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Electronic Health Record Readiness Assessment in Thai Binh Hospital, Vietnam

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Abstract: ***Objective**: To assess readiness for full-functioned electronic health record (EHR) application system in Thai Binh hospital. **Method**: A cross-sectional study was conducted at the Thai Binh hospital, Vietnam. The quantitative information was collected by using questionnaire to access EHR readiness among all health workers who work at hospital. The readiness in this study includes: core readiness, technological readiness, learning readiness and societal readiness. All items measured on five-point Likert scale. **Results**: The health workers realized the importance of information and communication technologies (ICT) in healthcare. IT skills of doctors and nurses are limited. Internet system is slow and not good quality. ICT infrastructure for the deployment of EHR applications generally is sufficient. However, to implement full-function EHR, hospital needs to develop more software and improve ICT infrastructure.*

Keywords: EHR, readiness, ICT

1. Background

The demand for health care is increasing. Using the ICT in health care is a rising area with a combination of health informatics, public health. Electronic Health Record (EHR) is a basic component of any electronic health system included six components: Administrative systems, Laboratory systems, X-ray systems, Pharmacy management systems, the Computerized Physician Order Entry[1]. Some forms of EHR has been achieved in implementing in some countries in recent year. In Korean, there are 11 hospitals implementing a full-function EHR. They include all impatient and outpatient healthcare information. Other countries such as Singapore, Taiwan, Hong Kong and Thailand were also developing EHR in one form or another with successfully implemented[2].The EHR system would help improve health care practices by providing health care evidence based and improve treatment efficacy[3]. However, previous studies showed that EHR adoption is not always successful, even in developed countries such as the U.S and Japan[4]. For developing countries, the acceptance of using EHR tend to be low due to concerns on insufficient infrastructure, unrecognized important of EHR. It is important to perform readiness assessment as a pre-implementation process with the aim to get information for decision making to develop the system[5]. Evaluation of readiness before implementing health is extremely important before applying EHR in health facilities[6]. A needs assessment and EHR application readiness study at two health care facilities in Afghanistan in 2011 showed that a picture of the readiness of those organizations for implementing electronic health record related to the lack and maintain intensive health manpower, capacity issues, lack infrastructure, coupled with the uncertainty of policy and institutional organizations [7]. In developed countries, Chew's study on identify strategies to facilitate internet use by family physicians at members of the local chapter of the American Academy of Family showed that 93% had computers available and had internet access at work[8]. Another study about the trend in EHR adoption in Japan presented health information system adoption in Japanese medium and large hospitals was high compared to small hospitals and clinics[9].

Currently, the adoption of EHR in hospitals in Vietnam was limited by the inconsistency of the equipment system, health management system software, a media transmission between the level of information and in each unit. Thai Binh general hospital has implemented the software programs to speed up administrative procedures such as admission and hospitalization cost. However, these applications were only part of the EHR and couldn't exchange information between departments. Pre-implementation EHR assessment has an important role in development and deployment of any EHR system. This assessment helps to determine the strengths and weaknesses of the system before applying EHR. Thus, our goal to assess readiness for full-functioned EHR application system in Thai Binh general hospital.

2. Methods

Study design: This study employed a cross sectional survey was conducted at the Thai Binh general hospital, Thai Binh province, Vietnamfrom July 2013 to July 2014.

Participants

Thai Binh General Hospital has separated from preventive medical centre since 2006, included 100 beds scale, 1 director, 2 deputy directors, 280 staffs, 4 function departments, and 9 specialization departments. For this study, a total of 280 health workers at the Thai Binh hospital were selected using the following criteria:

Inclusion criteria:

- The health worker who was working full-time at the hospital.
- Willing to participate and able to answer questionnaire.

Exclusion criteria:

Drivers and cleaner.

Measurement

An evaluation framework was built through a combination of the components of assessment of readiness in several previous research frameworks[6, 10, 11]. The tool was designed to collect relevant information from hospital staffs

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with different positions, release and responsibilities. The information contents of the questionnaire composed of 4 components including:

- Core Readiness related to needs, the planning aspects and decision factors for success such as the suitability of infrastructure and information technology and the combination of information technology with the existing services in the hospital.
- Technological Readiness includes issues on the importance of information technology needs, the demand for hardware and software necessary to implement an electronic health program. It includes: Transmission speed, quality of IT and Support for ICT; Software and Hardware; Availability and affordability of the desired ICT; The health facilities access IT/internet training.
- Learning readiness related to the current IT application training program for staff in the hospital. It includes: ICT using skill training for health worker and health worker involved in EHR project
- Societal Readiness includes issues related to interoperability issues between health facilities in the region and beyond. The main issue here is to address the factors related to accessibility and content appropriate and socio-cultural factors, addressing gender equality issues. It includes: communication with other organizations, shared health information, interoperability of healthcare facilities, sociocultural elements between health worker and patients and public.

Statistical analysis

Data were entered and cleaned by using Epidata 3.1 software. Descriptive statistics such as Mean (for quantitative data) and frequency, percentage, figure (for qualitative data) were used to describe information related to health worker and four domains of EHR readiness. All statistical analyses were performed using Stata 12 (STATACorp, College Station, Texas).

3. Result

Characteristics of study participants

A total of 280 health workers participated in the survey. Among all participants, 21.8% were pharmacist and doctor whereas nurses and technicians made up 33.2%. The health supporting staff was the highest proportion group (42.1%) and the IT staff was the least only 2.9%.Almost all participants were in the age ranges under 39 years old (82.1%) while those whose ages over 50 years old was 1.8%. The average time working time at the Thai Binh Hospital of medical staff was 8.0 years whereas the average time in current position was 5.4 years. In conctrast, the average time working at hospital of nurse and technician was relatively shorter (Mean score =6.9 years) and the current position was 4.0 years. The IT groups had the longest average time working at the hospital (**Table 1**).

The readiness for full-functioned EHR applications in Thai Binh General Hospital.

Core readiness

All medical staffs in the hospital was aware of the importance of EHR in diagnosis or treatment (Mean score = 4.4). However, they were not satisfied about using ICT applications in hospital (mean-score = 2.8). Most health workers believed that ICT will solve the problems in the hospital (mean score = 4.4).

Most IT staff, health supporting took part in planning for EHR projects (mean score> 4.3) whereas doctors and nurses did not know the detailed progress of this planning (mean score <3.3).

Most medical staff at the hospital completely satisfied with EHR (Mean-score > 4.3). It was suitable to the context of a hospital. Thus, they were willing to take part in when carry out EHR applications (mean score>= 4.4).The detail information about Mean-score of each item of the core readiness was displayed in **Table 2**.

Technological readiness

The mean score for the satisfaction level of internet speed and quality of most health care workers in hospital was relatively low (mean score <2.6).There were differences in the level of satisfaction of assistance services while implementing EHR applications. The mean score for the satisfaction level of ICT support services of physicians and nurses (mean score < 2.6) was lower than the IT staff and health supporting (mean score > 4.2). Most medical staff in hospital evaluates software and hardware in EHR project is temporary sufficient in applying the current 2 software: Hospital fee and registration patient (mean score>4.0).

There were differences in ability to access ICT as telephone, internet among health care workers. The mean score of ability to access IT of physicians and nurses (mean score = 3.1) was lower than IT staff and health supporting in the hospital (mean score > 4.2).

Training programs and support for user when deploying EHR applications showed as not yet ready(mean score <3.2). Health supporting and IT staff were always willing to participate in ICT training (mean score> 4) while doctor and nurse didn't take part in any training course (mean score <3). (See detail information about mean score of each item of the technological readiness in **Table 3**).

Learning readiness

There were differences in mean scores between doctors and other staff. Most nurses/technician, IT staff participated in courses on IT application (mean score>4), whereas the doctor was not participating (mean score = 2.4). The ongoing training course on using EHR applications in hospital almost didn't have. ICT applications don't apply in any continuous training course at the hospital. The mean score is relatively low (mean score <3).

The assessment results show that most IT staff, health supporting took part in the planning and implementation of new projects on EHR (mean score >= 4) whereas doctors and nurse only supported in planning and implementation a little bit. (mean score <3)(see detail in **Figure 1**).

Societal readiness

The level of exchange information with other organizations by email was still limited. Most IT staff sometimes used email (mean score = 3.1) while others never used email at

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the hospital (mean score <2.7). Mean scores on the assessment of the exchange and sharing medical documents by using an online repository of health staffs was very low (mean score < 3.0). There was no exchange of information between healthcare facilities, the mean score was less than 3.0. However, the sociocultural elements between health worker and patients in all health worker were 4.8 points (**Table 4**).

4. Discussion

All health workers in Thai Binh hospital determine the importance of EHR in diagnosis and trust in using ICT would solve the problems in the hospital. Doctors and nurse were not satisfied with using ICT applications in hospital. Especially, planning for EHR due to only IT staff and health supporting known it but doctors and nurses didn't know except detailed planning. Most medical staff at the Thai Binh hospital completely satisfied with EHR project because it was suitable to the context of a hospital. Thus, they willing to take part in when carrying out EHR applications. In addition, ICT applications were suitable for the current planning process in the hospital.

Internet connection speed and internet quality in the hospital was relatively low. The doctor and pharmacist weren't satisfied with the technical support services at the Thai Binh hospital when deploying EHR applications. To implement full-function EHR, Thai Binh hospital needs to develop more software and improve ICT infrastructure. The ability to access ICT by physicians lower than IT staff in the hospital. In addition, nurse, technician and IT staff always willing to participate in ICT training while the doctor didn't take part in any training course. Most nurses/technician, IT staff participates in courses on IT application whereas the doctor was not participating. In the process of teaching, they didn't use ICT applications in the continuous training course at the hospital.

Besides, most IT staff, health-supporting took part in the planning and implementation of new projects on EHR while doctors and nurse only support in planning and implementation a little bit. Exchange information with other organizations by email was limited. They only use the phone or mobile to contact other hospitals. IT staff sometimes use email while others never use email for their work at the hospital. There is no exchange information here. Exchange and sharing medical documents by using an online repository of health staffs were very low. Both rich and poor people get benefits when applying EHR application in diagnosis and treatment.

The study of EHR readiness at Thai Binh hospital showed that lack and maintain intensive health manpower, capacity issues, and lack infrastructure and policy, lack of standardized applications, deployment costs, training costs, educational issues, resistance to change, and pilot projects or small implementations with limited numbers of patients in healthcare organizations. In particular, this study indicated that physicians who almost did not have ICT skills. In addition, they didn't involve in any ICT training course. Eventually, they weren't involved in the process of EHR planning at the hospital. These plans are mostly the collaboration between IT and health-supporting staff.

This result reflects the true state of the health facilities in the developing countries. It's quite the same to the results electronic health record application readiness at two health care facilities in Afghanistan in 2011 and an implementation study ehealth challenges in Iranian medical centres[7, 12].

The lack of investment in ICT infrastructure (such as the internet system, hardware and software) was one reason for dissatisfaction with the quality and service of health workers in Thai Binh general hospital. Most big hospitals in Hanoi such as Bach Mai, Viet Duc hospital had much modern equipment for the healthcare, telemedicine, e-learning.

5. Conclusion

Board of Directors recognizes the importance when implementing EHR applications. Thus, they have changed from the old system to the new management system, implemented in accordance with the direction of the MOH using new IT applications in examination and patient treatment.The hospital was planning to build an overall plan for the whole system in which identifies long-term goals of stability and sustainability of the hospital.Medical staffs known more the mechanism from do by hand replace do by computer. Besides, they also took part in the process of system development, supporting the plan.

6. List of abbreviations

EHR: Electronic Health Record
ICT: information and communication technologies
IT: Information technology

7. Declarations

Ethics approval and consent to participate
The study protocol was reviewed and approved by the Institutional Review Board of Hanoi school of Public Health on July 30, 2013. The reference number for the ethics committee is 173/2013/YTCC-HD3. The committee evaluated the ethical aspects of the study in accordance with The World Medical Association's Declaration of Helsinki. The study was explained in detail to participants. Informed consent was obtained well before participant enrollment in all cases.

Consent for publication
Informed consent was obtained well before patient enrollment in all cases. This consent included their agreement to the publication of indirect identifiers for participants, such as age and gender.

Funding
We did not receive any funding to conduct this study.

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Table 1: Demographic characteristics of participants

Characteristic	Doctor & pharmacist	Nurses & Technicians	Health Supporting	IT	Total
	n=61 (%)	n=93 (%)	n=118(%)	n=8 (%)	n=280(%)
No. of respondents	61 (21.8%)	93 (33.2%)	118 (42.1%)	8 (2.9%)	280 (100%)
Age					
< 30	7 (11.5%)	48 (51.6%)	42 (35.6%)	1 (12.5%)	98 (35%)
30-39	42 (68.8%)	29 (31.2%)	59 (50%)	2 (25%)	132 (47.1%)
40-49	11 (18%)	15 (16.1%)	14 (11.9%)	5 (62.5%)	45 (16.1%)
50-59	1 (1.6%)	1 (1.1%)	3(2.5%)	0 (0%)	5 (1.8%)
Sex					
Male	14 (22.9%)	35 (37.6%)	69 (58.5%)	8 (100%)	126 (45%)
Female	47 (77%)	58 (62.4%)	49 (41.5%)	0 (0%)	154 (55%)
Experience (years)					
Mean duration in current institution	8 (6.2-9.9)	6.9 (5.6-8.2)	7.2 (6.1-8.3)	18.2 (10.8-25.7)	7.6 (6.8-8.4)
Mean duration in current job position	5.4 (4.1-6.7)	4 (3.3-4.8)	4.8 (4.0-5.6)	5.4 (1.7-9)	4.7 (4.2-5.2)

Table 2: The Mean-score of each item of the core readiness classified by the health worker

	Doctor/ Pharmactist	Nurses/ Technicians	Health supporting	IT	General
Determining the demands for EHR project	4.4	4.5	4.3	5	4.4
Comfort with technology	2.7	2.8	3.1	2.3	2.8
Trust in ICT uses	4.4	4.4	4.4	4.5	4.4
New EHR projects are planned	2.5	3.2	4.3	5	3.6
Overall satisfaction and willingness	4.4	4.3	4.4	4.3	4.3
Integration of technology	4.4	4.5	4.5	4.5	4.5

Table 3: The Mean-score of each item of the technological readinessclassified by the health worker

	Doctor/ Pharmactist	Nurses/ Technicians	Health supporting	IT	General
Transmission speed and quality of IT/Internet at the health facility	2.4	2.4	2.5	2.5	2.4
Service/Support for ICT	2.3	2.5	4.3	4.4	3.3
Software and Hardware	4.1	4.2	4.1	4.7	4.2
Availability and affordability of the desired ICT	3.1	3.1	4.3	4.8	3.7
The health facilities access IT/internet training	2.7	2.7	3.6	3.9	3.1

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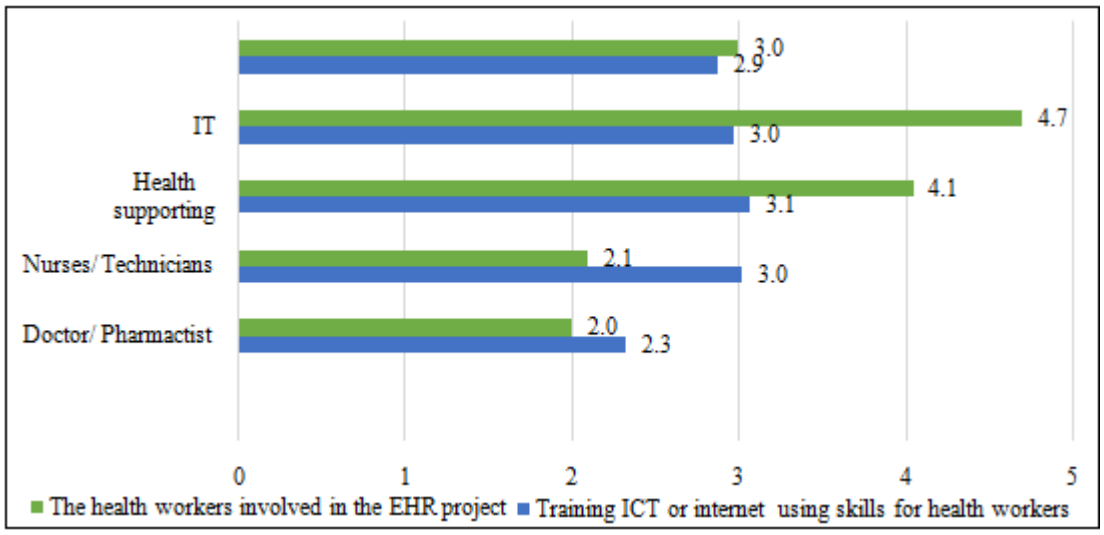

Figure 1: The Mean-score of each item of the learning readiness classified by the health worker

Table 4: The Mean-score of each item of the Societal readiness classified by the health worker

	Doctor/ Pharmactist	Nurses/ Technicians	Health supporting	IT	General
Communication with other organizations	2.1	2.2	2.6	3.1	2.4
Sharing among the health facility levels	2.8	2.8	2.8	2.6	2.8
Interoperability of health care facilities in the care of patients and communities	2.6	2.4	2.4	2.6	2.5
Sociocultural elements between health worker and patients and public	4.8	4.8	4.8	4.8	4.8

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