simplifies digital health as “the range of services and technologies” that allow patients to seek assistance without paying an actual visit to a hospital or clinic. World Health Organization guideline (2021) proposed a broader term of ‘digital health’ in combination with its previous statement in 2019 :

> ‘The field of knowledge and practice associated with the development and use of digital technologies to improve health’… Digital health expands the concept of eHealth to include digital consumers, with a wider range of smart and connected devices. It also encompasses other uses of digital technologies for health such as the Internet of Things, advanced computing, big data analytics, artificial intelligence including machine learning, and robotics. (p. 11)

Although there is a variety of digital health definitions by government agencies, organizations and academia around the world over the time, existing digital health/ eHealth literacy remains similarly limited and insufficient to be fully addressed as there are medical

areas are currently unable to be digitalized and the role of digital health will expand as technologies continue to grow in both quantity and capabilities (Shin, 2019; Mathews et al., 2019). The last decade has witnessed a significant highlight in innovative achievement in terms of emerging brand-new digital technologies involving big data, smart wearables, mobile applications, artificial intelligence in various health-related areas. Current digital health has become even more complex and diverse than ever. For instance, the focus has been shifting to explore the potential of medical AI solutions (MedAI), considered to be new concepts despite enormous challenges due to the complexity of technology integration and ethical challenges. (Saini & Saxena, 2023).

An integrated ecosystem introduced by WHO (Figure 1) and commonly used with classified groups and sub-groups based on the determinants' functions including health apps, smart wearables, regulatory interventions, platforms, digital health literacy, data exchange and storage tools. This ecosystem is expected to primarily offer the healthcare community regarding healthcare professionals, health service providers, public health authorities safe exchange of health data, a shared understanding and approriate approaches in order to embrace and harness the power of these technologies more efficiently and effectively (World Health Organization, 2021).

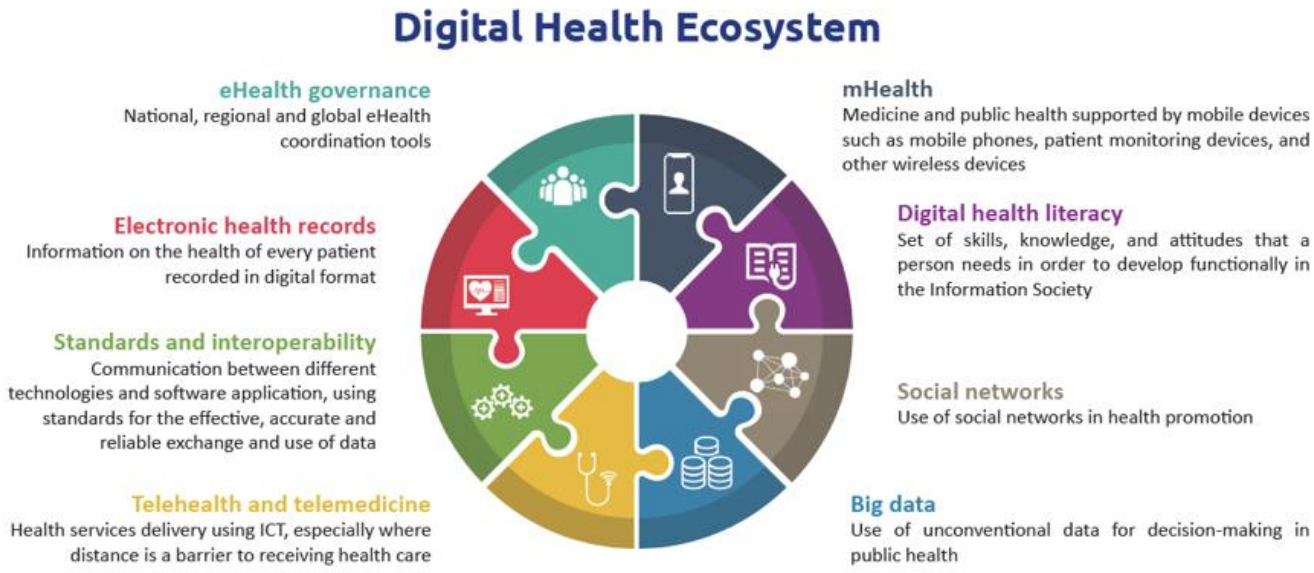

Figure 1 Digital Health Ecosystem. Source: WHO (2019)

2.1.1 Contributions of Digital Health in the COVID-19 Pandemic

Technologies in health sector were widely recognized and evolved rapidly over the last two decades, however, the progress of technological adoption in healthcare is different from each country, rather a challenge before Covid-19 and barriers to adoption of health digitalization was the focus of the debate (Petracca et al., 2020; Negreiro, 2021). The global outbreak of Coronavirus disease in the beginning of 2020 had put developed healthcare systems around the world to an emergency and exposed shortages of competent health workers for critical and intensive care to handle growing clinical demands. Social measures and new laws were implemented including social distancing, extensive lockdowns and travel bans within country and from one to another in the effort of flattening the curve. “Test, trace, isolate, quarantine” was recommended by the WHO in the attempt to gain control over the situation. In the midst of the constant spread of Coronavirus variants, the gaps in healthcare systems further highlighted the significant role of e-Health and m-Health services, and how critical of digital health is for the current scenario as well as future crises (Scott et al., 2020). As cell phones are widely used among glocal populations, mobile-based tools are considered well-suited and most beneficial for all parties to keep the spread under control and open a new era of health digitalization.

E-health literacy services. A study on Covid-19 infodemic and digital health by Choukou et al., (2022) shows that the pandemic had caused the extensive reliance of the people on digital media and social media platforms as a major means to access Covid-19 related information, for example, statistics, specific symptoms, treatment guidelines, social measures, vaccinnation matters and so on. However, the levels of eHealth literacy differ from each individual while a vast of online sources can be unreliable and misleading which can negatively endanger health and lives, therefore, e-health or digital health literacy services were quickly launched by the governments to cover the population’s urgent need of information, be it official national health web pages or international organizations such as WHO.

Telemedicine and mHealth. Telehealth or telemedicine allows for “the evaluation, diagnosis, treatment, monitoring, triage, consultation, and follow-up of the patients” without physical visits (Galvez & Rehman, 2011). In the Covid-19 era, digital technologies have been used in daily life for teleworking or online learning considered as a novel experience for many people. For healthcare delivery, it is even more essential during the pandemic to avoid the

spread of this communicable disease in overcrowded emergency rooms. Not only it reduced the unecessary number of visits at the facilities, also allowed healthcare workers to pay more attention on critically ill patients (Scott et al., 2020). Telehealth is currently being applied in a wide range of therapeutic areas such as diabetes, asthma, or cardiovascular disease to improve health outcomes by collecting patient data from electronic health records (EHRs), patient registration, and mobile apps (OECD, 2020). In many countries, such as Scotland, the limitation and unavailability of face-to-face models of care were early replaced by video consultations for real-time virtual consultations, remote visits and monitoring targeting patients with mild symptoms, and those with heightened anxiety needed reassure during the peak of the outbreak (Greenhalgh et al., 2020). The solution also increased the speed of surveillance. Several German hospitals have seen a reduction in all-cause mortality for patients with heart-failure issues due to telemedicine interventions. According to a survey by McKinsey and Company in 2020, telemedicine is likely to stay and will play a significant role in the future.

Contact tracing apps. Being introduced during the first phase of the epidemic in 2020, as a part of measure package, mobile apps for Covid-19 contact tracing and warning were quickly launched to tackle the ongoing pandemic and prepare for reopening the economy. These systems eventually send warning alerts to the users if there is a close physical proximity of a tested positive Covid-19 individual (Petracca et al., 2020). Moreover, the implementation of EU digital getaway was to ensure the transmission of information between national apps in case the users travel to another EU country. Many countries outside of Europe also developed their local apps for the same purpose.

Big Data and AI. Big data and Artificial Intelligence (AI) solutions have already been used for improving healthcare systems prior to the pandemic, particularly in the fields of cancer screening and radiology providing great support to cancer patients with early diagnosis and personalized treatment. These advancements also offered a powerful tool to tackle the novel Covid-19 outbreak according to a recent research about big data and AI solutions for Coronavirus by Pham et al., in 2020. As early treatment and prediction are important for Covid-19 detection and abnormalities normally found in infected Covid-19 patients' chest radiography images different AI techniques have been widely used for Covid-19's detection and diagnosis as well as vaccines and other medical treatments. In addition to AI, big data enabled outbreak prediction, virus spread tracking and Covid-19's diagnosis and treatment

from large-scale data analytics. Medical devices, supported by AI, big data, robotics and machine learning such as wearables,to track heart-rate, glucose level, blood pressure and temperature, have been proven to be useful during the outbreak to reduce doctor's visits and save costs (Negreiro, 2021).

2.1.2 Opportunities and Challenges for Digital Health Implementation

Opportunities

Even though Covid-19 pandemic has pushed the world to the edge, it became a force for countries "to bridge the digital health implementation gap" (Getachew et al., 2023) and to improve healthcare systems with the rise of mHealth, telemedicine, eHealth and mobile applications for different purposes including clinical care, follow-ups, diagnosis and more. Consequently, healthcare technologies have been received massive attention, investment and research after the battle against the pandemic for the unforeseen future emergencies. In addition to the existing technologies, numerous digital health solutions still require development and are in their early stages, therefore, there is still much room for improvement opportunities.

The academic, financial, and regulator communities are showing a growing interest in digital health as a paradigm for diagnosis, treatment, and prevention. This interest coincides with a surge in interest in omnipresent sensors as a component of the Internet of Things, as well as the use of AI to explore the deluge of data that these sensors are delivering. There is a vast amount of patient data available for further research and learning affecting health and healthcare delivery systems collected from different sources. Managing and analyzing structured and unstructured datasets appropriately will increase the understandings of health and disease. Moreover, making use of statistical tools such as AI and machine learning to develop data assessment tools and support research designs (Singhal et al., 2020).

Researchers, scientists, physicians, stakeholders, and regulators must collaborate with technology developers. Existing collaborators and new ones are encouraged to maximize working together, meeting challenges and overcoming communication risks towards future universal health coverage. Knowledge and know-hows of digital health designs and

implementation must be shared between the parties to achieve the ultimate aim of assisting humans in being healthier and long lives.

As legislation regarding digital health is still under construction, in addition to Covid-19 pandemic, this is considered as a motivation for regulators to work on a comprehensive legal framework to address the matters concerning privacy and confidentiality of data and data sharing rights is significantly crucial to support the development of digital health services and enhance the power of digitalization (Garell et al., 2016; WHO, 2021).

Challenges

The global outbreak of Covid-19 has forever changed the existing normality of healthcare. A revolution of digital transformations and a great number of applications being applied broadly in the fight against a communicable diease, however, there are challenges hindering digital health to be implemented worldwide. The key factors are diverse including a lack of legal control of digital health development and implementation, limited infrastructure, personnel capability for digital health applications and the digital knowledge of the consumers as the uneven progress of digitalization among countries (Negreiro, 2021).

Legal constraints. Employing digital health undeniably fosters countries' healthcare systems with safety, efficiency and sustainability, however, the scope of regulatory guidance and oversight remains constrained. In order for digital health to maximizes its role in supporting healthcare systems improving healthcare efficiency, transfering information between healthcare professionals and patients and within and across healthcare organizations is required. Additionally, data processing for pandemics is beyond the privacy issue because of ethical matters of using the consent. While using data collection tools effectively enable quick responses, high accuracy of diagnosis and minimize the impacts of the virus, however, the stress is on the privacy invasion (Gasser et al., 2020). Setting up policies and stardards for data governance has been a long-term challenge for, governments despite the fact that the improvement of technologies have reduced costs and led to a move toward digitalization by the majority of governments (World Health Organization, 2017).

Cybersecurity. The president of CyberActa Inc., Giantsidis pointed out that the Covid-19 pandemic had also witnessed the rise of cybersecurity incidents with high degrees of phishing campaigns and ransomeware attacks across the border because of the increasing

reliance on digital devices, particularly mobile digital health apps storing users' personal data, medical prescription as well as other medical certificates. Thus it is critical to establish security standards for mobile applications.

Human resource constraints. The recent pandemic also highlights the need for highly skilled nursing staff. The high degree of involvement of telelhealth and quickly emerging technologies have exposed the lack of digital health literacy and proper training for nurses to adapt and master health technologies. Digital health literacy, an extension of health literacy, plays a significant role in determining the usefulness of digital health technologies (Kickbusch et al., 2021). Nurses are made up the majority of healthcare workforce in the world and holding an important role in delivering initial healthcare services, especially during pandemics. Nevertheless, their frequent absence in the design and implementation of digital health advances has put nurses in a vulnerable position without technical competencies as well as readiness for changes. Another reason is the current education depending heavily on traditional teaching methods which is insufficient for fostering proper adoption of new digital tools leading to barriers in integrating monitoring technologies into daily practice (Isidori et al., 2022).

Financial constraints. According to the report by Congressional Research Service (2021), the viral Covid-19 outbreak has caused not only the deaths but also the worst global economic crisis in more than a century. Countries are weighing inflationary pressures while the recovery is taking a slow pace and varied from each country. Economic forecasts expect a long-lasting recovery on the global scale resulted by pent-up consumer demand due to rising personal savings. Shortages are a result of ongoing problems with labor markets, bottlenecks in the manufacturing and supply chain, disruptions in the world's energy markets, and shipping and transportation issues that are escalating inflationary pressures. Millions of million people have entered to extreme poverty. Given the current situation, it is a great challenge for countries to afford digital health advance adoption as well as health information security tools and training. In particular, developing economies struggling with continuous financial constraints and numerous social issues find it even more difficult to bear the expenses of insfrastructure upgrading and health digitalization.

2.2 Overview of Vietnam’s Digital Healthcare Landscape

Recent decades have seen a remarkable improvement In Vietnam’s healthcare landscape. Vietnam, today, is the fastest-growing economy in Asia (Bloomberg, 2022). Strong economic growth and population have led to an increasing demand higher-quality medical treatment from new middle-class. Private healthcare providers and digital health services are growing as a result of these wealthy, technologically savvy consumers who are willing to spend more on their healthcare (Austrade, 2019). Vietnam's population is not only getting wealthier, but also becoming older. The country is one of the most rapidly aging countries in Asia, according to Asian Development Bank’s report in 2022. The burden of disease is shifting from communicable to non-communicable diseases including diabetes and cancers. Coordinated, long-term care options using a systemic approach by Vietnamese government are necessary for these non-communicable diseases and to improve health for its population.

Reported by Austrade (2019), there are enablers for Vietnam to be ready for digital health implementation. Over 60 per cent of Vietnamese are under the age of 54 who are actively embracing online communication technologies such as Facebook, Viber, and Vietnamese developed communication app such as Zalo. The widespread of 4G network is now covering more than 95 percent of Vietnamese households, and 5G network is expected to pave the way in the near future. Cloud-based services are gradually being employed to the country’s technology infrastructure which likely to facilitate innovative and cost-effective healthcare solutions. Also, a number of projects related to digital health implementation in large urban hospitals have launched such as teleradiology, teleconsultation, telediagnosis and so on. While the government had not actively promoted mHealth, there was evidence that the government was willing to engage with mHealth intiatives due to the large figure of mobile device penetration in Vietnam. These provide a good foundation for digital transformation and integrated healthcare services in Vietnam.

2.2.1 Challenges of Digital Implementation in Vietnam’s Health Sector

Low and middle income countries such as Vietnam have been focusing on piloting and experimentation of digital health initiatives to improve national healthcare and the quality of healthcare delivery (Labrigue et al., 2018). Challenges, however, remain.

Health Financing. There has been some initial steps towards the establishment of electronic medical records (EMR) by Ministry of Health (MoH), it eventually takes some more effort until it is ready for EMR implementation in real clinical practice nationally. In order to move towards universal healthcare coverage where all people have access to needed health services without financial difficulties, a good financing health system is in need. Despite some improvement in healthcare coverages for some groups owing to multiple health financing reforms and the increase in public health expenditure, costs and the complexity of implementing digital health information systems such as electronic health records (EHR) and hospital information systems (HIS) remained biggest blocks to Vietnam's national health system (Austrade, 2019).

Unsynchronized medical data system. Lacking of a unique identification number for each individual in Vietnam and a centralized medical record system in most hospitals and clinics resulted patient's multiple medical records due to mutiple visits to different doctors for the same health conditions. Data entries were also varied from each hospital due to its own form and different standards of reporting (Dao & Hui, 2020).

Digital health literacy. Findings several studies before and after Covid-19 show that low digital literacy is a significant barrier for both patients and healthcare professionals in Vietnam to uptake the digital health solutions. Moreover, paper-based documentation is still more preferable among Vietnamese doctors and healthcare professionals, therefore, another hurdle is to help healthcare professionals with training to be familiar and adaptable to the use of digital systems. This is even more challenging for healthcare staff in mountainous and hard-to-reach areas with limited medical facilities and equipment.

Undeveloped infrastructure. One of the main obstacles to the adoption of digital health tools such as telemedicine in Vietnam is the lack of a synchronized digital system in many health facilities, particularly tier II and III hospitals.Particularly, healthcare and IT infrastructure in rural and low-income regions are out of date and citizens from those have been receiving far less benefits from digital health since they have less access to digital technologies such as mobile networks, internet, mobile devices and such (Dang et al., 2021).

Legal and ethical challenges. Same as other middle- and low-income countries, the adoption of digital health solutions in Vietnam has only taken within the last 10 years. The rapid advancements of technological tools with EHR systems, imaging diagnostics, surgical

support, advanced AI solutions stress on the remaining issue of no clear legislation, guidelines and standards published for these adoptions as well as data security (Lam et al., 2018).

2.2.2 Implementation of Digital Health Technologies in COVID-19 Pandemic

Covid-19 Pandemic left Vietnamese government no choice but to speed up the pace of digitalization adoption. There were several major digital applications were implemented in Vietnam in order to fight against the viral Covid-19 (Table 1), and to deal with the shortages of nursing staff in the front line. Based on functions, these applications were divided into four categories consisting of contact tracing and surveillance, artificial intelligence for diagnosis and medical care, telemedicine, and health communication (Bui et al., 2021).

Surveillance and contact tracing apps including eCDS which mainly focused on reporting based on the hospital admissions. Case mangement software (CMS) was developed after eCDS for follow-up clinical information of confirmed cases such as administrative data, image diagnosis results, and health facilities. Bluezone was widely used among Vietnamese population for tracking purpose.

Health Communication was important due to the lack of face-to-face human interaction. In a similar pattern as elsewhere, the Vietnamese were heavily dependent on online media and social media platforms for information related to Covid-19, therefore, the official portal by MoH was launched. Educating the public about the disease and the community on disease prevention and protection strategies have been made possible by the usage of information from this portal by numerous publications (La et al., 2020). Notably, a number of studies on COVID-19 in Vietnam used precise data for analysis from daily communication on the official portal and other newspapers. For surveillance and monitoring, NCOVI app was developed as an electronic health declaration form for domestic and international movement. The Vietnamese travelled from abroad were more familiar with the declaration website https://tokhaiyte.vn to perform medical declaration before entering Vietnam.

Same as other countries around the world, Vietnam also employed telemedicine in order to tackle the challenges caused by Covid-19 pandemic. Telemedicine centre was in charge of resource management, technical support for Covid-19 cases including admission,

quarantine, diagnosis and treatment. The center also provided remote consultation and treatment to hospitals and health facilities to remote regions (Tran et al., 2020).

By eHealth Administration, virtual chatbot was developed based on AI to assist healthcare professionals with automatic and real-time answers allowing questions related to Covid-19 information from multiple users. The software DrAid developed by Vingroup offered doctors and clinicians assistance with prognostic evaluation of treatment (Quan et al., 2021).

No	Digital Health Interventions	Main purpose
1	Electronic communicable disease surveillance software (eCDS)	Surveillance
2	https:ncov.moh.gov.vn	Communication
3	Vietnam Health app	Communication
4	Virtual Assistant (chatbot) on Covid-19	Communication
5	Bluezone app	Contact Tracing
6	NCOVI	Health Declaration
7	Covid-19 case management software	Surveillance, case management
8	Telemedicine center for Covid-19 Outbreak Control	Telemedicine
9	Pilot program on telemedicine	Telemedicine
10	DrAid software	Diagnosis and treatment support

Table 1 List of Digital Health Apps in addressing Covid-19 in Vietnam. Source: Bui et al., 2021

3 AIM AND PURPOSE OF THE THESIS

The aim of the thesis is to get more information regarding the development of national digital healthcare post COVID19 pandemic and Vietnamese nurses experiences with healthcare digitalization.

The purpose of the thesis is to describe nurses' experiences of the digitalization of Health system in Vietnam after the Corona virus pandemic.

The study is conducted to answer the following question:

What kind of experiences that nurses have of the development of digital healthcare system in Vietnam Post-Covid19?

4 IMPLEMENTATION OF THE THESIS

The aim of the thesis is to get more information regarding the development of national digital healthcare post COVID19 pandemic and Vietnamese nurses experiences with healthcare digitalization. The purpose of the thesis is to describe nurses' experiences of the digitalization of Health system in Vietnam after the Corona virus pandemic. The study is conducted to answer the following question:

What kind of experiences that nurses have of the development of digital helathcare system in Vietnam Post-Covid19?

The empirical study is the main method used in this research combined with relevant literature about the development of digitalization in Vietnam's healthcare post Covid pandemic for comparative purposes in order to find the answers to the research topic. The research methods carried out the empirical investigation will be introduced in the section that follows. The target audience and the tools used for data collecting and analysis will be outlined in more detail. Discussions about the data's validity and reliability difficulties, as well as ethical issues should also be addressed.

4.1 Research Methodology

Depending on how the research topic is described and understood, the researcher will be prompted to select quantitative, qualitative, or mixed methodologies based on their nature and other considerations (Davies & Hughes, 2014). For a number of reasons, qualitative research is the best method for this thesis.

Qualitative research is gaining popularity in several disciplines, including education, economics, sociology, psychology, and cultural studies, to mention a few. Particularly, it has gained popularity for a variety of applications in study on human emotions, feelings, experiences, and behaviors, specifically for studies lacking relevant well-developed literature such as the healthcare sector (Busetto et al., 2020), and for which numerical data and tests may be insufficient (Flick et al., 2004). According to Strauss and Corbin (1990, p.17), qualitative research is "any type of study that does not rely on statistical methods or other quantitative techniques".

In health care research, qualitative approach has been accepted more greatly in the recent years which can be seen in the increasing number of qualitative research articles published in health-related journals. The method is broadly applied to gain understanding of health behavior patterns, lived experiences, or exploring health needs and designing interventions (Sorell, 2013).

To collect qualitative data, there is a variety of approaches such as interviews, focused groups or ethnographic research, case study, observation (Taylor et al., 2016). The nature of this thesis is to explore the perspectives of Vietnamese nurses towards the digital transformations post pandemic era in Vietnam. The approach, therefore, with inductive and flexible characteristics was considered to be most appropriate to investigate the research problem. Therefore, the choice of data collection method for this research was semi-structured interviewing.

4.2 Data Collection

In-depth interviews enable researchers to gain an in-depth of understanding of a certain subject or area (Brinkmann, 2013). Respondents are requested to freely express their experiences, thoughts, and emotions without constraint. Dynamic approaches are essential in qualitative research, allowing the researcher to follow up on the responses provided by respondents in real time and spark insightful discussion about a topic.

To find the answer to the research question, this thesis involves a literature review with the relevant academic literature and scientific articles offering an overview of research topic and semi-structure interviews to provide the insights of the topic through participants' experiences and thoughts.

The aim and purpose of this study is to find out how digital health has been developed in Vietnam after the pandemic, therefore, the interviewing sessions in person with selected questions will be conducted to participants who specialized in healthcare industry and have been in volunteering campaigns against the pandemic such as nurses. Therefore, collecting the nurses' points of view about digital health technologies in Vietnam will be the focal point to draw out the conclusion. In order to ensure the quality of the outcome data, three nursing staff will be chosen.

4.3 Data Collection Methods

4.3.1 Interviewing

According to (Seidman, 2006), an effective technique to get understanding into significant societal issues is to comprehend the experiences of the individuals whose lives mirror those issues. To collect data for the purpose of this study, qualitative interviews were conducted in a semi-structured and conversational way, allowing the interviewer and interviewee greater opportunity to explore knowledge-generating potentials and concerns they deem significant to the research effort (Brinkmann, 2013). A qualitative research design is renowned for its great degree of question formulation flexibility. Through flexible and open-ended questions, in-depth interviews allow the researcher to be more adaptable in the interview with the participant, allowing the participant to reconstruct his or her experience in more detail and with more complicated replies related to the issue under investigation.

The primary purpose of this thesis and its expected outcome leads to the conclusion that the most approachable method is semi-structured interviewing technique.

4.3.2 Questions

The following structured questions will be used in the interview:

- How has digital health approached the Vietnamese population with the new digital healthcare system?
- Which digital health models are suitable for Vietnamese professionals' healthcare workers as a nurse?
- How does Vietnamese's government support digital health system?
- How was your experience with healthcare apps?

Due to the structure of semi-structured interviewing, depending on the answers of the interviewees, more specific questions will be asked to investigate the issue more deeply.

4.3.3 Participant criteria and interview procedure

The recruited participants consist of 3 Vietnamese nurses who are currently working at different hospitals in Vietnam categorized from medical specialty, years of experience, positions in the hierarchy, and groups of age.

The process of participant recruitment was mainly conducted through personal contacts of the researcher and the official interview invitations were sent via E-mail. Official participant briefing also provided via email to each respondent in English and Vietnamese version beforehand for better preparation and time saving which included the topic information, participant requirements, confidentiality address together with the structure of the interview. Estimated interview schedules were from the end of December 2022 until the middle of January, 2023 as latest.

Interviews were wholly conducted in person setting and via web conference platforms and private video call apps following semi-structured conversations. Interviews took place in Ho Chi Minh city, Vietnam. The duration of each interview differently ranged from 28-33 minutes depending on the preparation of each participant and how information was investigated in further detail. Since Vietnamese is the mother tongue of the author and participants, the interviews were conducted in Vietnamese language. Mini questionnaires were given and signed by the participants to confirm their consent for the interview to be audio recorded and used to serve the purpose of the research. The core intention of the interview will be carefully explained again by the interviewer before the conversation. Throughout the interviews, the participants were encouraged to take time to give their answers in as much detail as possible. All participants' personal information such as names, organizations, were anonymized for confidentiality protection.

4.3.4 Description of the sample

The partcipants consist of 3 nurses from Vietnam and their information shown as in Table 2.

Demographics			Position		Experience
Age	**Sex**	**Nationality**	**Profession**	**Responsibility in Covid-19 Pandemic**	**Years of Experience**
20-30	Female	Vietnam	Physiotherapist student	Emergency Nurse	1
20-30	Male	Vietnam	Registered Nurse	Emergency Nurse	5
40-50	Female	Vietnam	Head Nurse Emergency	Working directly with doctors	5

Table 2 Description of Participants (Own Illustration)

4.4 Data validity and reliability, and ethical issues

Reliability and validity are key factors in all research deciding the difference between a good quality research and a poor one. Particularly in qualitative study, these are vital and should be highly concerned as the possibility of the researcher's subjectivity may cloud the interpretation of the data, thus, the findings of qualitative studies are often face numerous questions and views with skepticism (Brink, 1993).

The interviewing method used to conduct in the thesis is a the most practical way to bring out the information needed which other methods are considered unable to. However, there are still concerns of this method's validity and dependability, and ethics that the writer must take into account. The interviewer requires to remain honest, truthful and neutral during the interview to prevent influencing the interviewees' point of views, as well as the data analysis process to avoid biased views which will lead to invalid and unreliable data. Moreover, the interviewees' perspective and stories related must be respected.

Interviews, even in different formats, frequently require the disclosure of sensitive information. Therefore, the interviewer must ensure that interviewees' personal information is treated with absolute secrecy. Before the interview began, candidates were asked to

provide a brief introduction about themselves with a mini questionnaire including their specific personal data on age, professional field, years of experience, for example. By providing signatures at the bottom of the form, by all means, the candates accept to give the researcher's consent to use of the transcript for the purposes of the study under the condition of anonymity.

As the research work mainly focuses on the experiences of digital health development in Vietnam from the perspectives of Vietnamese nurses, therefore, the findings are limited to the views of nursing care. The author acknowledges that the number of sample for the empirical study is rather small, however, it is believed to draw answers on the findings as the chosen participants are experienced using and have sound knowledge of digital health systems in Vietnam. Inexperience of the interviewer also needs to take into account for being unable to carry out more meaningful findings from the participants.

Furthermore, time was a critical factor in the limitation of this study and due to the insufficiency of scientific studies about recent Vietnam’s digital health, the literature review is unable to cover all aspects of digital health areas, although the author believes it should be able to provide the audience a great extent of understandings and insights of this topic.

4.5 Data analysis

As semi-structured interviewing technique provides the interviewer flexibility in supporting data collection process of the interviewees, some information might be given in another section of the conversation rather than in the main questions. Therefore, the recordings were firstly transcribed, summarized and inductively formulated based on the material to provide an overall picture.

Data was structured to remain essential contents and reduce the material that were not content-bearing, additional relevant material was also kept in the section of general comments to extend the understanding. All these steps of interpretation were necessary to speed up and enhance the analysis process.

After the completion of intepretation, the final transcripts were ready to analyze based on the main questions. These transcripts were being worked through for several times to determine the correct data to be used to answer the research questions to draw the

conclusion considering the insights from relevant academic literature as presented at literature review chapter.

5 FINDINGS

5.1 Vietnam's digital health approach by the population

Multiple studies and report in section 2.2 in the literature review show that there have been already some initial projects towards digital health implementation by Vietnamese government in the recent years. however, the research findings reveal that the Vietnamese citizens remain unfamiliar with E-health/ Digital health technologies. The actual digital practices occurred mainly during the global outbreak, and the limited features of current digital health apps are not appealing and useful to the Vietnamese health consumers despite the national digital health application VSSID has obtained some achievement in terms of the number of active users after some updates on its features:

> People usually approach health information via news on television and not many of them actually see the needs of using the app so there are not many users. Vietnamese people do not use the app much because its features are limited, people mainly depend on news reports to update the situation. Many people find it difficult to understand and had no idea how to use, some even misunderstood the information on the app. (N.G.K, personal interview, December 31, 2022)

> More like during the epidemic, in addition to be convenient in scheduling vaccinations, updating the number of vaccines you have received, making medical declarations, ... There was one more feature on VSSID which is the citizen can declare their unemployment situation during the pandemic and they will be supported by the government. After the pandemic, the most used software is still VSSID . (L.T.C.N, personal interview, January 13, 2023)

> There is only one app that is still being used called VSSID by the Ministry of Health, simply health information from paper-based forms converted into electronic data. The app existed before the pandemic, but at that time no one used it because in Vietnam, those kinds of apps were really not accessible to the people and were not familiar with the needs of the Vietnamese people. I would say, the time when e-health in Vietnam develops the most is during the pandemic… Communication and contact

> between people and healthcare workers must be contactless – through the electronic system/app. (N.T.V, personal interview, January 19, 2023)

5.2 Vietnam's digital health solutions from nurses' perspective

5.2.1 Usefulness of digital health to nursing staff

There is evidence from the findings that Vietnamese government took quick actions to implement digital technologies to support healthcare givers during the pandemic. The findings show that improvements have been made in the health system and patient's data exchange between health facilities to support the healthcare professionals in diagnosis and treatment, especially nurses for the delivery of primary care to certain extent.

> In the same hospital, the system provides all patient information between departments and nurses know the status not only in their department but of the whole hospital so that they can promptly handle in case of emergency which patient is admitted/discharged from the hospital, whose condition is complicated and worsens. (N.G.K, personal interview, December 31, 2022)

> During the pandemic, there was also a software that can be used and linked with all hospitals … the background information as well as the current condition of the patient which was already on the software, the nurses and doctors will also save time and quickly provide a better treatment. Because when treating Covid-19, it is not only necessary to pay attention to the covid situation but also to treat the underlying diseases. Some hospitals in Ho Chi Minh City will return health examination results via text messages which I find it is less time-consuming and reduces overcrowding. (L.T.C.N, personal interview, January 13, 2023)

> Helpful for receiving medical records, receiving and hospitalizing patients. But only transferring data from paper to electronic form on a computer, there is no connection and identical between hospitals or you cannot know the patient's medical history when entering patient information on the data system. (N.T.V, personal interview, January 19, 2023)

5.2.2 Challenges of digital health implementation from nurses' perspective

Although the implementation has given some advantages in terms of saving time and efficient during the pandemic, the interviewees find these solutions quite complex to use but limited in supporting their tasks. Some digital solutions for hospitals are considered having negative effects on senior nurses' workflows due to a lack of digital training and age is also another factor. Moreover, Vietnamese health consumers' behavior is also another challenge.

> … Medical staff at the aged over 35 and middle-aged have difficulties accessing the app and this affected and reduced workflow progress. For example, when adding patient data to the system, young nurses can admit from 300 cases a day and discharge 350 cases, but with the same job, it takes 4 middle-aged nurses to complete in a day. This proves that the system and approach to technology are new and age-limited. It is suitable for people under the age of 30 only. (N.G.K, personal interview, December 31, 2022)

> It is not helpful in the healthcare system without knowing the patient's medical history and it is time consuming for the nurse to provide intensive care. If known, it will shorten the time and quickly take measures to intervene. Not enough information to make a final diagnosis. Poor connection in high peak time during the day. Each hospital has a separate and different system, and it is impossible to connect patient information in case of transferring or visiting to another hospital. Information about medical history is declared by the patient themselves, not already on the system, the nurse will receive a file of the patient's medical record at the present time of treatment, not receive or know about the medical history if you do not report through the data entry department. (N.T.V, personal interview, January 19, 2023)

> After Covid-19, everything went back to normal. Patients come to the clinic empty-handed, without carrying any medical documents, forcing nurses and doctors to approach from the beginning, so it is very difficult and time-consuming. Vietnamese patients are not aware of what they have to bring when they go to the doctor, so it is quite inadequate. (L.T.C.N, personal interview, January 13, 2023)

5.3 Discussions

According to the findings and literature review, digital health in Vietnam was only actively made use of in order to serve the needs during the peak of Covid-19 pandemic in combination with the social measures to flatten the curve. Vietnam, same as other countries, implemented different mobile applications and softwares to give its consumers and healthcare givers the tools to keep themselves safe and assisted clinical treatment.

As Covid-19 pandemic is no longer considered a deadly threat, a majority of Covid-19 apps have already been removed. Taking advantage of the situation, Vietnamese government is actively promoting and investing further to the development of VSSID as Vietnam's national healthcare application as the first step to an integrated healthcare system. However, there are challenges that are hindering the development of digital health that the government must overcome.

First of all, the adoption of digital health solutions during the pandemic was given an impression of an temporary purpose, keeping the virus under control and against its impacts to the normal socialization. The complexity of these apps were described in the findings as "difficult to understand and use" while the features were considered "very limited". As a result, they were not appealing enough to the users as the majority of Vietnamese population did not find the need to use them for the future healthcare resulting in the number of people who can approach the eHealth applications is rather low.

Secondly, digital literacy among the population needs to be strenghthened. Digital education and appropriate training for nursing staff are significantly important as development of technologies must be aligned with health professionals' competencies. In order to deliver high-quality healthcare services, medical practitioners must become familiar with and adapt to these advancements. According to both findings and studies, especially for groups of older generations from over 30 years of age. The Vietnamese are still more used to traditional paper-based documentation, for both health users and healthcare professionals such as nurses during patient admission.

A need for an interlinked system between hospitals. Another evidence in the findings shows that that there is no centralized system of patient data exchange between health facilities which has been constantly a huge challenge in Vietnam. Each hospital has its own system

and patient information is not for sharing with other facilities, this leads to various issues for professional healthcare givers due to duplications of services, insufficient information for the final diagnosis and effective treatment.

Improvement of infrastructure is important. Poor digital infrastructure also hinders the development of digitalization in Vietnam’s health sector, which can be seen in the findings during the pandemic. Poor internet connection reduced the productivity and quality of service delivery of the health workers during the peak time of the day. Additional support for rural areas will also help to achieve an equalized access to digital health among the Vietnamese population geographically.

6 CONCLUSION

After Covid-19 pandemic, digital health technology adoption has become more critical for Vietnam’s current national health system to reduce the healthcare pressure from major issues including a rapidly aging population, a shifting illness load, and the persistent danger of infectious disease epidemics. Inequitable access to patient-centered healthcare is also a problem for the people in many areas. With the objective to ease these pressures, Vietnam must, therefore, investigate and implement advanced technologies as one of the solutions.

In order to prepare for the digital transformation, challenges need to be addressed such as insufficient digital infrastructure, low digital and health literacy among its population, and most importantly, digital education and appropriate training for health workers, particularly nurses who deliver daily healthcare services and primary care.

Given the position as one of the fastest growing economies, Vietnam has tremendous opportunities to adopt digital health transformation with a join effort between the government, healthcare professionals, stakeholders, and health consumers to develop a national road map for digital health technologies aligned with more effective policies, strong data protection, infrastructure improvement, and digital literacy to meet the local needs.

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