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WILLINGNESS OF HEALTH PROFESSIONALS TO USE ELECTRONIC MEDICAL RECORD SYSTEM IN BAHIR DAR CITY, NORTHWEST ETHIOPIA.

BERIHUN, BIRHANU

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BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

**DEPARTMENT OF HEALTH SYSTEM AND HEALTH
ECONOMICS**

**WILLINGNESS OF HEALTH PROFESSIONALS TO USE
ELECTRONIC MEDICAL RECORD SYSTEM IN BAHIR DAR
CITY, NORTHWEST ETHIOPIA.**

PI:

BIRHANU BERIHUN (BSc)

**A RESEARCH THESIS SUBMITTED TO THE DEPARTMENT OF
HEALTH SYSTEM AND HEALTH ECONOMICS, SCHOOL OF PUBLIC
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OF MASTERS IN HEALTH SYSTEM & PROJECT MANAGEMENT.**

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BAHIR DAR UNIVERSIT

BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND
HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF HEALTH SYSTEM AND HEALTH
ECONOMICS

INVESTIGATOR BIRHANU BERIHUN(BSC)

PHONE: - +251920761845

E-MAIL: - berbirr08@gmail.com

ADVISOR/S: -1. DESTA DEBALKIE (BSC, MPH)

PHONE: - +251910477921

E-MAIL: - desta2a@gmail.com

2. GETACHEW SETOTAW (MSC IN HI)

PHONE: - +251921600203

E-MAIL: - getachewrbf@gmail.com

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TO USE ELECTRONIC MEDICAL RECORD SYSTEM IN BAHIR
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Abstract

Background- Globally, the electronic information and communication technology has been applied and much expanded in health care industry. In developing countries including Ethiopia, electronic medical record system adoption and utilization for medical practice is still low and also health institutions which start utilization have failed to sustain. There is a limitation of study on health professionals' willingness to use electronic medical record system.

Objective: - The aim of this study was to assess health professionals' willingness to use electronic medical records system and to identify associated factors in Bahir Dar city.

Methods: - Institutional based cross-sectional study was conducted from September 1 to October 30, 2019 among 634 health professionals selected by using a simple random sampling technique. Data were collected by using a structured self-administered English version questionnaire. Data were entered into Epi data version 3.1 and exported to SPSS version 23 for further analyses. Descriptive statistics were computed to describe study variables and presented using tables and graphs. Health professional willingness to use EMR system was assessed by five 'Yes' or 'No' questions and score of 3 marks and above out of 5 marks suggested willingness while a score of less than 3 marks suggested unwillingness. A binary logistic regression model was fitted to identify the associated factors. The odds ratio (OR) with 95% confidence interval (CI) was used to measure the strength of association.

Results: - A total of 634 health professionals participated in the study with a response rate of 97%. The mean age of respondents was 30.9 ± 5.5 years (Mean \pm SD) with a range of 20 to 60 years. The majority (85.9%) of health professionals were willing to use EMR system. Health professionals who had good attitude to EMR, good computer skill, good knowledge on EMR, EMR training, EMR guideline access and management support were (AOR=2.23; P=0.029), (AOR=2.46; P= 0.005), (AOR=2.11; P=0.044) (AOR=3.75; P=0.001), (AOR=2.76; P=0.005) and (AOR=2.59; P=0.002) time more likely showing their willing to use EMR system than the counterparts, respectively.

Conclusions: EMR training, knowledge on EMR, attitude towards EMR, computer skill, presence of EMR guideline and management support were independent factor of willingness to use EMRS. EMR training should give and it should contain knowledge, attitude and skill. EMR guideline should also need to avail and give management support.

Key words: Willingness to use EMRS, health professionals, Bahir Dar city, Ethiopia.

Acronyms and abbreviations.

E-Health	Electronic Health
EMR	Electronic Medical Record
HER	Electronic Health Records
HIE	Health Information Exchange
HIS	Health Information Source
HSTP	Health sector transformation plan
ICT	Information Communication Technology
IT	Information Technology
KAP	Knowledge, Attitude, Practice
PHC	Primary Health Care
UHC	Universal Health Coverage
WHO	World Health Organization

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1. Introduction

1.1. Background

Application of electronic information and communication technology (ICT) increase throughout world-wide. As survey of world health organization (WHO) in 2012 indicated, only 45% of countries use electronic systems for patient data collection. From this, only 30% of countries has been collecting and communicating patient information with electronic systems. In Ethiopia, health sector transformation plan (HSTP) IV's strategic objective focused on utilization of electronic health management information system and electronic medical record (EMR) system in health service ([1](#), [2](#)).

Using information communication technology in health care is not merely about technology but it is a means to solve clinical communication challenges and critical data management in health care organizations, especially in developing countries. So, it increases health professionals easy data access to promote evidence-based decision making and intelligence health responses by aggregating and dissemination of quality data ([1-3](#))

EMR is an individual's health and health-related information record, which is recorded using computer software. It is also defined as an electronic software program developed for the storage, processing, and data exchange of medical and medical-related information on an individual that can be created, gathered, managed and consulted by authorized clinicians and staff by healthcare providers within one health care organization ([4](#), [5](#)). It is a long-life repository of health information that is essentially required for maintaining a personal health profile. ([4](#), [6](#)). Now it is the age of information and information is key to any success in both developed and developing country. EMR system is the tool which used to access information and within the last 20 years, different information technologies are being discussed, developed and implemented. In addition, it is also used to generate, collect and manage data by authorized healthcare workers to exchange data within a healthcare institution. ([7-9](#)).

Potentially, EMR system used to increase health professional productivity and improving patient safety, efficiency and quality by improving interdepartmental communication, reduce waiting times for patients, reduce medical errors and reduce the cost of the hospitalization and early detection of epidemics. For health care managers, it used to easier create reports, organizing and

locating clinical information, managing plan care. Basically, it used to assure the right health information provision to the right person at the right place and time (7, 8, 10).

Research done in US hospitals, 2013 showed that EMR system adoption decrease patient length of stay within 30 days by 0.11%, decrease patient mortality rate within 30 days by 0.18%, and patient rehospitalization by 0.46% (11). Another study done in Australia showed that 5% more patient consultation per hour seen by doctors in the EMR system period compared to the paper medical record period. And also, there was high quality documentation and easier to use EMR system than paper medical record which felt by more doctors and nurses(12). As cross-sectional study conducted in public hospitals Malawi, 2017 indicated that 76% health workers found EMR systems to be faster and easier to use than paper-based records. Additionally, most respondents 77.8% felt that during EMR system information was more accurate and patients were attended to more quickly than with the paper-based records system(9). Study conducted in south Africa, 2017 hand writing error decrease by 22% when using electronic prescription (3).

Nowadays, governments worldwide begun to give great emphasis on utilization and automation of medical record systems for major advancement in healthcare practice. But different barriers cause low utilization of EMRs. As WHO survey in European regions, 2016 indicated 49%, 33% and 29% of the region had financial, technical and infrastructural barrier to use EMR, which is directly related health professionals' unwillingness to use EMRS (13). Anther previous studies also identifies most common barriers in developing country Including Ethiopia which includes functional, organizational, technical, training, political, ethical and financial; which is related to the unwillingness of its users to accept EMRS (14).

1.2. Statements of the problem

The use of EMR system need revolution in healthcare services globally to provide solution to paper-based record limitation (15). Preventable medication prescription errors affect more than 1.5 million Americans annually (3). Prescriptions had 18.5% of reading error from those 10% name, 24% dosage and 30% dosage interval. Paper based system also had lack of patient confidentiality and privacy due to unauthorized users can easily access information and record could be lost by fire or flood without recovery. Storage takes up space and paper will decay somehow in the long run, access paper record could only one clinic at a time and complex to access (3, 9, 16).

As United States institute of medicine reports indicated that 44,000 to 98,000 people, die in hospitals each year as a result of medical error (poor handwriting) that could have been prevented by using EMR system. The estimated total costs \$17 billion to \$29 billion per year in hospitals nationwide were lost and errors also are costly in terms of loss of trust in the healthcare system by both patients and health professionals(17).

As study done in North Carolina hospitals indicated that 18% of patients were harmed by hospital medical care and one in seven Medicare patients suffered harm from medical care error. From those 63% harmed by hospital medical care and 44% of medical care error were preventable if health care professionals use EMR system. Within this study, more than 130,000 life-threatening situations caused by adverse drug reactions and \$44 billion could be saved annually by installing computerized physician order entry systems (18). Study done in India indicate that the duration of patient treatment was significantly longer for paper records than electronic records and EMR system were 40% more complete and 20% faster to retrieve than paper records (10).

Health professionals are major role player to successful implementation and sustainability to use EMR system. EMR system implementation challenges and barriers in one developing country may differ from one another. But there can be some common issues which have major role in the successful acceptance and utilization of EMR system. Thus, health professional's willingness to use EMR system is a key element for successful adaptation of electronic medical system(19).

As study done in Saudi Arabia on main barriers to use EMR system shows that 72.5% was lack of experience to use of computers and 52.9% health professionals resistance to use (20). As systematic literature review conducted in South Africa indicated that lack of skilled health care

personnel and health professional resistance to the new technology were the challenge for utilization of EMR system (21).

Cross-sectional research done in Addis Ababa, Ethiopia in 2015 showed EMR system /smart care/ software implementation was started in 2007/2008 but adoption and utilization rate is still low (22, 23). Even the health institutions that start to use EMR system were also failed to sustain EMRS. As indicated by the previous studies, health professionals' resistances and dissatisfaction to use new technology were major barrier to use EMR (6, 23, 24).

Despite the utilization of the system, there was no adequate evidence on health professionals' willingness to use EMR system and its associated factor in Ethiopia. In order to have commitment to use EMR effectively in future, evidence on the main factors of EMR success or failures must be studied. However, there is little evidence on determinant factors of willingness to use EMR in resource-limited settings where age, sex, work experience and IT skills were major concerns (25). Therefore, this study aims to address levels of health professional willingness to use EMR system and to identify its associated factors in Bahir Dar city, Ethiopia.

1.3. Significance of the study

Utilization of EMR system in healthcare service is one of the enhancing factors to improve health care quality. Nowadays, pre and post implementation assessments of health professional willingness to use EMR system is core component for successful implementation and to sustain the effective utilization of EMR system.

The information that will be generated through this research will be used as a baseline regarding health professionals' EMR usage in the study area. It will also be used, to plan and make effective and efficient EMR system implementation and sustainability.

It will also assist health managers and policy makers to design appropriate strategy to motivate health professionals EMR system utilization for improving health care service. It will also be used by researchers for further study of pre implementation about health professionals' willingness to use EMR system.

2. Literature review

Overview of EMR system utilization

The EMR system comprises health-related information that is created by health care providers on behalf of a patient, such as diagnostic tests or prescriptions for medications. Different literature from global to local research was reviewed on health professional willingness to use EMR system and associated factor. As WHO Global diffusion of e-health in 2016 survey indicated, 58% of responding member states now have an e-health strategy and half of countries have government-supported health internet sites that offer information in multiple languages (17). As survey done by world Bank showed around 40% of high-income countries reported high or very high interest use of electronic format (2). As literatures show that EMR system utilization had association with age, field of study, level of education, computer training, English language proficiency, knowledge, attitude for EMR system.

2.1. Health professional's willingness to use EMR system

A Markle Foundation survey of physicians on personal health records b/n 2008–09, indicated that 42.3% of physician had willingness to use to use patients' electronic personal health records in their clinical practices(26). According to cross-sectional research conducted in Saudi Arabia, most of the respondents (88.2%) reported their willingness to use national EHR to record their data for health services planning and policy making (27). As other study done in Saudi Arabia public hospital, 2015 revealed 83% health professional preferred to use EMR than paper-based system (20).

As a cross-sectional study done in Lagos University Teaching Hospital, Lagos, Nigeria, 2018 showed that nearly all of them (96.5%) were willing to use EMR system. In this study, 79.2% and 94% of the respondents said that they were willing to purchase personal laptops /computers/ and to undergo computer training to use EMR system respectively. Nearly all (96.5%) of them said they were willing to use EMR system if properly trained and if the technical infrastructures available(25). And another cross-sectional study done in Semi Urban Tertiary Hospital, Nigeria, 2017 indicated that 80% of respondents were willing to use Mobile Health technology(28). As cross-sectional study conducted in Rwanda, 2017 indicated, 88.5% of healthcare workers preferred and accept to use EMR over paper based records (29)

As cross-sectional study done in North Gondor zone, 2014 revealed that health professionals who were willing to implement EMR system were 2.63 times more likely to be ready to use EMR system than their counterparts(30).

2.2. Associated factors

2.2.1. Socio-demographic characters

2.2.1.1 Age

Cross-sectional study done in Nigeria, 2018 indicated that there was no significant association between age with willingness to use EMR system(25). As cross-sectional study conducted in public hospitals Malawi, 2017 indicated that 58.6% of healthcare workers within the 21-30-year age group used EMR system more than paper-based records. Within this study participants aged 61 to 70 years used paper records more than electronic records (9).

As cross-sectional study done in a developing country in Ethiopia, 2015 revealed that health professionals who were younger (25-35 years old) were approximately 3 times more likely to use computers than respondents aged 36 years and older (31). As cross-sectional study done in Addis Ababa, Ethiopia, 2015 indicated that health professionals aged ≤ 30 years were 2.57 times utilize computer to manage the patient as compared to age >30 years (32).

2.2.1.2. Sex

As cross-sectional study conducted in public hospitals Malawi, 2017 indicated that both sexes had equal utilization level for EMR system b/c both have equal exposure for technology (9). Cross-sectional study done in North Gondor zone, 2014 revealed that male health professionals were 1.87 times more likely to be ready to use EMR system than female health professionals (30).

2.2.1.3. Educational level

As cross-sectional study conducted in public hospitals Malawi, 2017 indicated that health workers with secondary level education used more EMR system than tertiary-level education. Because most health workers with secondary education were clerks and their scope of EMR system usage was mostly limited to the single EMR system function of collecting patient demographic information (9).

As cross-sectional research conducted in Benghazi, Libya, in 2007 indicated that doctors educational level had positive significance association with their computer use (33). As cross-sectional study done in a developing country in Ethiopia, 2015 revealed that in educational level those with higher levels of education were 2.78 times more likely to use computers than those with lower levels of education (31). As cross-sectional study done in Addis Ababa, Ethiopia, 2015 indicated that degree and above holders were 3.17 times to use computers than diploma holder(32).

2.2.1.4. profession.

As cross-sectional study done in Harar region, Ethiopia, 2015 indicated that medical laboratory technicians and pharmacists were more likely to use computers than nurses(31).

2.2.2. Attitude towards EMR system

Cross-sectional in Iran, 2015 showed that 65.2% of nurses had good attitude for EMR (15). Research conducted in Zahedan University in Iran, 2011 indicated that 75% of Physician had good attitude to accept EHR (34) while a research conducted in Benghazi, Libya, in 2007 indicated that 96% of doctors had good attitude for EMR utilization(33). A cross-sectional study done in Nigeria, 2018 indicated that all (100%) physicians had good attitude towards EMR and 71.8% of them strongly agreed that EMRs would improve quality of care and reduce medical errors while 97.5% and 52% strongly agreed EMR would improve quality of practice and increase patients' satisfaction respectively. Nearly all of them (92.6%) had the opinion that the benefits of EMRs outweigh its cost. More than half (60.9%) of the respondents agreed that EMRs would decrease the burden on physicians (25). Another research done in Nigeria indicated that 46.3% of respondents had overall satisfaction with EMR and 32.7% of the respondents agreed that EMR had improved services (35) Cross-sectional study done in Jeddah, Saudi Arabia, 2018 showed around 81.2% of health care providers` perceived EMR was easier than the previous routine medical records to reviewing patients' problems, 68.6% of health care providers were satisfied with the system information and terminology, 72.9% by system capabilities, 41.7%, technical support, 50.7% with the service and 72.7% ease of use. In this study, 63.4% agreed that templates were well suited to their specialty and 69.7% agreed that the system increased their ability to add important content (36).As cross-sectional study conducted in public hospitals Malawi, 2017 indicate, 73.8% of healthcare workers had good attitude for EMR utilization and 75.9% of them agreeing that EMRs are beneficial because they are easier and faster to use than paper-based

systems. Additionally, 70.0% of respondents strongly felt that EMRs were more useful than paper-based systems (9). As cross-sectional study conducted in Rwanda, 2017 indicated 80.1% respondents perceived EMR is fast and easy to use, 87% perceived EMR more accurate. About 88.2% of participants perceived that it improves quality of care and 75.6% perceived EMR information is more complete than paper-based system (29). Another research conducted in Lebanon showed that 54.0% of physicians, 61.4% of nurses and 50.9% other health care providers felt comfortable using EMR (37).

A cross-sectional study done in Ayder referral hospital, Mekelle, northern Ethiopia, 2015 showed that 56.7% of health professionals had a good attitude towards EMR system use (38) while another study done in North Gondor zone, 2014 revealed, 54.6% of health professionals had good attitude to EMR system. In the later study, health professionals who had good attitude for EMR system were about 1.56 times more likely to get ready to use EMR system as compared to those health professionals with poor attitude (30).

2.2.3. Technical variables

AS WHO global diffusion of e-health in 2016 showed, 75% of countries have institutions that encourage pre-service training or continuing education training on ICT for health and health sciences professionals to support the continuing education of the doctors, nurses and midwives (17).

2.2.3.1. Knowledge on EMR system

Cross-sectional study conducted in Iran, 2015 showed that 51.2% of nurses had knowledge about EHR's uses and applications. From those, 75% of nurses had knowledge about the main goals of HER but only 19% nurses had a good knowledge regarding EHR clinical terminologies. In this study there was no significant correlation between computer skills and knowledge but a negative correlation was found between knowledge and attitude (15). Cross-sectional study conducted in Iran, 2016 showed that 66.3% of health professionals had knowledge about computer and man factor for use of EMR (39). As cross-sectional research conducted in Benghazi, Libya, in 2007 indicated that around 53% of doctors had good knowledge about advantage of EMR system (33). As cross-sectional study done in East Yangon General hospital, 2017 indicated that 30.3% of respondents had good knowledge on EMR system. It was significant factors to use EMR (40).

Cross-sectional study done in a developing country in Ethiopia, 2015 revealed that only 18.7% of health professionals demonstrated good knowledge of computers and among those 4.4%, 23.3%, 26.7% of health professionals working at primary health centers, governmental and private hospital respectively. Knowledge is significant factor to use EMR(31). Cross sectional study done in North Gondor zone, 2014 indicated that 71.3% of health professionals had good knowledge for EMR system. This study found that health professionals who had good knowledge on EMR system were about 2.12 times more likely to get ready to use EMR system as compared to those health professionals with poor knowledge (30).

2.2.3.2. Computer skill

A cross-sectional study in Iran, 2015 showed that 43.4% of health professionals had computer skill. In this study, computer skills and attitude had no significant correlation (15). As cross-sectional research conducted in Benghazi, Libya indicated that health professionals' educational level had positive significance association with their computer skill (33). Similarly, a Cross-sectional study done in Nigeria, 2018 indicated that there was a statistical significance association between IT skills and health professionals' willingness to use EMR system (25).

A research conducted in Kenya showed that 44.6% of health professionals had sufficient computer skills on use of EMR system (41) while a study done in Egypt, 2013 showed that 17% health professionals had lack of computer skill which cause barriers to use EMR system (42). As cross-sectional Study done in Adama hospital, Oromia, Ethiopia 2015 indicated, health professional computer skill for Specialist physician was 100%, degree 71.8% and diploma 49.2% (22) while a cross-sectional study done in North Gondor zone, 2014 revealed that 10.2% of health professionals had no computer related skill (30).

2.2.3.3. EMR training

Research conducted in Zahedan University in Iran, 2011 indicated that 68.5% of physician had self-guided training about computer (34). As cross-sectional study conducted in public hospitals Malawi, 2017 indicated, 72.4% of health care workers received training on EMR system to use it (9) while a cross-sectional study done in Jeddah, Saudi Arabia, 2018 indicated 67.9% of health care providers had EMR system training (36). Another study conducted in Saudi Arabian, 2015 revealed that 66% participants had good EMR training levels. In this study, EMR training had significant positive relationship and necessary for EMR system acceptance, preference and

adoption (20). Cross-sectional study done in Nigeria, 2018 indicated that 64.4% of the respondents strongly agreed that proper training would be required before the implementation of EMR system and 90% were willing to devote time to undergo the training required for its implementation (25). As cross-sectional study conducted in South Africa in 2011 indicated that 93% of health professionals had received EMR training (43). Research conducted in a Saudi Arabia hospital, 2017 indicated that 53.0% of respondents had formal EMR training. In this study training had significant association with acceptance to use EMR (44).

Survey done in Kenya, 2015 showed that 66.7% reported that they had already been trained on EMR system. From these, 51.4 % of the healthcare professionals responded that the level of training provided was good (45). Another research conducted in Kenya showed that 44.6% of respondents agreed to having been trained in use on basic computer skills (41). As research done in Egypt, 2012 showed, 30% of health professionals had e-health training (46). As cross-sectional study done in East Yangon General hospital, 2017 showed that 64.4% health professionals had computer training. (40).

As cross-sectional study done in a developing country in Ethiopia, 2015 revealed, previous computer training were 3.65 times more likely to use EMR than those who did not have any kind of computer training (31) and As cross-sectional study done in Addis- Ababa, Ethiopia, 2018 showed, 64% of health professionals had EMR user training. Participants who had EMR soft were training were 3.04 times more likely to use EMR than those who did not have any kind of EMR software training (23). While another study done in Addis Ababa, Ethiopia, 2015 showed 45.0% health professionals were computer trained. Computer trained health professionals were 2.78 times higher to use EMR (32).

As cross-sectional study done in Ayder referral hospital, Mekelle, northern Ethiopia, 2015 showed, 74.3% of health professionals were computer trained (38) while another study done in this, 2017 indicated 37% of health professional received EMR training and from those 66.7% of them were laboratory technicians and 31% was nurses (47). Another study done in Bahir Dar, Ethiopia, 2013 indicated that 33.3% of health professionals were computer trained and others were not for various reasons; 59.7% no access to computer system, 22.6% didn't have time to learn, 16.8% both time shortage and no access to computer system and only 0.9% were not interested to learn it (48).

2.2.3.4. Computer utilization

Research conducted in Zahedan University in Iran, 2011 indicated that 81.4% of physicians use computer for majority daily activities (34). Research conducted in Lebanon showed that 71.9% of nurses and 67.9% of other types of healthcare providers use the computer on a daily basis but 42% of physicians never used the PHC center computer (37). As cross-sectional study done in East Yangon General hospital, 2017 showed, 68.1% health professionals had utilize computer (40). A cross-sectional Study done in Ethiopia, 2015 revealed 29.5% of health professionals had good computer utilization. From those 32.6% health professionals were working at government hospitals, 26.2% private hospitals, and 18.4% health professionals were working at primary health centers. Health professionals who were younger age (25-35 years) were approximately 3 times more likely to use computers than respondents aged 36 years and older (31).

As cross-sectional study done in Addis- Ababa, Ethiopia, 2018 showed, 76.1% health professionals started using the system immediately after implementation. Among them, the major proportion of users were nurses (44.0%), followed by HMIS staff (20.7%), laboratory, pharmacy staff and physicians (18.4%). In this study, the main reasons for not using EMR system were for 75.7% of physicians had no time to use it, 60.6% and 69.7% of nurse reported that computer is not working and power fluctuation respectively while 48% of laboratory and pharmacy reported that the other departments are not using the system (23). In another study done in Addis Ababa, Ethiopia, 2015 showed, 85.0% of health professionals used computers in their daily activities of which, 39.1% for used for recording and storing documents, 41.8% for report writing and 19.1% for internet services(32).

As cross-sectional Study done in Adama hospital, Oromia, Ethiopia 2015 indicated that 63.2% of respondents had experience of basic computer usage. Around 61% of health professionals had difficulties when using the smart care software. Within this study attitudes, training, networking between departments, experience variation, expectation variation among users were variable that had significant association with smart care software usage (22).

As cross-sectional study done in Ayder referral hospital, Mekelle, northern Ethiopia, 2015 showed, 78.2% of health professionals used computer for their daily work, 45.6% of the respondents used computers for data recording, 45.1% for report generating, 40.2% for reading, and 29.9% for videos accessing (38). On the other hand, a study done in North Gondor zone, 2014 indicated that only 46.5% health professionals were utilizing computer (30). Cross-sectional research done in

Bahir Dar, Ethiopia, 2013 indicated that of those health professionals who had access to computer, about 64.5% were using it for reading, keeping files and using internet (48).

2.2.3.5. computer experience

Cross-sectional study done in Jeddah, Saudi Arabia, 2018 indicated that 69.6% of health professionals had computer experience whereas 28.4% reported high experience (36). Cross sectional study done in North Gondor zone, 2014 indicated that health professionals with previous IT experience were 1.69 times readier to use EMR system compared with their counter parts (30)

2.2.3.6. English language barrier

Cross-sectional study done in Jeddah, Saudi Arabia, 2018 indicated that 54.2% of Participants had not experienced language difficulties when using the system. In this study, English language proficiency levels had significant positive relationship and necessary for EMR system acceptance, preference and adoption (20).

2.2.4. Organization and resource variables

2.2.4.1. Computer access

A cross-sectional study done in Iran, 2015 showed that 50.2% of nurses had computers access at home and 32% of them had access computers at workplace (15) while a research conducted in Lebanon showed, 77.0% of physicians, 87.7% nurses and 92.5% other health care providers had access to computers at their work place (37). As cross-sectional research conducted in Benghazi, Libya, indicted that 57.1% of doctors had no computer access (33). As cross-sectional study done in East Yangon General hospital in 2017 showed, 46.2% of health professionals had computer access. Computer access at home and at workplace were not significantly associated with the readiness to use EMR system (40).

Survey done in Nakuru county, Kenya, 2015 showed that 62.5% respondents reported that they had a computer access in their working area (45). Another cross-sectional study done in Nairobi in Kenya, 2015 showed that 56.6% adoption and utilization of EMR system technology in public health institution was influenced by computer availability (49).

Study done in Addis Ababa, Ethiopia, 2015 showed that 43% health professionals had computer access. Health professionals who have computer access 7.12 times use computer to their activities than their counterparts (32) while another cross-section study done in Addis- Ababa in 2018

showed, 20.4% of health professionals had individual computer access in the office, from those, 55.4% were HMIS staff (23).

Cross-sectional study done in Ayder referral hospital, Mekelle, northern Ethiopia, 2015 showed that 57.5% health professionals had computer access in their working area (38) while another study done in this hospital in 2017 indicated that 91.8% of health care providers had computer access with installed of EMR system in their working area and from these, 95.7% of nurses, all laboratory technicians and 82.9% of physicians had a computer access with EMR system installed in their office (47). On the other hand, a cross-sectional study done in North Gondor zone, 2014 indicate that 93.4%, of health professionals had no good computers access and related technologies (30) while a cross-sectional research done in Bahir Dar, Ethiopia, 2013 indicated that 36.6% of health professionals had access to computer at different areas; 7.7% at working area, 2.4% at home and 4.4% at both work area and home (48).

2.2.4.2. Internet and EMR guideline access.

Research done in Iran, 2014 showed that 71.6% of health professionals had internet network access and internet access was the main factor to use EMR(50) while another cross-sectional study done in Iran, 2015 showed that 28% of nurses use of Email and World Wide Web (15). Cross-sectional research done in Bahir Dar, Ethiopia, 2013 indicated 42.8% of health professionals had internet access at different places (48). Cross-sectional study done in Ayder referral hospital, Mekelle, northern Ethiopia, 2015 showed, a small number of respondents (15.4%) responded to have a standard protocol manual to the EMR system available in their working units (38).

2.2.4.3. IT support personnel availability

Research done in Iran, 2014 showed 28.6% health professionals had IT support personnel access (50). Cross-sectional study done in Nigeria, 2018 indicated that 49% health professionals strongly agreed that EMR system cannot be used without the availability of skilled human resources and provision of support (25). Another cross-sectional study done in Nairobi, Kenya, 2015 showed that 65% adoption and utilization of EMR system technology in public health institution influenced by presence of trained personnel to install and operate EMR system technology applications. This shows that a significant number of health facilities fail to use EMR system technology for lack of expertise knowledgably personnel on how to operate and manage EMR system technology (49).

2.2.4.3. Management support and budget allocation

Research conducted in a Saudi Arabia hospital, 2017 indicated that 62.9% of respondents had top management support to use EMR. In this study top management support were significant association with acceptance to use EMR(44).

Cross-sectional study done in Ayder referral hospital, Mekelle, northern Ethiopia, 2015 showed that 39.7% of the respondents mentioned the presence of management support and 16.6% a budget allocation (38).

2.3. Conceptual frame work.

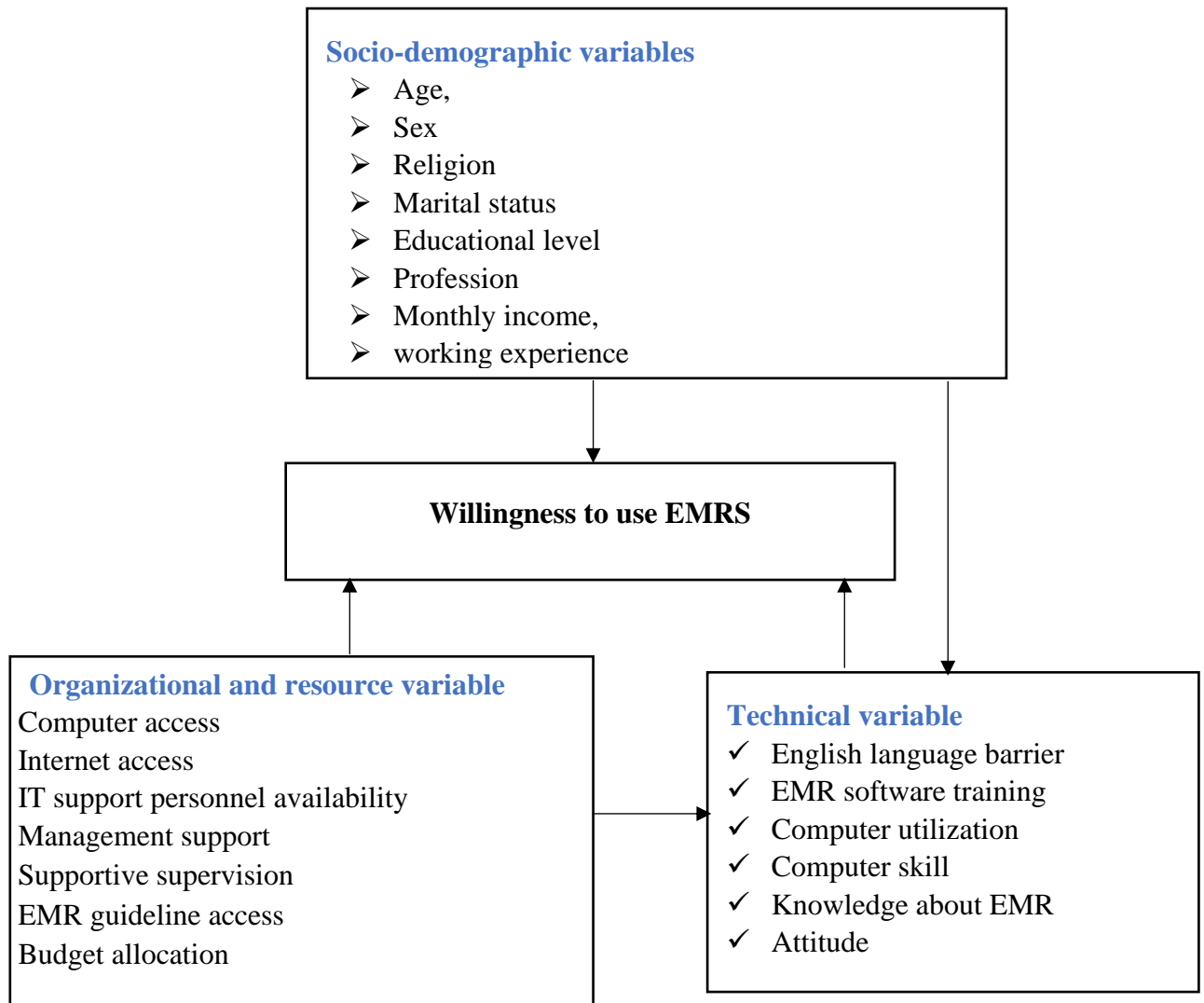


FIGURE 1. CONCEPTUAL FRAMEWORK ADAPTED FOR WILLINGNESS OF HEALTH PROFESSIONALS TO USE EMR SYSTEM IN BAHIR DAR CITY, NORTHWEST ETHIOPIA, 2019 ([30](#), [38](#), [48](#), [51](#), [52](#)).

3. Objective

3.1 General objective

To assess the willingness and associated factors of health professionals to use EMRS in health institution, Bahir Dar city, Northwest Ethiopia.

3.2 Specific objectives

To determine the health professionals' willingness to use EMR system at health institution in Bahir Dar city, Northwest Ethiopia from September 1 to October 30, 2019.

To identify factors associated factors with willingness to use EMR system at health institutions in Bahir Dar city, Northwest Ethiopia, from September 1 to October 30, 2019.

4. Methods and materials.

4.1. Study design and period.

An institution based quantitative cross-sectional study design was employed from September 1 to October 30, 2019.

4.2. Study area and setting.

This study was conducted among four Healthcare facilities in Bahir Dar city, Amhara regional state (Felege Hiwot comprehensive specialized hospital, GAMBY teaching hospital, Bahir Dar health center and Marie stopes international clinic). Bahir Dar is located in Northwestern part of Ethiopia, at a distance of 480 km from Addis Ababa, capital city. In this city there are 10 public health centers, four public hospitals and different levels of private clinics and hospitals. Feleg Hiwot is specialized hospital which serve for more than 7 million people. This hospital had around 554 beds with 814 health professionals (131 physicians, 460 nurse, 72 laboratory and 151 other health professionals). GAMBY teaching hospital had around 50 bed and 95 health professionals. Bahir Dar health center had around 41 health professionals and Mary stop international clinic had around 34 health professionals. There were 984 health professionals working from the four healthcare facilities.

In Bahir Dar city, there were many healthcare facilities but only six health care facilities have started to use EMR system. From those, three hospitals (Adinas, GAMBY and Felege hiwot hospitals), two public health centers (Bahir Dar and Han health center) and one clinic (Marie stopes international clinic) were started to use EMRS. From those four-health care facility were selected by using simple random sampling. In Felege Hiwot comprehensive specialized hospital EMR system was installed but it was used only for intra departmental communication in pharmacy, laboratory, radiology department. Other three (GAMBY teaching hospital, Bahir Dar health center and Marie stopes international clinic) were started to use EMR system in all its departments.

4.3. Population.

4.3.1. Source Population

All health professionals working in healthcare facilities of Bahir Dar city.

4.3.2. Study Population

All health professionals working in selected health care facility during data collection period

4.4. Inclusion criteria

4.4.1. Inclusion criteria

All health professionals employed for permanent and working for more than 6 months and those are physically present in the study area during the study period.

4.4.2. Exclusion criteria

All health professionals who were critically ill and those absent in the study area during the study period due to different personal or governmental reason like long term training, annual leave and maternity leave etc.

4.5. Study variables

4.5.1 Dependent variables

Health professionals' willingness to use EMRS.

4.5.2 Independent variables

Socio-demographic variables

Age, sex, religion, marital status, monthly income, years of experience, profession and educational level.

Technical variables

EMR training, computer utilization, language barrier, computer skill, knowledge on EMR and attitude to use EMR.

Organizational and resource variable.

Types of facility, computer access, Internet access, IT support personnel availability, EMR guideline access, management support, supportive supervision and adequate budget allocation.

4.6. Operational definition

Willingness for EMR system use: means preparedness of healthcare professionals to use EMR system Health professionals were asked five 'Yes' or 'No' questions that indicated their willingness to use EMR system. Five of these questions was scored and the maximum score obtainable was 5 marks. A score of 3 marks and above out of 5 marks suggested willingness while a score of less than 3 marks suggested unwillingness (25).

Attitude towards EMR system– health professionals’ emotion or feeling to use EMR systems

This contain 2 items which includes attitude towards EMR and perception of user to EMR improve service quality and save time and money. Health professionals’ attitude to use EMR system were measured by 16 questions each measured by a Likert scale of 1 to 5 adapted from a study conducted in Nigeria, 2018 and in North Gondor zone. A 5-point Likert scale was used to score the responses ranging from “agree” to “strongly disagree”. The maximum score obtainable was 80 marks while the minimum score obtainable was 16 marks. A score of above 64(80%) suggested good attitude while a score of 64(80%) and less than 64(80%), suggested poor attitude([5](#), [25](#), [30](#)).

Computer access is availability of computer (desktop, PC and smartphone) in the working unit for EMRS use (yes, no) ([53](#)).

Organizational resource: - is the availability of computer in working units, internet, un interrupted electric power supply and IT technical personnel to run EMR system ([38](#)).

Using computer: is the use of the computer for reading, keeping patient files or to preform different tasks (yes, no) ([31](#)).

EMR Training: participants who have ever taken a training on the EMR system (yes, no) ([38](#), [48](#))

Language barrier is presence of language difficulty when using computer for EMR system (yes, no) ([31](#)).

Computer skill: Competence to perform Microsoft window, Microsoft Word, Microsoft excel, Microsoft access, Microsoft power point and internet which was graded with 8 questions each measured by a Likert scale of 1 to 5 with maximum score of 40 and minimum score of 8. A score of more than 28(70%) was categorized, as good computer skill and 28(70%) and less than 28(70%) were categorized, as poor computer skill ([15](#), [45](#)).

Knowledge on EMR: familiarity with EMR and understanding the benefits of EMR with regard to patient satisfaction and confidentiality, which was graded with 13 questions each measured by a Likert scale of 1 to 5 with maximum score of 65 and minimum score of 13. A score of more than 52(80%) was categorized, as good knowledge on EMR system while 52(80%) and less than 52(80%) were categorized as poor knowledge on EMR system ([31](#), [53](#)).

4.7. Sample size and sampling method

4.7.1. sample size determination

4.7.1.1. Sample determination for objective one

The sample size determined by using single population proportion formula by considering a 95% Confidence level, 5% Marge of error (d), significant level of the study alpha (α) of 0.05, which is 1.96 and P1= 96% were study conducted on doctors willingness to use EMR system in Nigeria (25).

P2 =50% was taken to increase sample size because no study done on it in Ethiopia.

Where; n= desired sample size $Z_{\alpha/2}$ = the value of standard score at 95% confidence level (1.96)

P= proportion of health professional willingness to use EMR system.

De= design effect (1.5 to get adequate sample)

Single population formula $n = \frac{(Z_{\alpha/2})^2 pq}{d^2}$

$$n1 = \frac{(1.96)^2(0.96 \times 0.04)}{(0.02)^2} = \frac{3.84 \times 0.0384}{(0.02)^2} = \frac{0.15}{0.0004} = \mathbf{375 \text{ with proportion p1}}$$

$$n2 = \frac{(1.96)^2(0.5 \times 0.5)}{(0.5)^2} = \frac{3.84 \times 0.25}{(0.5)^2} = \frac{0.96}{0.0025} = \mathbf{384 \text{ with proportion p2}}$$

4.7.1.2. Sample size determination for objective two

The sample size for the second objective i.e. associated factors was determined by considering a 95% Confidence level and 80% power.

TABLE 1. SAMPLE SIZE DETERMINATION FOR THE ASSOCIATED FACTORS OF WILLINGNESS TO USE EMR SYSTEM, BAHIR DAR CITY HEALTH INSTITUTION, NORTHWEST ETHIOPIA, 2019.

Associated variable	% of utilization exposed	% of utilization unexposed	AO R	Assumption/ confidence interval & power	Samp le	Total sample size	References
Age/25-35/	39	16	3.06	95%, 80%	n3	158	(31)
EMR training	36.5	7.6	3.65	95%, 80%	n4	194	(31)

Level of education	52.4	21.3	2.78	95%, 80%	n5	162	(31)
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The maximum sample from the above is $n_2=384$ from objective one.

$$\text{Final sample} = 384 * de = 384 * 1.5 = 576$$

Then by adding 10% to compensate for non-response (eg. $576*0.01=57.6$). Finally, the adjusted sample size was $576+58=634$. So, the final sample size was 634.

4.7.2. Sampling technique/procedure

The study units were determined from Bahir Dar city healthcare facilities which were started to use EMR system /Felege Hiwot comprehensive specialized hospital, GAMBY teaching hospital, Addinas hospital, Bahir Dar health center, Han health center and Marie stopes international clinic/. Four healthcare facilities were selected by simple random sampling. List of all respective human resource profile of health professionals who are working in study area included was retrieved to calculate the stratified proportional allocation of sample size in each healthcare facilities. The number of health professionals were allocated to each healthcare facilities determined by using stratified and proportional sampling technique to-health professional size. As result, in each healthcare facilities, the numbers of estimated sample size were also allocated among health professionals by using stratified proportional allocation based on professional number in each profession. Then, health professional that participated in the study was identified from each profession by using computer generated, simple random sampling techniques.

THE STUDY AREA HAD 984 HEALTH PROFESSIONALS

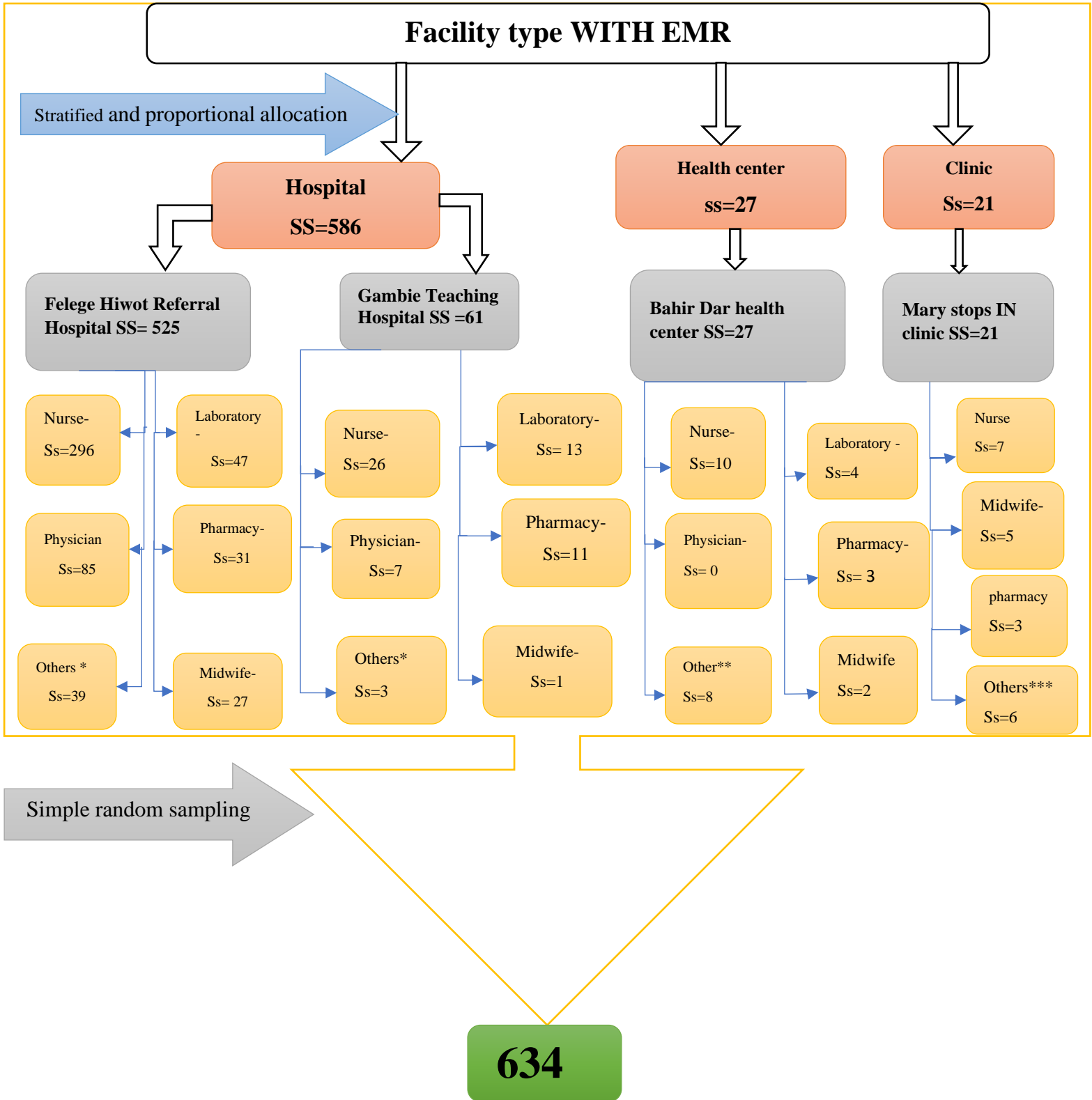


FIGURE.2. SCHEMATIC PRESENTATION OF SAMPLING TECHNIQUES FOR PARTICIPANTS IN BAHIR DAR CITY, NORTH WEST, ETHIOPIA, 2019.

Note: - ss (sample size), others*(anesthetist, health officer, radiology professionals), others**(health officer), others*** (health officer, integrated emergency obstetrical and surgical professionals)

4.8. Data collection tools and procedures

In this study quantitative method was conducted in Bahir Dar city which was started to use EMR system. Semi structured and pre-tested English version questionnaire was used to collect data from September one to October 30, 2019 at four health institution in Bahir Dar city. Four diploma holder health informatician and one Msc holder were selected for data collection and supervision respectively.

Study respondents' verbal consent was obtained before the questionnaire administered. The questionnaire was coded in numerical and stratified into sections, socio-demographic variable, willingness to use EMR system, perception of users on EMR system, health professional's capacity to use EMR system and resource availability to use EMR system. Data were collected by data collectors through self-administered questionnaires.

4.9. Data processing and analysis

Data were coded and entered in to Epi Data version 3.1 software and exported to SPSS version 23 for analysis. Descriptive statistics were used to summarize the data in the form of frequency; cross-tabulation and proportions. Bi-variable and multivariable logistic regression analysis were carried out to identify the association between the dependent and independent variables. Variables with p-value < 0.2 in bi-variable logistic regression were used for multiple variable logistic regression. The p-value < 0.05 and odds ratio with 95% CI were used to determine the significance and association between the independent variables and the dependent variable. For variable selection, forward stepwise regression analysis was conducted. Associations between outcome and exposure variables were described by adjusted odds ratio with a 95% confidence interval (CI).

4.9.1. To measure health professional willingness to use EMR system

Health professionals were asked five 'Yes' or 'No' questions that indicated health professional willingness to use EMR system. Five of these questions was scored and the maximum score obtainable was 5 marks. A score of 3 marks and above out of 5 marks suggested willingness while a score of less than 3 marks suggested unwillingness (25).

4.9.2. To measure socio demographic character.

This was containing 7 items which included questions on age, expressed in years, sex, which was recorded as male or female. The marital status refers to discrete options describing as single,

married and divorced/widowed. The religion of the respondent classified as Christianity, Muslim and others. And others monthly income, years of experience, profession (physician, nurse, midwifery, laboratory and pharmacy) and educational level (diploma, degree, masters, specialist and above).

4.9.3 Attitude towards EMR system

This contain 2 items which includes attitude towards EMR and perception of user to EMR improve service quality and save time and money. Health professionals' attitude to use EMR system were measured by 16 questions adapted from a study conducted in Nigeria, 2018 and in North Gondor zone. A 5-point Likert scale was used to score the responses ranging from “agree” to “strongly disagree”. The maximum score obtainable was 80 marks while the minimum score obtainable was 16 marks. A score of above 64(80%) suggested good attitude while a score of 64(80%) and less than 64(80%), suggested poor attitude([25](#), [30](#)).

4.9.4. To measure organizational and resource variable.

This contained 8 items which include computer access, EMR guideline access, internet access, and IT support personnel access. ([53](#)). The organizational which contain uninterrupted electric power supply, budget allocation, management support and supportive supervision (M&E) with feedback for effective EMR system implementation of new technology. All of this item contained yes when it is available and no when it is not available ([38](#)).

4.9.5. To measure technical variables.

This constrained 5 items which included EMR training (yes, no), computer utilization (yes, no), English language barrier (yes, no), computer skill and knowledge on EMR. Computer skill measured by eight questions each has Likert scale of a five point which is from “agree” to “strongly disagree”. The maximum score obtainable was 40 marks while the minimum score obtainable was eight marks. A score of above 28 (70%) suggested good computer skill while a score 28 (70%) and less than 28 (70%), suggested poor computer skill according study conducted Tehran University in Iran 2015 ([15](#)). Knowledge on EMR contain 13 questions adapted from a study conducted in Shiraz teaching hospitals to implement EMR system in Iran in 2016 ([53](#)). A 5-point Likert scale was used to score the responses ranging from “agree” to “strongly disagree”. The maximum score obtainable was 65 marks while the minimum score obtainable was 13 marks. A

score of above 52 (80%) suggested good knowledge while a score of 52 (80%) and less than 52 (80%), suggested poor knowledge.

4.10. Data quality Assurance.

The quality of data was controlled starting from the time of questionnaires preparations. The questionnaire was developed after reviewing different relevant literatures on the subject and revised before the main study to ensure reliability was 0.85 and the tool validity confirmed.

Before actual data collection two days training about the aim of the study and the content of the instrument was given for data collectors and supervisor. After completing the training, trainees were conducted tool pretested on 61 health professionals in Gondor city, Gondor university hospital and Poly health center which did not belong to the study healthcare facilities but which have similar character to study area. Collection tool corrections were made to improve clarity, understandability, and simplicity of the messages based on pretest result.

During data collection, supervisor and principal investigator were receiving questionnaires from data collectors and review for completeness, accuracy, missing or unclear information and consistency on daily bases. Data quality were kept after data collection during data entry and analysis, data were coded and entered in to Epi Data and exported to SPSS for analysis.

4.11. Ethical considerations

An official letter from the ethical clearance committee of the University of Bahir Dar college of medicine and health sciences through the School of Public Health was obtained. This ethical clearance committee letter was given Amhara regional public health Institute and the institute was given supportive letter to each healthcare facility. This letter was given for each health care facility. Written consents were taken from the respective healthcare facilities managers and data was collected after getting permission. A written statement was also be included on the introductory part of the questionnaires that further explains the study purpose and confidentiality of the research information. Then verbal consent was also obtained from individual study participants after a clear explanation of the study objectives, data confidentiality issues and their rights during data collection process before data collection. Information that was collected and stored in a file without your name, but code number was assign to it. No other than the investigator, assistance and responsible advisors can access the collected data and data was be kept locked with key.

4.12. Dissemination and utilization of result

The final report will be presented as partial fulfillment of the degree of Master of health system and health economics to School of Public Health, College of Medicine and health sciences, Bahir Dar University. This paper will be submitted to Bahir Dar University, school of public health, department of health system and health economics. Copies will be sent to the health institution, Amhara regional health Bureau. It was also disseminated through publication on local or international journals and presentation on scientific conferences and workshops.

5. RESULT

5.1. Sociodemographic characteristics

About 616 health professionals participated in the study with a 97% response rate. The mean age with standard deviation of the health professionals was 30.9 ± 5.5 years (Mean \pm SD) with a range of 20 to 60 years. Majority of health professionals 571(92.7%) were 20-39 years. About 351(57%) females, 437(70.9%) married, and 523(84.9%) Christian orthodox follower. About 453(73.5%) of the participants were first degree holder, 375(60.9%) working less than 7 years and more than half of them 328(53.2%) were nurses professional (table .2).

Table 2. socio-demographic and socio-economic characteristics of health professionals in Bahir Dar health institution, northwest Ethiopia, 2019 (N=616).

Variable	Category	Frequency	Percent (%)
Sex	Female	351	57.0
	Male	265	43.0
Age	20-29 years	293	47.6
	30-39 years	278	45.1
	≥ 40 years	45	7.3
Religion	Orthodox	523	84.9
	Muslim	73	11.9
	Others	20	3.2
Marital status	Married	437	70.9
	Single	171	27.8
	Divorced/ widow	8	1.3
Educational level	Diploma	92	14.9
	Degree	453	73.5
	Master	50	8.2
	Specialist and above*	21	3.4
Profession	Nurse	328	53.2
	Physician	88	14.3
	Laboratory	66	10.7
	Pharmacy	50	8.1

	Midwifery	35	5.7
	Others**	49	8.0
Monthly income	1561-3200	17	2.8
	3201-5250	139	22.6
	5251-7800	278	45.1
	7801-10900	165	26.8
	>=10901	17	2.8
	Work experience in currently facility.	<4 years	455
>=4years		161	26.1
Total working experience	<= 7 years	375	60.9
	>7 years	241	39.1

Note. Others** (anesthetics, health officer, radiology professionals, psychiatric and ophthalmic health professional), specialist and above*(physician who specialized in different fields and above)

5.2. Attitude towards use of EMR system

Less than half (46.4%) of health professionals had good attitude while 53.6% of them had poor attitude towards the use of EMR system. About 385(62.5%) of health professionals were perceived EMR save time and money for both the organization and the patient.

TABLE 3. HEALTH PROFESSIONALS PERCEPTION TO EMR SYSTEM IN BAHIR DAR CITY, NORTHWEST ETHIOPIA, 2019 (N=616).

Variable	Response	frequency	Percent (%)
Attitude	Good	286	46.4
	Poor	330	53.6
Perception EMR system save time	Yes	538	87.3
	No	78	12.7
Perception EMR save money	Yes	408	66.2
	No	208	33.8
Perception to save time and money	Yes	385	62.5
	No	231	37.5

5.3. Organizational and resource related factor.

From those health professionals, 515(83.6%), 53(8.6%), 27(4.4%) and 21(3.4%) were interviewed for the study taken from Feleg- Hiwot comprehensive specialized hospital, GAMBY teaching hospital, Bahir Dar health center and Marie Stopes international clinic respectively.

Of the total respondents, 484(78.4%), 538(87.3%) and 399(64.8%) had computer, EMR guidelines and internet access to use EMR system respectively. More than two third (66.6%) of health professionals had trained IT technical support personnel access but only 304(74.1%) of health professional had IT technical support (table. 4). About 298(38.8%) and 398(64.6%) of health professionals had adequate budget allocation and managers support use EMR system respectively (table. 4).

TABLE 4. ORGANIZATION AND RESOURCE OF HEALTH PROFESSIONALS TO USE EMR SYSTEM IN BAHIR DAR CITY, NORTHWEST ETHIOPIA, 2019 (N=616).

Variable	Response	Frequency	Percent (%)
Participants in the study area	Felege Hiwot referral hospital	515	83.6
	GAMBY teaching hospital	53	8.6
	Bahir Dar health center	27	4.4
	Marie stopes international clinic	21	3.4
Computer access	Yes	484	78.6
	No	132	21.4
Place of computer access	at home	123	25.4
	at work place	122	25.2
	at both home and work place	239	49.4
IT technical support personnel access	Yes	410	66.5
	No	206	33.5
IT technical personnel support.	Yes	304	74.1
	No	84	20.5
	I don't know	22	5.4
Internet access for EMR system use	Yes	399	64.8
	No	217	35.2
EMR guideline access	Yes	538	87.3

	No	78	12.7
Adequate budget allocation	Yes	239	38.8
	No	316	51.3
	I don't know	61	9.9
Management support for EMR system	Yes	398	64.6
	No	218	35.4
M&E* use of EMR system and give feedback	Yes	386	62.6
	No	230	37.4

Note: - M&E*=monitoring and evaluation.

5.3. Technical variables

Of 45.9% and 58.3% of health professionals had good knowledge on EMR system and computer skill respectively. Less than half (45.1%) of them were received EMR training while 54.9% of them not received EMR training. The reasons not taking the training 73.4% and 7.7% were no access and time to take training respectively. More than two third (69.2%) of health professionals had no language barrier when they use computer system (table 5).

Table 5. Technical variables of health professional to use EMR system in Bahir Dar city, northwest Ethiopia, 2019 (N=616).

Variable	Response	Frequency	Percent (%)
Knowledge on EMR	good	283	45.9
	Poor	333	54.1
Computer skill	Good	359	58.3
	Poor	257	41.7
EMR training	Yes	278	45.1
	No	338	54.9
Reason for not taking EMR system training	No time to take training	26	7.7
	No access to take training	248	73.4
	not interested to take training	31	9.2
	My work does not need training	33	9.8
Using computer for EMR	Yes	402	65.3
	No	214	34.7

Reasons of using computer	Report writing	46	11.4
	Seeing video and listening music	20	4.9
	Reading	116	28.9
	Keeping patient file	220	54.7
Language barrier	Yes	190	30.8
	No	426	69.2

5.4. Proportion of Willingness to use EMR system

Majority (85.9%) of health professionals were willing to use EMR system while 14.1% were not willing to use EMR system. About 71.3% and 83.8% of professionals, were willing to avail a personal computer and to undergo computer training to enable EMR usage respectively (table 6).

Table 6. health professionals' willingness to use EMR system in Bahir Dar city, Ethiopia, 2019 (n=616).

Statement	Response	Frequency	Percent (%)
Over all willingness to use EMR system	willingness	529	85.9
	unwillingness	87	14.1
Willingness to avail a personal computer for using of EMR system	Yes	439	71.3
	No	177	28.7
Willingness to undergo computer training to enable EMR system usage.	Yes	516	83.8
	No	100	16.2
Willingness to implement EMR system after taking EMR training.	Yes	451	73.2
	No	165	26.8
Willingness to use EMR system for patient service and if properly trained.	Yes	451	73.2
	No	165	26.8
Willingness to use EMR system if full infrastructure available.	Yes	492	79.9
	No	124	20.1

5.7. Factors associated with willingness to use EMR system

Health professionals' sex, EMR system training, computer access, computer utilization, availability of local area network, IT technical personnel availability, presence of EMR guideline, adequate budget allocation, management support and supervision, attitude towards EMR system, computer skill and knowledge on EMR were associated with health professionals willingness to

use EMR system with bivariable logistic regression analysis with P-value<0.2. Health professionals EMR system software training, presence of EMR guideline, management support to use EMR, computer skill and knowledge on EMR system were significant association with willingness to use EMR system in multivariable logistic regression analysis p-value <=0.05.

Health professionals ever had trained for EMR system software were 3.75 times more likely willing to use EMR system than who had never trained for EMR system software (AOR=3.75; 95% CI: 1.73, 8.12; P=0.001). Health professionals who had EMR guideline in their clinical service area were 2.76 times more likely willing to use EMR system than these who had no EMR guideline (AOR=2.76; 95% CI: 1.36, 5.60; P=0.005). Health professionals who had management support to use EMR system were 2.59 times more likely willing to use EMR system than those had no management support (AOR=2.59; 95% CI: 1.40, 4.77; P=0.002).

Health professionals who had positive attitude towards EMR, good computer skill and good knowledge on EMR were (AOR=2.23; 95% CI: 1.08, 4.58; P=0.029), (AOR=2.46; 95% CI: 1.31, 4.61, P= 0.005) and (AOR=2.11; 95% CI: 1.02, 4.37, P=0.044) time more likely willing to use EMR system than their counterparts respectively.

Table 7. Factors associated with willingness to use EMR system among healthcare professionals in Bahir Dar City, Northwest Ethiopia, 2019 (N=616).

Variable	Willingness to use		OR (95%)		P value
	Willing	Not willing	COR	AOR	
EMR training					
Yes	267	11	7.04(3.65-13.55)	3.75(1.73-8.12)	0.001**
No	262	76	1	1	
EMR guideline access					
Yes	482	56	5.67(3.34-9.66)	2.76(1.36-5.60)	0.005**
No	47	31	1	1	
Management support to use EMR					
Yes	369	29	4.61(2.85-7.48)	2.59(1.40-4.77)	0.002**
No	160	58	1	1	
Attitude					

	Good	271	15	5.04(2.82-9.02)	2.23(1.08-4.58)	0.029*
	Poor	258	72		1	
Computer skill						
	Good	338	21	5.56(3.30-9.38)	2.46(1.31-4.61)	0.005**
	Poor	191	66	1	1	
Knowledge						
	good	266	17	4.17(2.39-7.39)	2.11(1.02-4.37)	0.044**
	Poor	263	70	1	1	

Note; 1= reference category * P< 0.05 significant, **P<0.01 highly significant, ***P<0.001 very highly significant.

6. Discussion

This study assessed health professionals' willingness to use EMR in four healthcare facilities of Bahir Dar city. In addition, the study aimed to identify factors that were associated with willingness to use EMR system. Understanding willingness and its associated factors will aid in the planning and successful implementation of the scheme in the study area. It will also aid in exposing areas where efforts need to be channeled for a feasible and sustainable scheme in the study area.

The result of this study indicated that majority (85.9%) of health professionals were willing to use EMR system. This result had significant implication to sustain and establish EMR system utilization in the study area. This finding is similar to studies conducted in Rwanda, 88.5% (29) and study in Saudi Arabia, 88.2% (27) and another Saudi Arabia public hospital, 83% (20).

The result of current study also indicated that 85.9%, 71.3% and 83.8% of health professionals were willing to use, to avail a personal computer and to take computer training on EMR system respectively. This result is lower than study conducted in Nigeria(Lagos), 96.5%, 79.2% and 94% (25), respectively. The probable reason for this variation may be the health professionals included in previous study were working only in hospitals while in this study health professionals working at hospitals, health center and clinic were included. Those working in health center and clinic might have less computer access and information communication technology. Small sample size of the previous study might be another reason.

On the other hand, it is higher than another study conducted in Nigeria (Semi Urban Tertiary Hospital), 80.2% (28). This may be due to age difference; in the current study 47.6% of the study subjects were in the age less than 30 years with mean age of 30.9 ± 5.5 years (sociodemographic table 2) while in the previous study, 72.9% of them were in the age above 30 years with mean age of 35.2 ± 7.3 years(28). This may be due to the fact that younger people naturally tend to have more motive, interest, and commitment to accept new technology developments than aged people (30, 38). But this result is contrary to a survey of Markle Foundation, 42.3% (26). The possible justification may be, nowadays the government worldwide begun to give great emphasis of utilization and automation of medical systems for major advancement in healthcare practice (7, 8). This discrepancy might be also due to study period difference.

As indicated by previous studies, the willingness to use EMR system is varying across the world due to several barrier and success factors. The current study also identified factors which affect

willingness to use EMR system by health professionals. Health professionals EMR training, computer skill and knowledge on EMR, presence of EMR guideline and management support were positively associated with health professionals' willingness to use EMR system with $p\text{-value} \leq 0.05$ (table 7).

Health professionals who ever had EMR training were more willing to use of EMR system (table 7). This finding is supported by study conducted in Ethiopia (Addis-Ababa(23), Harari region(31), Adama hospital (22) and Ayder hospital(38)) and to a study Malawi (9) and Saudi Arabia(44). From different previous findings, it is true that training can change the knowledge, attitude and skills of health professionals on EMR systems and increase commitment to use EMR system.

Those who had good attitude were more willing to use EMR system as compared to those health professionals who had poor attitude. This may be because favoring to use EMR system may influence the willingness to use EMR system. This study is similar to study conducted in Ethiopia (North Gondor zone(30)), public hospitals in Malawi (9) and Lebanon(37). This is the reason of a need to create awareness about EMR system before implementation in order to engage professionals during the system implementation so that they will have good attitude and develop commitment for a better sustainability of the system.

In this study, health professionals who had good computer skill were more willing to use EMR system than their counterparts. This result is similar to study conducted in Ethiopia (Adama hospital (22) and in North Gondor zone(30)) and to a study conducted in Nigeria, (25), Kenya (41) and Egypt (42). Successful implementation and sustainability of an EMR utilization depend on the computer skills of all healthcare professionals who were exposed to use it (7). The possible reason for this could be health professionals with good computer skill have ease and self-efficacy to use EMR which influence health professionals' views to use of EMR system.

The present study also identified that health professionals who had good knowledge on EMR system were more likely willing to use EMR system as compared to health professionals with poor knowledge. This may be due to the fact that health professionals who have good knowledge may have the tendency to accept the advantage of technology and more likely willing to use EMR system. It is similar to study conducted in Ethiopia (north Gondor zone (30) and Harer region (31)) and a study conducted East Yangon General hospital (40) and Iran (39). This finding will

contribute towards the ongoing effort to expand the utilization and sustainability of EMR by making them secure and easy to use.

Additionally, management support and presence of EMR guideline were significant variables to determine willingness to use EMR system). A possible justification to this finding could be that the presence of management support will increase supportive supervision and motivation of the health professionals. Presence of EMR guideline will also serve as guidance for the users. This result is similar to study conducted in Ethiopia (Ayder referral hospital ([38](#))) and a study in Saudi Arabia hospital ([44](#)).

6.1. limitation of the study

The study assessment relied on self-report, and thus does not provide an objective measure of the health professionals skill to use EMR system.

Social desire bias was not minimized since and the study is cross sectional, temporal relationship could not be established.

This study was done using only quantitative research, for more in-depth investigation with qualitative research method further research should be done using mixed quantitative and qualitative research methods.

7. Conclusion

Result, 97.1% health professionals participated in this study. As result showed that there is a better willingness to use EMR system by health professionals. Even though, health professionals are the main actors for successful implementation and sustainability of EMR system. So, interventions are needed in building willingness to use EMR systems.

This study also identified associated factors for health professional's willingness to use EMR system. Health professionals' EMR training, attitude towards EMR, knowledge on EMR, computer skill, presence of EMR guideline and management support had significant association with health professional's willingness to use EMR system. So, health should have EMR training and the training contain attitudes towards EMR, knowledge on EMR and skills.

8. Recommendation

Based on the study findings, the following are recommended:

This study found that the health professional's willingness to use EMR system were significantly influenced by EMR system training, computer skill and knowledge on EMR. So, the regional health bureau and the respective health institutions' management team should provide and organize trainings on EMR system, which incorporate knowledge and skill.

This study also clearly indicated that EMR system guideline access and management support have positive influence on willingness to use EMR system. Therefore, the respective organizational management teams in collaboration with the regional health bureau need to avail EMR system guideline for each clinical service area and give supportive supervision.

EMR system is new technology, Regional health bureau and Federal Minister of health should develop EMR system guideline, should contain KAP to enable potential users.

This research was conducted only in health institutions which started to use EMR system. So, it would be better if further study be done on healthcare facilities which do not start to use EMR system for policy making.

In order to obtain mere comprehensive information about the health professionals' willingness to use EMR system, qualitative techniques are also recommended to generate in depth information.

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10. ANNEXES

ANNEX 1. PARTICIPANT INFORMATION SHEET

Title: willingness to use electronic medical records among health professionals in Bahir Dar city

Name of principal investigator **Birhanu Berihun**

Name of the organization: - School of Public Health and health Science, Department of Health system and project management Bahir Dar university, Bahir Dar, Ethiopia.

Introduction

First of all, I would like to thank you in advance for your cooperation and consent in participation in this study. I am Birhanu Berihun, a health system and project management student in Bahir Dar University. Now I am doing research on willingness to use electronic medical records among health professionals in Bahir Dar health institution. Research is just the process to learn the answer to a question. Please read about the general information of the study and If you have any question regarding the study please ask freely.

Background information

A health care industry without information communication technology is impossible to provide efficient and effective health care service. In Ethiopia, the implementation of Electronic Medical Record (EMR system) was started in 2007/2008. However, its adoption and utilization rate are still very low. So, investigate and analyze health professional levels of acceptance and willingness and also associated factors for this is essential for EMR system service utilization improvement in Bahir Dar city health institution.

Invitation to participate: - We are asking / inviting you to take part in a research study.

What is involved in the study?

Once you have read this information document and agree to take part in the study, you might be randomly selected to take part in the study. You will be requested to fill in a questionnaire by answering specific questions in the questionnaire with the help of an information data collectors. Completion of the questionnaire will be in the comfort of your work environment and at a time convenient to you. No any sample will be taken from you for the study.

procedure of the study

The study participants are health professionals in Bahir Dar city who are working in Felege Hiwot hospital, Gambi teaching hospital, Bahir Dar health center and Mary stops international clinic. Data will be collected in this study area by using self-administer semi closed questioner.

purpose of the study

The aim of this study is to determine the levels of health professional willingness to use EMR system and associated factors in Bahir Dar city in four health institution

Benefits for the participants

Study participants will not have any financial incentives or other inducements from participating on this study. However, participations of health workers in this study with honest response to the questions stated in the survey questionnaire is important to improve the adoption and utilization of EMR system so as to improve the patient safety and quality of care.

Confidentiality

The data collected in this research was keep confidentially. Information that was collected and stored in a file without your name, but code number was assign to it. No other than the investigator, assistance and responsible advisors can access the collected data and data was be kept locked with key. It also gets ethical clearance from Bahir Dar University Medical Faculty research ethical reviewing board (RERB).

Risk and complication

There is no any risk and hidden idea on the study subjects due to participating but questions will be asked on your willingness to use EMR SYSTEM and the questionnaire will take 20-30 minutes to give your view.

Right to withdrawal

You have full right to refuse from participating in this research. You can also choose not response some or all question. This will not be affected you from any kinds of issue. You have the full right to leave from this study at any time. You wish without losing of your right.

Assurance of principal Investigator (PI)

I put my signature below to confirm you that I take over the responsibility for the scientific ethical and technical conduct of the research project and for provision of progress reports for all stakeholder of the research project.

Birhanu Berihun (*PI*)

Signature -----Date -----

Note: If you have any questions about this study, please feel free to ask any time throughout the study phase by contacting through the following address:

PI Address: Birhanu Berihun: Bahir Dar University School of Public health and health Science, Department of health system and health economics, Bahir Dar, Ethiopia

E-mail: berbirr08@gmail.com

Cell Phone: +251920761845

+251927611327

ANNEX 2. CONSENT FORM

Good morning/Good afternoon. Thank you for your interest to talk with me today. I amwho is data collector for Birhanu Berihun who is students in health system and project management master program in Bahir Dar university for study conducted in entitled “Health professional willingness to use electronic medical record/EMR system /in four health institution which started to use EMR system in Bahir Dar city of Amhara Regional, Ethiopia.” The purpose of the study is to assess levels of health professional willingness to use EMR system in Bahir Dar city four health institution in the study period. As you know, we are living in the globalization period which needs quality and recent health service to be good competent in the market. So, health professionals should have access to relevant and recent health technology to be competent and deliver quality services to their clients. To achieve this goal health professionals should have willingness to use electronic medical records.

You have been selected as one of the respondents to assist in providing the requisite data and information for this undertaking and I kindly request you to spare a few minutes and answer the attached questionnaire. If you do not wish to answer any of the questions included in the survey, you may skip them and move on to the next question. Your answers will be kept private. Your name will not be written on this form. There is no any special payment to you due to your participation except great thanks and solving our problems in common. However, your participation and honest response to the questions is crucial to address health professional willingness to use electronic medical records to you and your staffs. Questions are prepared in simple English and It will take about 20-25 minutes to answer the questions. Your participation in this research is entirely voluntary. I would greatly appreciate your help in responding it.

Are you interested to participate in the study?

1. Yes, I am interested to participate. 2. No, I am not interested to participate.

NB. If your answer is yes, just start answering the questions on the next pages.

If you have any question comment you can contact principal investigator with phone

+251920761845, +251927611382 or email berbirr08@gail.com

Thank you for your cooperation

ANNEX 3. SELF-ADMINISTERED QUESTIONNAIRE

Electronic Medical Record- survey questionnaire

Questionnaire on EMR system for health professionals working in Feleg Hiwot hospital, GAMBY teaching hospital, Bahir Dar health center and Marie stopes international clinic. Please fill in the following questionnaires, your comments are very important for further improvements in effective adoption and utilization of EMR system. Thank you in advance for your time.

Hospital name

part .2. Organizational and resource variables

No	Questions	Responses	Skip to
201	Do you have computer access?	1. Yes No	2. If no skip 202
202	If your answer is “yes” for que 201, where is your computer access?	1. At home 2. At work place 3. Both	
203	Do you have local area internet network access for using EMR system?	1. Yes 2. No	If no skip 204-207
204	If your answer is “yes” que 203, Are your department computers linked local area internet for using EMR system?	1. Yes 2. No	
205	If your answer is “yes” que 204, Do you use local area internet for EMR system?	1. Yes 2. No	
206	If your answer is “yes” que 204, how often do you use internet service?	1. Every movement of patient data mgt 2. Every data 3. At least once a week 4. At least once a month	
207	If your answer is “yes” que 205, mainly for what purpose do use internet?	1. To get information which support my profession. 2. To communicate with my friends 3. To get daily news 4. To manage patient’s health profile and data 5. To report different data 88. Other.....	
208	Does your hospital have trained IT technical support personnel?	1. Yes I don’t know	2. No 3. If no skip 209

209	If your answer yes que 208, is there Provision of technical support?	1. Yes 3. I don't know	2. No	
210	Do you think that EMR system reduce patient waiting time?	1. Yes I don't know	2. No	3.
211	Do you have EMR system guideline in your health institution?	1. Yes I don't know	2. No	3.
212	Do you have adequate budget allocation to implement EMR system?	1. Yes I don't know	2. No	3.
213	Is there management support to implement EMR system of new technology?	1. Yes I don't know	2. No	3.
214	Is there monitoring and evaluation (M\$E) for effective use of EMR system and feedback?	1. Yes I don't know	2. No	3.

Part 3. Health professional Willingness to Use EMR system

No	Question	Response	Skip
301	Do you have willingness to avail a personal computer for using of EMR system?	1. Yes 2. No	
302	Do you have willingness to undergo computer training to enable EMR system usage?	1. Yes 2. No	
303	Do you have willingness to implement EMR system after taking EMR training?	1. Yes 2. No	
304	Do you have willingness to use EMR system for quality health care if properly trained?	1. Yes 2. No	
305	Do you have willingness to use EMR system if the technical infrastructures are available?	1. Yes 2. No	

Part 4. Attitude to use EMR system

304	Do you think EMR save time?	1. Yes	2. No	3. I don't know	
305	Do you think EMR save money?	1. Yes	2. No	3. I don't know	

Please point out the extent about attitude towards EMR which you agree with each of the following statements. Please tick (√) or circle the appropriate answer.

Use liker scale with strongly disagree- 1, disagree- 2, Neutral -3, Agree-4 and strongly agree-5

s.no	Measuring factor	strongly disagree	disagree	Neutral	Agree	Strongly agree
401	EMR system would improve and promote quality of care	1	2	3	4	5
402	EMR system would establish Proper communication among healthcare providers	1	2	3	4	5
403	EMR system would reduce medical errors using alerts and reminders	1	2	3	4	5
404	EMR system would improve quality of work flow.	1	2	3	4	5
405	EMR system would increase health professionals 'satisfaction	1	2	3	4	5
406	EMR system benefits would outweigh than the cost.	1	2	3	4	5
407	EMR system would decrease burden on health professionals	1	2	3	4	5
408	EMR system would make patients' data easily accessible	1	2	3	4	5
409	EMR system would increase practice productivity	1	2	3	4	5
410	EMR system keep patient confidentiality and security	1	2	3	4	5
411	EMR system not cause new responsibilities and much expectations	1	2	3	4	5
412	EMR system using is easy when IT skilled support person available	1	2	3	4	5
413	EMR S system use not affect the work position	1	2	3	4	5
414	To use EMR system training would be required	1	2	3	4	5

415	I would devote time to undergo training for its implementation	1	2	3	4	5
416	Using EMR system increase level of patient satisfaction in this health institution.	1	2	3	4	5

Part 5. Technical variables

5.1. Technical variable question

No	Question	Response	Skip
501	Have you experiencing language difficulties when using computer system (EMR system)?	1 Yes 2. No	
502	Have you received EMR system training?	Yes 2. No	If yes skip 503
503	If No, for que 115, what is your main reason not taking the training?	1.I don't have the time to take training 2. I have no access to take training 3. I'm not interested to take training 4. My work does not need training "	
504	Have you use a computer in your work place?	1. Yes 2. No	If no skip 506-508
505	If your answer is "yes" for que 504, how often do you use computer?	1. In every healthcare delivery 2. Daily 5. Monthly 3. Three times a week 4. Weekly 6. Not specific.	
506	If "yes" for que 504, How long have you been using the computer?	
507	If your answer is "yes" que 504, mainly for what purpose do you use computer?	1. Report writing 4. Keeping patient file	

		2. Seeing video and listening music 5. Reading 88. Others	
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5.2. computer skill

Please point out the extent about computer skill which you agree with each of the following statements. Please tick (√) or circle the appropriate answer.

Use liker scale with strongly disagree- 1, disagree- 2, Neutral -3, Agree-4 and strongly agree-5

No	Factor	strongly disagree	Disagree	Neutral	Agree	Strongly agree
501	I am competent in using computer in my department	1	2	3	4	5
502	I have good concepts for computer application	1	2	3	4	5
503	I am competent in using MS Window	1	2	3	4	5
504	I am competent in using MS Word	1	2	3	4	5
505	I am competent in using MS Excel	1	2	3	4	5
506	I am competent in using MS Access	1	2	3	4	5
507	I am competent in using power point	1	2	3	4	5
508	I am competent in using access and browse internet.	1	2	3	4	5

5.3. Knowledge on EMR system

Please point out the extent about knowledge on EMR which you agree with each of the following statements. Please tick (√) or circle the appropriate answer.

Use liker scale with strongly disagree- 1, disagree- 2, Neutral -3, Agree-4 and strongly agree-5

No	Questions	strongly disagree	disagree	Neutral	Agree	Strongly agree
601	I have good proficiency in computer use	1	2	3	4	5
602	I am familiar with the concept of EMR system	1	2	3	4	5
603	I am familiar to the benefits of EMR system	1	2	3	4	5
604	I am familiar with tools and technologies needed for EMR system	1	2	3	4	5

605	I am familiar with EMR system of other countries	1	2	3	4	5
606	Education has effect in increasing the knowledge of hospital staff to work with EMR system	1	2	3	4	5
607	EMR system has effect in increasing the quality of health care services and patient safety	1	2	3	4	5
608	EMR system has effect in increasing the speed to deal with patients.	1	2	3	4	5
609	EMR system has effect in reducing the patients and hospital costs	1	2	3	4	5
610	EMR system has effect on public access to healthcare services	1	2	3	4	5
611	EMR system has effect in increasing patients' satisfaction	1	2	3	4	5
612	EMR system has effect in preserving the patients' privacy	1	2	3	4	5
613	EMR system has effect in preserving the confidentiality and security of patient information.	1	2	3	4	5

Thank you!!!!

ANNEX 4. DECLARATION.

I, the under signed, declared that this is my original work, has never been presented in this or any other University, and that all the resources and materials used for the research, have been fully acknowledged.

Principal investigator

Name: Birhanu Berihun (BSc, MPH Candidate)

Signature.....

Date.....

Advisors: First

Name: Mr. Desta Debalkie (BSc, MPH, Assistant Professor)

Signature.....

Date.....

Advisors: Second

Name: Getachew Setotaw (MSC in HI)

Signature:

Date.....

Examiners: Internal

Name: Mr mulusew Andualem (associative Professor)

Signature.....

Date.....

Examiner: External

Name: Mr. Shimelis Ololo

Signature

Date: