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Availability and Utilization of Digital Health Technology for Improved Patients Care: A Cross-Sectional Study of Nurses' Perspectives at a State General Hospital in North-Central Nigeria

Disponibilité et utilisation de la technologie de santé numérique pour l'amélioration des soins aux patients : Une étude transversale des perspectives des infirmières dans un hôpital général d'État dans le centre-nord du Nigeria

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Abstract

Digital health technology (DHT), the application and implementation of the digital transformation strategy in the healthcare system, entails incorporating both software and hardware services to facilitate different health needs. In Nigeria's healthcare system, the utilization of digital health technology has not been fully explored resulting in the lagging behind the delivery of healthcare for digitalized, improved patient care, and nursing practice. This research study was designed to assess knowledge, availability and utilization of digital health technology by nurses at a North-Central Hospital, in Kwara state. A descriptive cross-sectional research design was adopted. The researcher used a Self-developed administered questionnaire to elicit responses from a convenient sample of 125 nurses. The data collected were analysed using descriptive and inferential statistics (with a 0.05 level of significance). The study revealed that the majority of the nurses had good knowledge (n= 92; 73.6%) and positive perception (n=90; 72%) about digital health technology with fair adequate utilization (n=74; 59.2%) of the few available digital health technology devices. A significant association was found between the knowledge of nurses about digital health technology and their highest academic qualification with a p-value of 0.022, which is less

than a 0.05 level of significance. Also, a significant association was found between the knowledge of nurses and the utilisation of digital health technology with a P value of 0.005. In conclusion, digital health technology knowledge among nurses was good and positive respectively and the level of utilization of digital health technology was adequate. Therefore, hospital administration and nurses need to advocate for improved provision of adequate digital health technologies for health care and practices especially for nursing care. Hospital administration should continue to improve the knowledge of the health workers and continually enhance digital health technology utilisation for improved patient care.

Keywords: Knowledge, Availability, DHT, Utilization, Health care, improved patient care.

Résumé

La technologie de la santé numérique (DHT) est l'application et la mise en œuvre de la stratégie de transformation numérique dans le système de santé, qui implique l'incorporation de services logiciels et matériels pour faciliter les différents besoins en matière de santé. Dans le système de santé nigérian, l'utilisation de la technologie de santé numérique n'a pas été pleinement explorée, ce qui entraîne un retard dans la fourniture de soins de santé numérisés, l'amélioration des soins aux patients et la pratique des soins infirmiers. Cette étude a été conçue pour évaluer les connaissances, la disponibilité et l'utilisation des technologies numériques de santé par les infirmières d'un hôpital du centre-nord de l'État de Kwara. Un modèle de recherche transversale descriptive a été adopté. Le chercheur a utilisé un questionnaire auto-élaboré pour obtenir des réponses d'un échantillon de 125 infirmières. Les données recueillies ont été analysées à l'aide de statistiques descriptives et inférentielles (avec un niveau de signification de 0,05). L'étude a révélé que la majorité des infirmières avaient une bonne connaissance (n=92 ; 73,6%) et une perception positive (n=90 ; 72%) de la technologie de santé numérique avec une utilisation adéquate (n=74 ; 59,2%) des quelques dispositifs de technologie de santé numérique disponibles. Une association significative a été trouvée entre les connaissances des infirmières sur les technologies numériques de santé et leur qualification académique la plus élevée avec une valeur p de 0,022, ce qui est inférieur au niveau de signification de 0,05. De même, une association significative a été trouvée entre les connaissances des infirmières et l'utilisation des technologies numériques de santé avec une valeur P de 0,005. En conclusion, les connaissances des infirmières en matière de technologies numériques de santé étaient bonnes et positives respectivement, et le niveau d'utilisation des

technologies numériques de santé était adéquat. Par conséquent, l'administration de l'hôpital et les infirmières doivent plaider en faveur d'une meilleure fourniture de technologies numériques de santé adéquates pour les soins de santé et les pratiques, en particulier pour les soins infirmiers. L'administration de l'hôpital devrait continuer à améliorer les connaissances des travailleurs de la santé en améliorant continuellement l'utilisation des technologies numériques de santé pour améliorer les soins aux patients.

Mots-clés : Connaissance, disponibilité, DHT, utilisation, soins de santé, amélioration des soins aux patients.

Background to the Study

Digital Health technology (DHT) is a system that uses computing platforms, connectivity, software, and sensors for healthcare and related uses (Sharma et al., 2018). As the science and art of DHT evolve and keep gaining ground, so also the science and practice of nursing. It is of crucial importance that nurses incorporate the use of this technology into practice in order to improve the professionalism of nursing as well as delivering quality care to their patients. The existence, usage and benefits of DHT in nursing are relevant topics in the light of the current discussion on technology as possible solutions to problems such as shortage of skilled workers and increasing demand for long-term care (Bello, et al., 2004; Kowatsch et al., 2019).

The importance of DHT in nursing for the improvement of patients' care is critical in making innovative treatment forms possible by the accelerated exchange of patient data (Bernstein, 2021). Facilitation of communication between caregivers, reduction of long hospital stay and medication error, provision of access to information as well as qualitative patient-centred care (Alotaibi, 2017), are crucial. In addition, helping people in need of care to maintain their independence and improve their quality of life and health, improves patients' safety (Kowatsch et al., 2019) faster laboratory result, reduced operational cost, reduced test and procedure redundancy (Mathews, et al., 2019) are also important.

In 2016, at the annual Royal College of Nursing (RCN) Congress, it was agreed that the College should lobby for every nurse to be an 'e-nurse', able to use data, information, knowledge and technology to its full potential for patients, carers and service users (Curtis, 2020; Etingen et al., 2020). There are several ways DHT can improve patients' care in nursing: automated intravenous pump, portable monitors, smart bed technology, wearable devices, e-health records, centralised command centres, tele-health and apps, digital drug retrieval and delivery systems, smart-phone based hardware and software technology (Krick et al., 2019). The need to evaluate the availability of some of these devices and their utilization in health care institution in our environment has become paramount.

Statement of Problem

The health care worker has a duty of care to the patients and the use of technology to improve individuals' health and wellness is a broad and growing desire across the globe. There has been an increasing attendance and utilization of the health care services at the General Hospital, Ilorin because of its strategic location and the government health care policy to ensure that the hospital provides the adequate secondary level of health care to all. In the course of clinical contacts with the General Hospital, Ilorin, one of the authors had observed, among other things, health care workers manually sorting patient information, complete manual paper-based nursing activities, and the long hospital stay of patients and clients. The hospital had served as the temporary site for the University of Ilorin Teaching Hospital for over a decade, before the Teaching Hospital moved to its permanent site. This informed the intention of the researchers of the need to assess the status of digital health technology at the institution from the nurses' perspective. This study aimed to assess the nurses' perspectives on the availability and utilization of digital health technology for improved patients care among the nurses at General Hospital, Ilorin, Kwara State.

Methodology

Design and Setting: A cross sectional, descriptive and non-experimental research design adopted to carry out the study. The research study was conducted at General Hospital, Ilorin, Kwara State,

Nigeria. The hospital was the temporary site for the University of Ilorin Teaching Hospital (UITH) for many years, thus making it a well-established health care facility known for general and specialised services. It thus consists of various wards and units including Medical, Surgical, Obstetrics and Gynaecology, Paediatrics, and Behavioural science (Psychiatric) Wards, and specials clinics and units such as the Dental clinic, Eye clinic, Intensive Care Units, Operating Theatre, among others. The hospital has 162 nursing staff of various cadres distributed across these wards and units. The entire consisted the study population; this is because of the small number (N=162). However, only those accessible over the two weeks of data collection were approached to participate in the study.

Sampling: An availability-convenience sampling technique was used to select a sample size of 125 from the accessible and willing population of nurses at the hospital.

Instrument: A self-structured questionnaire was used to obtain information from the respondents. The instrument consists of four sections:

Section A: Socio-demographic Characteristics of Respondents

Section B: Awareness and basic knowledge of DHT with questions having Yes/NO options

Section C: Perceptions of Nurses on DHT with the responding options of "strongly agree," "agree," "undecided," "disagree," "strongly disagree."

Section D: Availability of DHT devices with questions having "available" or "not available."

Section E: Utilization of DHT devices

The instrument was checked for face and content validity and the instrument were modified according to recommendations. The

reliability of the instrument was measured using Cronbach's Alpha and coefficient of 0.8 was obtained which was considered reliable.

Data Analysis: The data collected were analysed using Statistical Products and Service Solution (SPSS) version 25 and results were presented using both descriptive and inferential statistics. to test the hypotheses generated with level of statistical set at 0.05.

Data generated to assess the level of knowledge of the nurses towards digital health technology for improved patients' care and rated 'good' or 'bad.' Determined by the calculation of the point attributed to specific questions provided by the respondents. The calculation of 'good' or 'bad' was based on graduation of answer provided on the 'yes' or 'no' options for knowledge items while perception about Digital Health Technology among Respondents was measured on Likert Scale.

Ethical consideration: Permission was obtained from the Head of Nursing Department, General Hospital, Ilorin for this research work.

Results

Socio-demographic Characteristics of Respondents

As shown in Table 1, age distribution shows that, majority of the respondent, 62 (49.6%) are between 21 to 30 years old, while 39 (31.2%) respondents are between 31 to 40 years of age. The respondents were predominantly female (n= 93; 74.4%) and Registered Nurses (RN) only (52.8%) and BNSc (36.0%). Only about 9% have postgraduate qualifications.

The respondents are spread across the various units of the hospital's Special Care Baby Units (SCBU), Obstetrics and Gynaecological Units (O&G), Emergency Paediatrics Units and Accidents and Emergency Unit (A&E), and Medical-Surgical wards including renal unit. The nurses also have various years of professional experiences ranging from 1-5 years 52 (41.6%) to 16-25 years (n=7; 5.6%). They are also of various ranks with the junior cadre (CNO 2 and below) constituting over 70% of the respondents.

Table 1: Socio-demographic data of respondents

Variable	Response	Frequency (%)
Age (years)	Less than 20	1 (0.8)
	20-30	62 (49.6)
	31-40	39 (31.2)
	40 above	23 (18.4)
Gender	Male	30 (24.0)
	Female	93 (74.4)
	Choose not to say	2 (1.6)
Rank	DNS	1 (0.8)
	DDNS	8 (6.4)
	CNO1	15 (12.0)
	CNO 2	32 (25.6)
	PNO1	20 (16.0)
	PNO2	30 (24.0)
	NO	19 (15.2)
Highest qualification	RN	66 (52.8)
	NSC	45 (36.0)
	MSC	12 (9.6)
	PHD	2 (1.6)
Ward/unit	SCBU	23 (18.4)
	O&G	20 (16.0)
	EPU	38 (30.4)
	A&E	18 (14.4)
	FMW	18 (14.4)
	MMW	4 (3.2)
	Renal	4 (3.2)
Years of service (years)	1-5	52 (41.6)
	6-15	66 (52.8)
	16-25	7 (5.6)

Awareness and Knowledge of Digital Health Technology among Respondents

Table 2 shows that the general awareness level of DHT among nurses was 90.4% with awareness of the uses (n=97; 77.6%). However, only 28.8% of them had attended any related workshop on DHT. This

suggests that individual nurses made personal attempts to educate themselves about the DHT in various ways which were not explored in this study.

The table also shows that respondents displayed good knowledge of basic DHT such as the meaning (96.0%), benefits and uses for nursing care/ useful for fast diagnosis and treatment (96.0%), as well as the components such as the signs monitor, Tele-app, electronic health records (95.0%).

Table 2: Awareness and Knowledge of Digital Health Technology among Respondents

S/N	Awareness Statements	Responses	
		Yes (%)	**No (%)**
1	I have good idea about digital health technology.	114 (90.2)	11 (8.8)
2	I have a good level of understanding on the usage of Digital Health Technology.	97 (77.6)	28 (22.4)
3	I have never attended any training on the use of DHT in nursing care and practice.	36 (28.8)	89 (71.2)
	Knowledge Statements	**Correct**	**Incorrect**
4	DHT is the application of digital transformation strategy in the healthcare field.	120 (96.0)	5 (4.0)
5	DHT technology is beneficial for improved nursing care.	120 (96.0)	5 (4.0)
6	DHT facilitates quick diagnosis and treatment.	120 (96.0)	5 (4.0)
7	Hardware, software and networking are needed for the utilization of DHT	110 (88.0)	15 (12.0)
8	Vital signs monitor, Tele-App, Electronic health records are all examples of DHT	119 (95.2)	6 (4.8)
	Average	**94.2%**	**5.8%**

Knowledge of respondents were collated and scored and rated based on the responses from the participants. Ratings were done by scoring the correct responses as '1' and incorrect ones as '0' from specific items indicated under knowledge question items (items 4 - 8). These were summed up and rated 'good' and 'poor.' This is shown in Table 3.

Table 3: Knowledge Score on Digital Health Technology among Respondents

Knowledge Rating	Frequency	Percentage (%)
Good	92	73.6
Poor	33	26.4

Table 3 showed that majority of the respondents, 92 (73.6%), have good knowledge of DHT while 33 (26.4%) have poor knowledge of DHT.

Respondents' Perception about Digital Health Technology

Table 4 shows that majority of the respondents 68 (54.4%) agrees that digital health technology makes them accomplish nursing task more quickly, 56 (44.8%) which are majority of the respondents agrees that digital health technology improves their job performances, and 49 (39.3%) respondents strongly agree that digital health technology improves their job performances, 65 (62.0%) strongly agree that digital health technology improves the patient health outcomes, 90 (72.0%) agrees that digital health technology requires a lot of mental efforts 39 (31.2%) respondents do not agree nor disagree that digital health technology are not frustrating, 65 (52.0%) respondents agrees that digital health technology do not limit their interactions with patients and 47 (37.6%) respondents agree that digital health technology are necessary in nursing care and practices

Table 4: Perception about Digital Health Technology among Respondents

Perception Variables	SD (%)	D (%)	UN (%)	A (%)	SA (%)
DHT makes me accomplish nursing task more quickly	7 (5.6)	3 (2.4)	11 (8.8)	68 (54.4)	36 (28.8)
DHT improves my job performance	0 (0.0)	1 (0.8)	19 (15.2)	56 (44.8)	49 (39.2)
DHT improves patient's health outcome	3 (2.4)	1 (0.8)	9 (7.2)	47 (37.6)	65 (52.0)
DHT requires a lot of mental efforts	2 (1.6)	2 (1.6)	24 (19.2)	90 (72.0)	7 (5.6)
DHT are not frustrating	1 (0.8)	43 (34.4)	39 (31.2)	38 (30.4)	4 (3.2)
DHT do not limit my interaction with patients	0 (0.0)	29 (23.2)	21 (16.8)	65 (52.0)	10 (8.0)
DHT are necessary in nursing care and practices	0 (0.0)	14 (11.2)	15 (12.0)	47 (37.6)	49 (39.2)

Note: SD= Strongly Disagree; D=Disagree; UN=Undecided; A=Agree, SA=Strongly Agree

Table 5: Reported Availability of Digital Health Technology

Digital Health Technology	Yes (%)	No (%)
Nebulizer	77 (61.6)	48 (38.4)
Automated intravenous pumps	108 (86.4)	17 (13.6)
Suctioning machine	108 (86.4)	17 (13.6)
Air sterilizer	20 (16.0)	105 (84.0)
Oxygen concentrator	106 (84.8)	19 (15.2)
Smartphone TRI analyser	15 (12.0)	110 (88.0)
Digital Haemoglobinometer	81 (64.8)	44 (35.2)
Rapid diagnostic test kit	79 (63.2)	46 (36.8)
Patient lift	28 (22.4)	97 (77.6)
Vital signs monitor	45 (36.0)	80 (64.0)
Wearable artificial kidney	18 (14.4)	107 (85.6)
Pulse oximeter	72 (57.6)	53 (42.4)
Eye wears	25 (20.0)	100 (80.0)
Hearing aids	24 (19.2)	101 (80.8)
Radiant warmer	33 (26.4)	92 (73.6)
Radiation therapy delivery system	16 (12.8)	109 (87.2)
Incubator	20 (16.0)	105 (84.0)
Nano drug delivery system	47 (37.6)	78 (62.4)
Tele-health	7 (5.6)	118 (94.4)
Mobile apps	18 (14.4)	107 (85.6)

Table 5 shows the level of reported availability of DHT items in the hospital wards. It is shown that the most available items include automated intravenous pump (86.4%); suctioning machine (86.4%) and digital haemoglobinometer (64.8%)while other least available items are smartphone TRI analyser; air sterilizer.

Table 6: Utilization of Digital Health Technology by respondents

Utilization Variables	Never (%)	Sometimes (%)	Often (%)	Always (%)
DHT for all nursing care	100 (80.0)	15 (12.0)	8 (6.4)	2 (1.6)
For specific nursing procedure	67 (53.6)	25 (20.0)	25 (20.0)	8 (6.4)
Based on patients' preferences and request	53 (42.4)	50 (40.0)	17 (13.6)	5 (4.0)
Unstable power supply hinders the use of DHT fully	6 (4.8)	80 (64.0)	22 (17.6)	17 (13.6)
Bad network coverage affects our level of DHT utilization	12 (9.6)	25 (20.0)	18 (14.4)	70 (56.0)
Inadequate financing of DHT affects our level of utilization	2 (1.6)	5 (4.0)	20 (16.0)	98 (78.4)

Table 4. shows that 25 (20%) respondents sometimes use only DHT for specific nursing procedure, 17 (13.6%) often use DHT based on patients' preference and request and 5 (4%) respondents always use DHT based on patient preference and request, 80 (64.0%) respondents agree that unstable power supply sometimes hinders the use of DHT adequately and 98 (78.4%) respondents agree that inadequate financing of DHT always affect their level of utilization.

The utilization if DHTs of respondents were collated and scored and rated based on the responses from the participants. Ratings were done by scoring responses from 3 to 0, with '3' denoting 'Always,' '2' denotes 'Often' and '1' for 'Sometimes' and '0' for 'Never.' These scores were aggregated and responses with 2 and above were rated as 'Adequate' while those below '2' were rated as 'inadequate' as shown in Table 7.

Table 7: Level of Adequacy in Utilization of Digital Health Technology among Respondents

Utilization Rating	Frequency	Percentage (%)
Adequate	74	59.2
Inadequate	51	40.8

Table 7 showed that majority of the respondents, 74 (59.2%), utilize DHT adequately while 51 (40.8%) do not have adequate utilization of DHT.

Hypotheses Testing

Two null hypotheses were postulated in order to determine whether significant relationship exist between some attributes of the respondents and their knowledge of DHT. The qualification and level of utilization of DHT were compared with the respondents' level of knowledge on DHT and the results showed that both qualification (table 8) and level of utilization of DHT (table 9) were significantly associated with the respondents' level of knowledge on DHT ($p < 0.05$).

Table 8: Association between knowledge of nurses about digital health technology and their highest academic qualification (n=125)

Highest qualification	Knowledge of Digital Health Technology		Total (%)	Pearson Chi-square X^2	Df	P-value
	Good (%)	Bad (%)				
RN	42 (63.6)	24 (36.4)	66 (100.0)	9.583a	3	0.022*
BNSC	36 (80.0)	9 (20.0)	45 (100.0)			
MSC	12 (100.0)	0 (0.0)	12(100.0)			
PHD	2 (100.0)	0 (0.0)	2 (100.0)			
Total	92 (73.6)	33 (26.4)	125 (100.0)			

** $p < 0.05$*

Table 8 shows that a significant association exist between knowledge of nurses about digital health technology and their highest qualification

($p < 0.05$). This implies that respondents with higher qualification have better knowledge than those with lower qualifications.

Table 9: Statistical illustration of relationship between knowledge of nurses and the utilization of digital health technology for improved patients' care (N=125)

Utilization of Digital Health Technology	Knowledge of nurses about Digital Health Technology		Total (%)	Pearson Chi-square X^2	Df	P-value
	Good (%)	Bad (%)				
Adequate	70 (94.6)	4 (5.4)	74 (100.0)	40.900[a]	1	*0.005
Inadequate	22 (43.1)	29 (57.9)	51 (100.0)			
Total	92 (73.6)	33 (26.4)	125 (100.0)			

* $p < 0.05$

Table 9 shows that there is a significant association between the knowledge of nurses about digital health technology and the utilization of digital health technology for improved patients' care ($p < 0.05$). This implies that knowledge of respondents on the use of DHT influenced the utilization of DHT among the respondents.

Discussion Of Findings

Awareness and Knowledge of Digital Health Technology Devices

This study revealed that majority of the respondents have very good idea knew about digital health technology, are aware of uses of digital health technology but only few had attended any related training workshop on it. Most of them understood that DHT is the application of application of digital transformation strategy in the healthcare field; its benefits for improved nursing care, and fast diagnosis and treatment, as well as the types of devices. Similar recent findings by Thaddeus and Mushi (2021) and Raj (2019) corroborate with these findings of the study. Previous studies in Nigeria such as Bello, et al., (2004), had found varying knowledge among various cadres of health personnel and health sciences students. This indicates that study on DHT had been an ongoing exercise but the present study is on nurses in a

northcentral secondary health facility, compared to the Bello et al., (2004) study in eastern Nigerian tertiary health facility.

Perception about Digital Health Technology

Findings from this study revealed that majority of the nurses 90 (72%) had positive perception about digital health technology; only a few displayed negative dispositions to it. Some previous studies had also shown similar positive perceptions. For example, a study carried out by Thapa et al, (2021) in Saudi Arabia had revealed that 87.1% of nurses had positive perception towards digital health technology while Rohmawati et al., (2021) reported that 90% of nurses in their setting perceived digital health technology positively. Similarly, Sibandze and Mallinsion, (2018) discovered that nurses had positive perception about that digital health technology, believing that DHT makes nurses work easier, and saved time, made documenting easier and neater, reduced paperwork and facilitated editing patients' health records.

Availability of Digital Health Technological Devices

Findings from the study revealed that over two-third of the nurse reported non-availability of the common digital health technological devices in their facilities; 41(33%) of the nurses indicated availability of digital health technology of only some devices. This indicates a general poor availability of DHT devices, as also found by Mbunge et al., (2022) where 93% of the nurses reported poor availability of digital health technology. However, and in contrast, a study by Osei et al., (2021) reported more than two-third of nurses in their setting indicated that digital technological devices were sufficiently available to them**.**

Level of Utilization of Digital of Health Technology

Findings from the study revealed that 15(12%) respondents sometimes used Digital health technology for all their nursing care, while 67(53.6%) respondents never used DHT for specific nursing procedures, 50(40.0%) respondents sometimes used DHT based on patient preference and request. This aligns with the study conducted by Chand and Sarin (2019) where 71.98% of the nurses reported adequate level of utilization of DHT in their facility. However, Huque et al., (2021) found that more than half of the nurses (55.6%) in their study

reported low level of utilization of digital health technology. Bello, et al., (2004) had earlier reported low utilization habits among health care professionals and students in Nigeria. This study however focused only nurses.

Statistical illustration of association between knowledge of nurses about digital health technology and their highest academic qualification

Hypothesis 1 testing shows that there is a significant association between highest academic qualifications and the use of Digital Health Technology for all nursing care among nurses with p-value = 0.022 < 0.05. Hence, null hypothesis was therefore rejected and alternative accepted. This is similar to a study conducted by Thapa et al., (2021) in which there is a significant association between the highest academic qualification of nurses and their knowledge of digital health technology

Statistical illustration of association between knowledge of nurses and utilization of digital health technology for improved patient care

Hypothesis 2 testing shows that there is a significant association between knowledge of nurses about digital health technology and the utilisation of Digital health technology for improved patient care with p-value= 0.005< 0.05. Hence, null hypothesis was therefore rejected and alternative accepted. This aligns with the study conducted by Chand and Sarin (2019) where 32(71.98%) nurses had adequate level of utilization of digital health technology.

Limitations of the Study

The use of diagnostic testing to "diagnose" what nurses know and do not know about DHT; or the use of formative testing to gauge nurses' learning during the lesson and the use of others techniques such as benchmark testing and summative testing could have made knowledge of DHT more in-depth. However, this study is exploratory in nature with the intention to bring to the fore basic knowledge related to the meaning and available DHT devices.

Secondly, on the evaluation of the availability, only nurses' perspectives were used in this study. However, the use of a check list to find out the available digital technology devices in the hospital will be a stronger measure, compared to nurses' views. This approach used in this study however presents a self-reported availability by supposed users of the DHT devices who should be in a vantage position to present the status of these items.

Lastly, this study basically explored nurses' views on the utilization of DHT devices. The use of a questionnaire to find out the frequencies of the use of available digital technology devices in the hospital (and other settings) in subsequent studies will be more elaborating.

With the aforementioned limitations however, this study aimed to exploring the DHT situation at a General Hospital following some clinical observations. These preliminary findings are worthwhile to stimulate more in-depth studies on DHT availability and uses in healthcare facilities, with a view for enhanced educational input for both administrators and clinicians. The various traditional (conventional) and e-learning modules could be adopted for this digital endeavour.

Implications to nursing profession

The implication of this study to nursing practice presents the high awareness and basic knowledge of DHT and its importance to nursing profession. These are potential advantages for the introduction of DHT in the facility studies. Both Hospital Management and the Nursing Administration should deliberately train nurses more on DHT usage and make devices to facilitate improved quality of care. The observed scenario of long stay of patients, manual information processing among others could be overcome rapidly with DHT implementation across all units of the hospitals.

Conclusion

There is need for to intensify effort to improve their knowledge and skills among nurses, since findings from the study also revealed that knowledge influences the utilization of digital health technology

among nurses. Thus, nurses should be educated continually on various digital health technology and their usage for improved patient care. Interventions should be targeted at the entire population of nurses irrespective of their highest academic qualifications, rank or years of service. Also, nurses should be up-to-date about the trends of digital health technology for improved patient care.

Recommendations

Based on the findings of this research study, the following recommendations are suggested;

Government

i. Provision of digital health technological devices to various health sectors
ii. Adequate budget towards the full implementation of digital health technology
iii. Organization of programs to educate health care provider on the uses and importance of digital health technology devices.

Hospital Management

i. Ensure availability of necessary digital health devices and infrastructures when provided by government
ii. Monitor the usage of these devices often.
iii. Ensure healthcare provider have the skill to operate this device.
iv. Organizing programs on the uses of various digital health technological devices.

Nursing Personnel and other Healthcare professionals

i. Endeavour to learn new skills required for operating digital health technological devices.
ii. Be informed and updated about the trends of digital health technology
iii. Properly make full utilization of available digital technological devices for improved nursing care and practices

References

Bello, I.S., Arogundade, FA, Sanusi, AA, Ezeoma, IT Abioye-Kuteyi, EA Akinsola A (2004). Knowledge and Utilization of E-Health Care Delivery among Health Care Professionals in Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria *J Med Internet Res*, 6(4): e45; doi: 10.2196/jmir.6.4.e45

Bernstein, A., & Katz, D. L. (2021). Lifestyle Medicine and Climate Change: The Role of

Curtis, K., & Brooks, S. (2020). Digital health technology: factors affecting implementation in nursing homes. Nursing Older People, 32(2).

Etingen, B., Amante, D. J., Martinez, R. N., Smith, B. M., Shimada, S. L., Richardson, L., & Hogan, T. P. (2020). Supporting the implementation of connected care technologies in the Veterans Health Administration: cross-sectional survey findings from the Veterans Engagement with Technology Collaborative (VET-C) cohort. *Journal of Participatory Medicine*, 12(3), e21214.

Kowatsch, T., Otto, L., Harperink, S., Cotti, A., & Schlieter, H. (2019). A design and evaluation framework for digital health interventions. IT-Information Technology, 61(5-6), 253-263.

Krick, T., Huter, K., Domhoff, D., Schmidt, A., Rothgang, H., & Wolf-Ostermann, K. (2019). Digital technology and nursing care: a scoping review on acceptance, effectiveness and efficiency studies of informal and formal care technologies. BMC health services research, 19(1), 1-15.

Li, C., Vandersluis, S., Holubowich, C., Ungar, W. J., Goh, E. S., Boycott, K. M., ... & Ng, V. (2022). Correspondence on "cost or price of sequencing? implications for economic evaluations in genomic medicine" by Grosse and Gudgeon. Genetics in Medicine, 24(1), 251-252.

Lievevrouw, E., & Van Hoyweghen, I. (2019). The social implications of digital health technology

Mathews, S. C., McShea, M. J., Hanley, C. L., Ravitz, A., Labrique, A. B., & Cohen, A. B. (2019). Digital health: a path to validation. NPJ digital medicine, 2(1), 1-9.

Mbunge, E., Batani, J., Gaobotse, G., & Muchemwa, B. (2022). Virtual healthcare services and digital health technologies deployed during coronavirus disease 2019 (COVID-19) pandemic in South Africa: a systematic review. Global Health Journal.

Osei, E., Agyei, K., Tlou, B., & Mashamba-Thompson, T. P. (2021). Availability and Use of Mobile Health Technology for Disease Diagnosis and Treatment Support by Health Workers in the Ashanti Region of Ghana: A Cross-Sectional Survey. Diagnostics, 11(7), 1233.

Providers in Addressing a Public Health Challenge. American Journal of Lifestyle Medicine, 15598276211017097.

Raj, H. U. (2019). Nurses' knowledge And Attitude Toward Using Mobile Health Application: A Study In Finland And Lithuania.

Rohmawati, N., Ardiana, A., & Nur, K. R. M. (2021). Overview of Nurses Perception about Caring Based on Technology in the ICU and ER of Jember Region Hospital. Nursing and Health Sciences Journal (NHSJ), 1(3), 193-197.

Sharma, A., Harrington, R. A., McClellan, M. B., Turakhia, M. P., Eapen, Z. J., Steinhubl, S., ... & Peterson, E. D. (2018). Using digital health technology to better generate evidence and deliver evidence-based care. Journal of the American College of Cardiology, 71(23), 2680-2690.

Thadeus W, Mushi L. (2021) Health care professional knowledge and attitude towards the use of digital technologies in provision of

maternal health services at Tumbi regional referral hospital in Tanzania. *J Med Res Innov.* 5(1):e000233.

Thapa, Subash, (2021): Willingness to use digital health tools in patient care among health care professionals and students at a University Hospital in Saudi Arabia: quantitative cross-sectional survey." JMIR medical education 7.1 e1859