

Level Of Acceptance Of Electronic Health Technologies Among Health Practitioners And Cancer Patients In The North Central Nigeria

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Abstract: This study examined the use of electronic health technologies in use for the management of cancer in the North Central geographical zone of Nigeria. The study was conducted in the North Central zone of Nigeria. Purposive sampling technique was used to select three states in the zone including Kogi, Kwara, and Niger, together with Federal Capital Territory Abuja, because of high number of oncology clinics in the tertiary hospitals in the states. Therefore, tertiary hospitals with oncology clinics were purposively selected, to include two each of varied hospital ownerships of Federal, State, and Private, making a total of six (6) hospitals. Using Cochran's formula, two hundred and forty (240) respondents were randomly chosen from the selected six hospitals. Forty (40) respondents from each hospital, comprising 3 Doctors, 3 Nurses, 20 patients, 3 ICT professionals, 6 Pharmacists, and 5 Record officers, were selected from the hospitals. Two sets of questionnaires were designed for the study: One for the health practitioners and one for the patients. The questionnaire gathered information on the level of acceptance among patients and health practitioners, such as Perceived Usefulness, Perceived Ease of Use, Behavioural Intention to use and Perceived Unintended Consequences of the technologies. Findings revealed that the level of acceptance of electronic health technologies among the respondents was moderate, with the health practitioners demonstrating a higher (mean score = 2.7) acceptance than patients (mean score = 2.5). The study concluded that performance expectancy proved to be the most powerful force of adoption and perceived usefulness and clinical benefit were foundations of influence on adoption of electronic technologies.

Keyword: Level of Acceptance, Electronic Health Technologies, Cancer Management, Tertiary Hospital, Oncology Clinics, Technology Adoption, North Central Nigeria

I. INTRODUCTION

Cancer is a major health issue in the world and one of the main causes of disease and mortality, especially among the low- and middle-income nations across the globe 2018 (Cai and Liu, 2021). The cancer burden in Nigeria is on the rise

because of the high population, late presentation, inaccessibility to specialised services, and poor health system capacity (Ndukwe *et al.*, 2021). North Central region of Nigeria still experiences difficulties associated with the lack of proper infrastructure, insufficient cancer specialists, inappropriate health information management, and incomplete

continuity of care, which impact cancer outcomes negatively (Mansour *et al.*, 2024).

Electronic health technologies have been found to be useful in enhancing healthcare delivery; these technologies are electronic health records, telemedicine systems, mobile health apps and health information systems (Olver *et al.*, 2020; Adetunji *et al.*, 2024). These technologies are used in cancer care to facilitate the provision of timely diagnosis, care coordination, communication between health practitioners and patients, and monitoring and follow-up (Aapro *et al.*, 2020). The experience of both developed and developing nations indicates that electronic health technologies could enhance the efficiency of the provided services, data quality and engagement with patients provided that they are properly introduced.

Nevertheless, acceptance by both health professionals and patients plays a major role in the effective adoption of the electronic health technologies in the health system.

Electronic health technologies have significant potential to change cancer management by improving patient outcomes and workflow efficiency. However, there is still a major gap in understanding the acceptance level of these technologies among healthcare practitioners and cancer patients, especially in developing countries like Nigeria. (Vijayakumar *et al.*, 2023). This problem could lead to inadequate adoption of electronic health technologies among healthcare practitioners and cancer patients. These technologies have the potential in enhancing cancer management. The significance of electronic health technologies in cancer management is still inconclusive among researchers and scholars, as existing studies have not reached a agreement on their adoption outcomes (Caputo *et al.*, 2023). That showed crucial gap in knowledge that must be addressed in order to facilitate informed decision making on electronic health technologies adoption for cancer management in the healthcare systems.

II. METHODOLOGY

This study was carried out in the tertiary hospitals in the North Central zone of Nigeria. However, this study was conducted in three states namely Kogi, Kwara, and Niger together with Federal Capital Territory (FCT) was purposively selected for the study because of high number of oncology clinics in the tertiary hospitals in the states. Therefore, tertiary hospitals with oncology clinics were purposively selected, which consist of two each of varied hospital ownerships of Federal, State and Private making a total of six (6) hospitals. Both primary and secondary data was used. Using Cochran's formula, primary data was collected from structured questionnaire, which was administered randomly among two hundred and forty (240) respondents in these hospitals. Forty (40) respondents from each hospital, comprising three (3) Doctors, three (3) Nurses, twenty (20) patients, three (3) ICT professionals, six (6) Pharmacists and five (5) Record officers, were selected from the hospitals. The questionnaire gathered information on the level of acceptance of electronic health technologies among patients and health practitioners, such as Perceived Usefulness, Perceived Ease of Use, Behavioural

Intention to use and Perceived Unintended Consequences of the technologies.

III. RESULTS AND DISCUSSIONS

This study employed three stages of acceptance to measure the level of acceptance of electronic health technology for cancer management, as recommended by (Tuck *et al.*, 2020). The three stages adapted were disagreed, neutral, and agreed stages. The study employed mean ranking; it was ran using statistical package for social sciences. Therefore, Table 1 highlighted the mean ranking of the level of acceptance of electronic health technologies for cancer management in tertiary hospitals in North Central zone of Nigeria. Twenty-seven (27) variables were presented for this study. The variables were further grouped into five groups namely perceived usefulness, perceived ease-of-use, behavioural intention to use, perceived unintended consequences, and motivation, as shown in the Table 1.

The study presented job easiness to have the highest mean score of 2.67, with 74.6% of healthcare practitioner agreeing that electronic health technologies to makes their tasks easier. The study presented Job performance improvement to be the next with mean score of 2.58 and job effectiveness enhancement with mean score 2.53 as revealed in the study to record high level of acceptance by the healthcare practitioners. This revealed that electronic health technologies adoption is pivotal to effective cancer management in the healthcare system.

The study findings are in line with Technology Acceptance Model (TAM) by Davis (1989) who noted perceived usefulness to be paramount to the acceptance and adoption of electronic health technologies in the healthcare system (Toros *et al.*, 2024). Similarly, a study conducted by Marques *et al.* (2019), highlighted that electronic health technologies boost job performance of healthcare practitioners in the various healthcare systems.

The study also presents quick task accomplishment to have a mean score of 2.48 and further reported general job usefulness to have the mean score of 2.50 suggesting that electronic health technologies facilitate job performance among the healthcare practitioners. However, the study recorded a low acceptance level with job productivity reported a mean score of 2.30, with almost 26% of the healthcare practitioners disagreed to electronic health technologies to promotes job productivity. The study revealed that electronic health technologies easiness of tasks but its lasting effects on general productivity were not seen the same way by all the healthcare practitioners. This finding aligns with outcomes in a study conducted by (Parker and Grote (2022), which highlighted that electronic health technologies ease job performance by saving time.

The perceived ease of use consists of six variables in the group and this group showed high level of acceptance of electronic health technologies. Regarding easy usage, the variable recorded a high mean score of 2.50 while the variable, flexible interaction recorded mean score of 2.48. the study revealed that easy learning recorded mean score of 2.37 and the variable skills enhancement was reported to have

mean score of 2.35, this may suggest that due to the poor acceptance of easy learning and skills enhancement among healthcare practitioners specialised training programmes should put in place boost the acceptance level.

The outcomes of the study confirm the findings of Nankya *et al.* (2024) role in patient compliance to treatment plans. Moreover, the study reported general ease to have a low mean score of 2.30, this may suggest that the adoption of electronic technologies to make healthcare practitioners daily tasks easier may not be fully achievable considering the poor responses of some of healthcare practitioners.

The study further revealed the behavioural intention to use technology of healthcare practitioners' acceptance level to be neutral on adoption of these technologies with the study reported self-efficacy improvement to have a mean score of 2.42.

Variable	Disagreed Freq (%)	Neutral Freq (%)	Agreed Freq (%)	Mean
Perceived Usefulness				
Job Easiness	11 (4.6)	50 (20.8)	179 (74.6)	2.67
Job Performance Improvement	3 (1.3)	70 (29.2)	167 (69.6)	2.58
Job Effectiveness Enhancement	8 (3.3)	84 (35.0)	148 (61.7)	2.53
General Job Usefulness	2 (0.8)	76 (31.7)	162 (67.5)	2.50
Quick Task Accomplishment	3 (1.3)	64 (26.7)	173 (72.1)	2.48
Job Productivity Increment	62 (25.8)	177 (73.8)	62 (25.8)	2.30
Perceived Ease-of-Use				
Easy Usage	17 (7.1)	76 (31.7)	147 (61.3)	2.50
Flexible Interaction	17 (7.1)	78 (32.5)	145 (60.4)	2.48
Easy Learning Skills Enhancement	19 (7.9)	74 (30.8)	147 (61.3)	2.37
Understandable and Clear Interaction	17 (7.1)	81 (33.8)	142 (59.2)	2.35
General Easiness	8 (3.3)	84 (35.0)	84 (35.0)	2.37
Behavioural Intention to Use				
Self-Efficacy Improvement	13 (5.4)	80 (33.3)	147 (61.3)	2.30
Self-Efficacy Improvement	31 (12.9)	78 (32.5)	131 (54.6)	2.42
Self-Efficacy Improvement	31 (12.9)	78 (32.5)	131 (54.6)	2.42
Job Satisfaction	30 (12.5)	67 (27.9)	143 (59.6)	2.38
Subjective Norm	29 (12.1)	85 (35.4)	126 (52.5)	2.30
Coping with Computer Anxiety	40 (16.7)	74 (30.8)	126 (52.5)	2.10
Perceived Unintended Consequences				
Job Loss	30 (12.5)	81 (33.8)	129 (53.8)	2.20
Data Insecurity	30 (12.5)	85 (35.4)	125 (52.1)	2.12
Error Creation	34 (14.2)	79 (32.9)	127 (52.9)	2.10
Time Consuming	33 (13.8)	80 (33.3)	127 (52.9)	2.08
Third Party	44 (18.3)	78 (32.5)	118 (49.2)	2.03
Lack of Thought Expression and	37 (15.4)	75 (31.3)	128 (53.3)	1.93

Communication				
Motivation				
Intention	37 (15.4)	51 (21.3)	152 (63.3)	2.33
Social Norm	95 (39.6)	55 (22.9)	90 (37.5)	2.30
Risk Perception	23 (9.6)	115 (47.9)	102 (42.5)	21.5
Attitude	42 (17.5)	74 (30.8)	124 (51.7)	2.10

Key: Disagreed: 1.00 – 1.49; Neutral: 1.50 – 2.49; Agreed: 2.50 – 3.00

Table 1: Level of Acceptance of these Technologies among Healthcare Practitioners

This reveals that healthcare practitioners are not fully sure if electronic healthcare technologies will be of help to them managing cancer patients' health conditions effectively. The study further revealed job satisfaction to have a mean score of 2.38 while subjective norm also has mean score of 2.30, this suggests a slightly acceptance level but not significant, showing that social and organisational factors influenced healthcare practitioners' interest to adopt electronic health technologies.

Nevertheless, the study reputed coping with computer anxiety variable to have a low mean score of 2.10, this indicates that some of the healthcare practitioners are still faced with problem of confidently adopting electronic healthcare technologies for cancer management Kavandi and Jaana, (2020), noted similar outcomes on computer anxiety negatively influencing the level of acceptance of digital technologies despite its great potentials to transform the health system.

The study revealed the outcomes of the various variables adapted for perceived unintended consequences and also highlighted some of the challenges observed at the course of the study. The variable job loss received neutral responses of mean score of 2.20, data insecurity also recorded neutral responses of mean score of 2.12, then the variable error creation was reported to mean score value of 2.10 which falls within the neutral measurement scale, and the lowest responses was observed in the variable lack of thought expression and communication which the respondent disagreed with the acceptance of lack of thought expression and communication with mean score value of 1.93. The findings in this study reflects the healthcare practitioners indifferent on the acceptance of electronic health technologies.

This was also noted in a study by Abernethy *et al.* (2022), which revealed that despite the effectiveness of digital health technologies for health management effective communication is a serious challenge among healthcare practitioners. Furthermore, the fear of third party accounted for the mean score of 2. among healthcare practitioners while the challenge of electronic health technologies consumes time accounted for the mean score of 2.08. The study outcome in this regard shows the recent trend on data privacy and security in workflows as a result of the adoption of electronic health technologies.

The study also recorded a neural response on all the variables presented for motivation factors except for risk perception variable where the acceptance level was weak. The study presents intention under motivation factors to record mean score value of 2.33 while social norm recorded mean score of 2.30, this means that the healthcare practitioners were neutral about the acceptance of these indicators. This indicates

that the healthcare practitioners were indifferent about the acceptance and adoption of electronic health technologies for managing cancer patients.

Nevertheless, risk perception indicator recorded the lowest responses from the healthcare practitioners with mean score value of 1.39. This may be attributed to fears of harm or mistakes that may occur in accepting and adopting electronic health technologies for managing patients' health especially for cancer management. The study by Belfrage *et al.* (2022) confirms this outcome. They noted that health practitioners were skeptical about the acceptance and adoption of electronic health technologies for cancer management due to lack of trust for the concept, safety issues, and ethical problems. The study further recorded that the healthcare practitioners were indifferent about the acceptance of the indicator attitude with mean score 2.10. The gap in the indifferent of healthcare practitioners' attitude towards the acceptance of these technology for cancer management can be addressed by organising a public awareness programme to encourage their attitude towards the acceptance and adoption of electronic health for cancer management.

Conversely, the level of acceptance of electronic health technologies by cancer patients for the management of cancer were reported in Table 2. The indicators adapted for this study were grouped into five groups namely, perceived usefulness, perceived ease-of-use, behavioural intention to use, perceived unintended consequences, and motivation. The indicators in perceived usefulness group demonstrated a highly significant level of acceptance among the cancer patients such as Disease Management Plans Improvement with mean score of 2.77, Easy Disease Management Plans with mean score of 2.68, Disease Management Plans Enhancement with the mean score of 2.58, and Useful in Disease Management Plans with mean score of 2.54 while the study reported the patients to be highly neutral about the acceptance of some of the indicators such as Disease Management Plans Effectiveness with mean score of 2.48 and Seeing Healthcare Provider Quickly with mean score of 2.45. These outcomes were similar to previous studies in this context for example, study by Caffaro *et al.* (2020) revealed that perceived usefulness is pivotal in the acceptance of digital health technologies in the healthcare system for the management of chronic disease such as cancer.

Furthermore, the indifferent reported in the study on disease management plans effectiveness and seeing healthcare provider quickly may be attributed to the skepticism of the patients of if electronic health technologies will produce their desired expectations on these regards.

Moreover, perceived ease of use group, presented five indicators of which the cancer patients were indifferent about the acceptance and adoption electronic health technologies as it relates to these indicators for instance, Easy Learning with mean score of 2.38, General Easiness with mean score of 2.37, Easy Usage with mean score of 2.32, Flexible Interaction with mean score of 2.32, and Understandable and Clear Interaction with mean score of 2.31. These outcomes further revealed high significant indifference of these patients towards the acceptance and adoption of electronic health technologies for managing their cancer health issues. This confirms previous study by Davis (1989) on technology acceptance model who

noted that perceived ease of use influences the acceptance and adoption of technology.

Behavioural Intention to Use also adapted five indicators as shown in Table 2. The results of each of these indicators were presented as follows, Coping with Computer Anxiety with mean score of 2.32, Self-Efficacy Improvement mean score of 2.31, Disease Management Experience mean score of 2.30, Healthcare Service Satisfaction mean score of 2.28, and Subjective Norm mean score of 2.24. The study further revealed that showed that these patients were neutral about the acceptance of electronic health technologies for cancer management as it relates to coping with computer anxiety, self-efficacy improvement, disease management experience, healthcare service satisfaction, and subjective norm. The study findings in this regard aligns with study by Arthanat *et al.* (2019) which highlighted challenges such as anxiety can slow down or prevent the acceptance and adoption of technologies despite its usefulness in managing cancer. This suggests the need to organised public awareness sessions on the key potentials in accepting electronic health technologies for cancer management in order to addressed the challenge.

Variable	Disagreed Freq (%)	Neutral Freq (%)	Agreed Freq (%)	Mean
Perceived Usefulness				
Disease Management Plans Improvement	1 (0.8)	26 (21.7)	93 (77.5)	2.77
Easy Disease Management Plans	2 (1.7)	35 (29.2)	83 (69.2)	2.68
Disease Management Plans Enhancement	4 (3.3)	42 (35.0)	74 (61.7)	2.58
Useful in Disease Management Plans	11 (9.2)	33 (27.5)	76 (63.3)	2.54
Disease Management Plans Effectiveness	13 (10.8)	36 (30.0)	71(59.2)	2.48
Seeing Healthcare Provider Quickly	16 (13.3)	34 (28.3)	70 (58.3)	2.45
Perceived Ease-of-Use				
Easy Learning	20(6.7)	34(28.3)	66(55.0)	2.38
General Easiness	22(18.3)	32(26.7)	66(55.0)	2.37
Easy Usage	26(21.7)	30(25.0)	64(53.3)	2.32
Flexible Interaction	22(18.3)	38(31.7)	60(50.0)	2.32
Understandable and Clear Interaction	23(19.2)	37(30.8)	60(50.0)	2.31
Behavioural Intention to Use				
Coping with Computer	21(17.5)	40(33.3)	59(49.2)	2.32

Anxiety				
Self-Efficacy	26(21.7)	31(25.8)	63(52.5)	2.31
Improvement				
Disease	22(18.3)	40(33.3)	58(48.3)	2.30
Management				
Experience				
Healthcare	24(20.0)	39(32.5)	57(47.2)	2.28
Service				
Satisfaction				
Subjective	24(20.0)	43(35.8)	53(44.2)	2.24
Norm				
Perceived				
Unintended				
Consequences				
Error Creation	22(18.3)	38(31.7)	60(50.0)	2.31
Third Party	20(6.7)	44(36.7)	56(46.7)	2.30
Lack of	24(20.0)	39(32.5)	57(47.2)	2.28
Healthcare				
Provider				
Relationship				
Time	25(20.8)	38(31.7)	37(47.5)	2.27
Consuming				
Data Security	30(25.0)	37(30.8)	53(44.2)	2.24
Breaches				
Motivation				
Intention	32(26.7)	30(25.0)	58(48.3)	2.31
Attitude	34(28.3)	30(25.0)	55(45.8)	2.30
Social Norm	34(28.3)	30(25.0)	55(45.8)	2.30
Risk Perception	89(74.2)	15(2.5)	16(13.3)	1.39

Key: Disagreed: 1.00 – 1.49; Neutral: 1.50 – 2.49; Agreed: 2.50 – 3.00

Table 2: Level of Acceptance of these Technologies among Cancer Patients

Furthermore, Perceived Unintended Consequences also adapted five indicators and each of them recorded neutral responses from the cancer patients. This implies that they were not sure on their stand about the acceptance of electronic health technologies as it relates to each of these indicators. The results on perceived unintended consequences are presented as follows: Error Creation with mean score of 2.31, Third Party with mean score of 2.30, Lack of Healthcare Provider Relationship with mean score of 2.28, Time Consuming mean with score of 2.27, and Data Security Breaches with mean score of 2.24. Similarly, study conducted by Alsyouf *et al.* (2023) also noted data

Also, Motivation Factor is characterised of four indicators with indecisive responses from the patients except risk perception that recorded weak acceptance level. The results are reported as follows: Intention with mean score of 2.31, Attitude with mean score 2.30,

security problem as one of the challenges influencing the acceptance of health technology by patients for managing their health issues.

Social Norm with mean score 2.30, and Risk Perception with mean score 1.39. The results further revealed that the patients were not particular about the perceived risks associated with the acceptance of electronic health technologies for managing their disease despite the unintended consequences and this was also confirmed by Ayanlade *et al.* (2019) findings on the unintended consequences involved in the adoption of technology for disease management.

The findings on the mean sum of level of acceptance of electronic health technologies among health practitioners and

cancer patients for cancer management in the selected tertiary hospitals in North Central Nigeria were presented in Table 3. The variables adapted were summed up using statistical package for the social sciences to arrive at five basic indicators used to report the mean sum of level of acceptance of electronic health technologies among health practitioners and cancer patients for cancer management in the selected tertiary hospitals in North Central Nigeria. The first three (that is Perceived, Usefulness, Perceived Ease of Use, and Behavioural Intention to Use) indicators mean sum for level acceptance among the healthcare practitioners were significantly high while only Perceived Usefulness was high for the patients.

The study findings showed that the healthcare practitioners recorded a higher level of acceptance of electronic health technologies as related to the measured indicators than the cancer patients. This may be attributed to the fact that these healthcare practitioners required these technologies to aid their job performance compare to the cancer patients that need to accept these technologies to access online health services and manage their pain level. This also may suggest that most of the healthcare practitioners are digitally informed. The study findings in this context are in related to Davis (1989) study findings which highlighted those individuals exposed to both academic and professional trainings are more likely to accept and adopt digital technologies to solve practical problems.

Also, due to the frequent adoption of electronic health technologies in workplaces, the healthcare practitioners perceived usefulness and perceived ease of use of acceptance of these technologies are higher compared to the patients that have little or no access to these technologies. The study presents the findings on the mean sum of level of acceptance of electronic health technologies among healthcare practitioners are as follows, perceived usefulness had the mean score of 2.75, followed by perceived ease of use with mean score of 2.62, behavioural intention to use recorded a mean score of 2.56, perceived unintended consequences with mean score of 2.46, and motivation with mean score of 2.47.

The higher acceptance level among the healthcare practitioners regarding perceived usefulness, perceived ease of use, and behavioural intention to use as shown in Table 3 reflect a key point that healthcare practitioners adequately understands the importance of electronic health technologies for cancer management. This finding was confirmed by recent researches for example, Toros *et al.* (2024) highlighted that perceived usefulness is a key factor for the acceptance of digital technologies. The study further highlighted the continued trainings enjoyed by healthcare practitioners may be responsible for their significant acceptance level of electronic health technologies. This aligns with the research conducted by Tapuria *et al.* (2021) which noted that training facilitates technologies acceptance.

Thus, the acceptance and adoption of electronic health technologies by healthcare practitioners is pivotal to improve effective cancer management. Furthermore, the study suggests the acceptance of these technologies positively influenced the health condition of these patients. This was revealed in the study conducted by Davis (1989), he noted that perceived ease

of use of technologies influences the perceived usefulness and behavioural intention.

However, the low acceptance level recorded among the healthcare practitioners may be as a result of inadequate knowledge in digital technologies, systematic or technical problems (Esmaeilzadeh, 2019).

Conversely, the study reported the results of the mean sum of acceptance level of electronic health technologies among cancer patients are as follows, perceived usefulness recorded the mean score of 2.58, perceived ease of use with mean score of 2.33, behavioural intention to use with mean score of 2.56, motivation with mean score of 2.29, and perceived unintended consequences with mean score of 2.28. The higher acceptance level among the cancer was observed in perceived usefulness as shown in Table 3. This shows that cancer patients adequately understand the vital roles of electronic health technologies managing their health. This finding aligns with Toros *et al.* (2024) which noted perceived usefulness to be a key indicator for the acceptance of technologies.

The study further revealed the continued public awareness may increase acceptance level of electronic health technologies for cancer management. This aligns with the research conducted by Tapuria *et al.* (2021) which highlighted that training programmes facilitates technology acceptance.

Thus, the acceptance and adoption of electronic health technologies cancer patients is important for effective cancer management. The study further revealed that cancer patients always rely on healthcare practitioners' prescriptions and advise before consulting digitals platforms for solutions to their health issues (Conner, 2020). The study conducted by Tapuria *et al.* (2021) further revealed that cancer patients are prone to some difficulties such as poor computer knowledge, age especially with the fact that cancer is prevalence among the aged, fear associated with accessing these technologies due to their complexities. Patients in some cases still struggle with these electronic health technologies platforms requiring assistance from people around and this lower their moral to accept these technologies for adoption. Thus, it is suggested that the interfaces of these electronic health technologies platform be simplified for easier access. Also, public awareness talk or programme may address this gap.

Variables	Mean Sum	Mean Sum
	Staff	Patient
Perceived Usefulness	2.75	2.58
Perceived Ease of Use	2.62	2.33
Behavioural Intention to Use	2.56	2.28
Perceived Unintended Consequences	2.46	2.29
Motivation	2.47	2.02

Key: Disagreed: 1.00 – 1.49; Neutral: 1.50 – 2.49; Agreed: 2.50 – 3.00

Table 3: Mean Sum of Level of Acceptance of these Technologies among Health Practitioners and Patients

IV. CONCLUSION

The study concluded by specifying perceived usefulness for instance variables such as Job Easiness, Job Performance

Improvement, Disease Management Plans Improvement and Easy Disease Management Plans together with perceived ease of use for example variable like Easy Usage proved to be the most acceptance force for the adoption of electronic technologies for cancer management in tertiary hospitals in North Central Nigeria.

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