The Implementation of the Clinical Information System (CIS) in General Practitioner Clinics

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ABSTRACT

Malaysia has started the initiative to implement Health Information Technologies since the establishment of the country’s telemedicine blueprint in July 1997. The term Telemedicine was later changed to Telehealth, and the approach is used as a tool to reshape the healthcare delivery system to becoming more virtual, distributive and integrated by utilizing the telecommunications, information and multimedia technologies. Previous studies have highlighted the need to integrate information between public and private healthcare. Therefore, it is important to identify the outcome of the implementation of the Clinical Information System (CIS) in private healthcare in achieving data integration. The three main aspects to be explored in CIS implementation are CIS components implemented in General Practitioners’ (GPs), CIS implementation effectiveness and GPs’ willingness towards integration. Semi-structured interviews were conducted at ten General Practitioner clinics. Findings show that the implementation of CIS has been well accepted in GP clinics. It is demonstrated that the computer system infrastructure in place in GP clinics is prepared for data integration; and three dimensions of the effectiveness of CIS implementation have been found in these clinics. Further, GPs positively agreed on the implementation of data sharing with some justification to be fulfilled to make sure it is well developed. This study contributes to assessing the readiness of data integration from GPs’ perspectives within Malaysia’s healthcare system.

Keyword: Clinical Information System, General Practitioner clinics, Healthcare

1.0 Introduction

Information Systems (IS) is an integrated computer system that contains software, hardware and databases to collect, store and display electronic terms. It has many advantages for improving an organisation’s file system including the healthcare sector, such as hospitals and clinics. Silver, Markus and Beath (1995) mentioned that information systems are implemented within an organisation for the purpose of improving the effectiveness and efficiency of that organisation. According to Yamauchi, Ikeda, Suzuki, Asai, Toyama and Hayashi (1994), IS can reduce healthcare costs by coordinating regular health services, reducing errors, and shortening the treatment time.

Malaysia has embarked on initiatives to implement Health Information Technologies since July 1997. Malaysia hoped that Telehealth could play a major role in the future of healthcare by giving meaning to reversed pyramid of healthcare focused on the disease to emphasis personal care. Telemedicine blueprint (1997) described Telehealth "as a priority to provide integrated access system in high-quality health care and affordable", which proves the government's commitment towards harnessing the potential of Information and Communication Technology (ICT) to promote greater access and more comprehensive healthcare services for rural and remote areas. One of the Telehealth projects is Tele-primary Care (TPC).

Tele-primary Care (TPC) is Malaysia’s first home-grown enterprise-wide electronic clinic management and Clinical Information System (CIS) that links public primary and secondary care. One of the objectives of TPC is to provide a system for storing, archiving and retrieving medical records electronically. In 2005, the TPC project was established initially on 57 sites; this has since extended to 73 health clinics, four specialist outpatients’ clinics in hospitals and 10 district health offices in the states of Johor, Sarawak, Perlis, Selangor and Federal Territory Kuala Lumpur. As of
31 December 2010, 88 clinics and seven hospitals had implemented TPC (The Malaysian Public Sector Strategic Plan, 2011). Meanwhile, General Practitioners (GPs) in Malaysia were already exposed to computers and technology for accounting, recording drug stocks, patient records and research purposes as early as 1998 (Ming, 1998), followed by financial and office automation (Malaysia’s Health, 2008). The Academy of Family Physicians of Malaysia (Ramli, 2008) reported that, in 2008, approximately 800 private primary care clinics were equipped with electronic clinical information. Even though ICT has seen greater implementation in the private sector, however, systems in GPs’ clinics still in isolated standalone system (Malaysia’s Health, 2008) and are not designed to communicate with one another (The Academy of Family Physicians of Malaysia, as cited in Ramli, 2008). Malaysia’s Health (2008) asserted that an integrated system between private and public is paramount since patients are known to seek care from multiple providers or clinics, which leads to the inability to assign a gatekeeper or single provider or clinic that delivers the majority of care to a patient within provider profiling (Kamaliah, Jafar, Ehsan, Safice, Ismail, Saleh, & Warjio, 2009). This is due to the fact that currently there is no regulation which requires patients to be registered with a primary care doctor, allowing the patients to hop from one doctor to another, contributing further to duplication and fragmentation of care (Ramli, 2008). Since the medical record is the element that Public and Private Primary Care have in common (Aljumid, 2008), the integration of data between both areas care will be of little help for strategic and national healthcare data-sharing that is the aspiration of most countries (Malaysia’s Health, 2008). Therefore, this preliminary study is to identify the outcome of the implementation of the Clinical Information System (CIS) in private healthcare in achieving data integration.

2.0 Literature Review

2.1 Telemedicine and Telehealth

Telehealth is used as a tool to reshape the healthcare delivery system with better and more efficient integrated healthcare. Telehealth includes health education and the health community, the development of the healthcare system and epidemiology while Telemedicine is more oriented to the clinical aspects (Darkins and Cary, 2000). According to the blueprint telemedicine (1997), a life-long health plan is a network-based management tool designed to help users plan and manage health, access to health services, health records and transactions disease.

According to The Malaysian Public Sector Strategic Plan (2011), “Teleprimary Care (TPC) integrates the systems used in specialist clinics and systems used in pathology, radiology and pharmacy (p.15)”. Teleprimary Care is Malaysia’s first home-grown enterprise-wide electronic clinic management and Clinical Information System (CIS) that links public primary and secondary care. With TPC, outpatients only need to register once at any clinic or hospital implementing the system to then be able to receive treatment at any other clinic or hospital.

As medical records are not shared between private and public primary care organisations, this can potentially duplicate investigations (Ramli, 2008) and create problems in managing patient data and records (Economist Intelligence Unit, 2011). The Economist Intelligence Unit (2011) reported that the importance of sharing data and records among public and private healthcare organisations motivated Hong Kong healthcare to change from data being stored in multiple locations being moved to one central repository.

2.2 A primary care sector in Malaysia

There are two types of care; primary care, and secondary and tertiary care. The Declaration of Alma-Ata (1978) stated that the primary care level as the first level of care is close to where people live and involves frontline health workers who have well developed generalist skills and who maintain regular contact with individuals/families/local communities with a broad range of health issues. Malaysia’s Health (2008) stated that the services in this level provide most of the anticipatory preventive care and early detection of and intervention for risk factors and curative services care for common time-limited health problems, the ongoing care of multiple chronic health problems, and rehabilitative services as follow-up from those discharged from hospitals. The public primary healthcare delivery
system can be summarised as a two-tier system - health clinic and network of community clinics, meanwhile, General Practitioner (GPs) categories in private primary care sector (Malaysia’s Health, 2008).

The Health Informatics Centre (2014) reported that, as at December 2013, there were 6,801 private medical clinics registered with the Ministry of Health Malaysia. Private primary care clinics have been mushrooming throughout the country, particularly in urban areas (Merican, Rohaizat, Haniza, 2004). However some have relocated to rural areas and small towns because of competition in cities (Aljunid, 2008). Traditionally, GPs’ surgeries have been the preserve of those doctors who did not specialise (Malaysia’s Health 2008). There are two types of GP ownership - single owner (solo-practitioner) and group practice. Table 1 shows characteristics of GPs (Aljunid, 2008).

<table>
<thead>
<tr>
<th>Single Owner (Solo-Practitioner)</th>
<th>Group Practice</th>
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<tr>
<td>Small capital</td>
<td>Bigger capital</td>
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<tr>
<td>Small size and numbers of clinics</td>
<td>Chain of clinics</td>
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<tr>
<td>Limited facilities/ equipment</td>
<td>More expensive equipment</td>
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<td>Operating shorter hours</td>
<td>Longer operating hours</td>
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GPs provide services such as general outpatient care, specialist services (if owned by a specialist), drugs prescriptions, simple procedures, minor operations, circumcisions, incisions and drainage, laboratory services and blood and urine examination (Aljunid, 2008). Payment for the services are largely borne by the patients with out-of-pocket payment, or by their employers (Ramlil, 2008), in the form of employer-provided insurance with panel doctors, company’s panel doctor and health maintenance organisations, and private medical insurance (Kamaliah et al., 2009). Patients prefer private facility health for the reasons of longer opening hours, after-office hours and weekend service, shorter waiting time, no appointment needed, easier to get treatment by doctors, better interpersonal quality, and well equipped clinics (Aljunid, 2008).

2.3 Clinical Information System

The study looks into CIS implementation at GPs’ clinics based on the CIS component used in public primary care. This is important to ensure that the CIS component at GPs’ clinics is aligned with public primary care for future systems or data integration, if feasible. To achieve this, the Putrajaya Clinic CIS Modules (MOHM, 2009) serve as our case in this study, as shown in Table 2.

<table>
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<th>Table 2: Putrajaya Clinic CIS Modules</th>
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<td>CIS Modules</td>
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<td>Registration</td>
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<td>Appointment</td>
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<td>Queue</td>
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<td>Charging</td>
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<td>Order Management</td>
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<td>EMR8-Triage</td>
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<tr>
<td>EMR-Clinic Notes</td>
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<td>EMR-School Health</td>
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<tr>
<td>EMR-Templates Pharmacy Information System</td>
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<td>Macromedex</td>
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<tr>
<td>Laboratory Information System</td>
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<td>HL7 Interface</td>
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<td>Environment Health Integration</td>
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<td>Triage Protocol Information</td>
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<td>Reporting</td>
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Meanwhile, for CIS implementation effectiveness, the dimensions of impact, staff satisfaction, ownership and technical difficulties are assessed. These dimensions are adopted from
Gugerty, Maranda and Rook (2006) who introduced a CIS implementation evaluation scale (CSEIS). Even though there are other dimensions dedicated for CIS, namely CIS Success Model (CSSM) (Garcia-Smith and Effken, 2013) and Information Systems Expectations and Experiences (I-SEE) (Wakefield, Halbesleben, Ward, Qiu, Brokel, and Crandall 2007), the CSEIS has been selected for use in this study. CSEIS is not only dedicated to CIS, it is also found to be a useful instrument, which is easy to administer and is acceptable to respondents. It was developed for post-CIS implementation administration and the questions were constructed after observing and talking with the experimental users about their roles in and attitudes towards the implementation of the Critical Care Clinical Information System (CCCIS) (Gugerty et al., 2006).

Delone and McLean (1992) have identified user satisfaction as one of the success measures of management information systems. A study by Van Der Meijden, Tange, Troost and Hasman (2003) found that user satisfaction was evaluated in 46% of the studies. User satisfaction based on Gugerty et al. (2006) are general user satisfaction on the usage, training adequacy and effectiveness, and handling feedback.

Gugerty et al. (2006) stated that the impact can be divided into three sub-dimensions - practice, team and workload. According to Delone and McLean (1992), there are two impact dimensions - individual impact and organisational impact. In this study, impact on workload can be associated with individual impact that is measured for the effects of the system or the information on users' behaviour, and attributes (Delone and McLean, 1992). Meanwhile, impact on practice and team can be considered organisational impact (Delone and McLean, 1992) that refers to the effects of the system on organisational performance.

The ownership dimension based on Gugerty et al. (2006) is about participation of CIS users in designing the system and their role in the development of the system. Lastly, the technical difficulties dimensions evaluate system reliability, accuracy and accessibility.

3.0 Methodology

This is a qualitative study as it lends itself to a subjective nature of study. Naoum (1998) described qualitative research as 'subjective' in nature that emphasises meanings, experiences and descriptions. In direct contrast to quantitative research, qualitative research is based upon the non-numerical examination and interpretation of observations for the purpose of discovering underlying meanings and patterns of relationships (Strauss and Corbin, 1998).

This study focused on eight GPs’ clinics that used computer systems in their daily task. The respondents are either the doctor or employees in the clinic who have experienced use of the CIS. The interview questions were created based on the 2006 Clinical Information System Implementation Evaluation Scale of Gugerty et. al (2006) in order to identify CIS performance, and these were then pre-tested among the colleagues prior to the interview session. The researcher conducted semi-structured interviews with the respondents and the length of interviews ranges from 40 minutes to an hour. In semi-structured interviews, the researcher has a list of themes and questions to be covered, but the sequence may vary from one interview to another (Saunders, Lewis and Thornhill, 2009). The conversations were tape-recorded and then transcribed into a Microsoft word document. Following this, the transcripts were reread when conducting the iterative process of qualitative data analysis.

Concerning data analysis, the interview data were thematically analysed. The themes were identified from the interview transcriptions based on the prior themes that had been decided earlier on following previous research such of that Gugerty et al. (2006). Nevertheless, the new emerging data are allowed in the process until saturation point was reached.

4.0 Findings and Discussion

The findings of CIS implementation from this study are based on three main aspects; CIS component implemented in GPs’ clinics, CIS implemented effectiveness and GPs’ willingness towards data integration.
4.1 Generic information

Findings reveal that all respondents (six doctors; one nurse and three clinical assistants) use computer systems in the clinics’ daily tasks. When asked about whether they purchased or developed the system, all respondents purchased their systems from suppliers. In essence, this study found that all respondents implemented the in-house CIS component, with a minimum four years and maximum 12 years use of the system.

4.2: CIS Component implemented in GPs’ clinics

The implementation of CIS has been well accepted among the respondents. The study found that GPs’ clinics implement the following components: Registration, Consultation, Laboratory, Pharmacy, Inventory Management, Billing and Reporting. Nevertheless, there are sets of components that are not currently implemented in the GPs’ clinic such as EMR8-Triage, EMR-Clinic Notes, EMR-School Health, Macromedex, HL7 Interface, Environment Health Integration and Triage Protocol Information. This might be because these components are the advanced version of CIS that comprises information on drugs, pediatrics, diseases, labwork, and toxicology to comprehensive resources for patient and consumer education (Macromedex.com) that are used in huge and complex healthcare organisations.

4.3: CIS implementation effectiveness dimensions

With regard to CIS implementation effectiveness dimensions, it has been found that these findings are not in line with Gugerty et al. (2006) since there are only three dimensions that have been emphasised by the respondents. These are impact, satisfaction and technical difficulties which are discussed in detail below.

Dimension 1: Impact

There are three sub-dimensions for impact in this study, namely practice, team and workload. All respondents agreed that CIS implementation facilitates their work; as one respondent said, “the staff is more efficient in carrying out their duties, and the work done is convenient, fast and transparent”. Furthermore, the use of CIS could increase cooperation among staff in the organisation. Each member of staff has their own task to monitor in the CIS system to ensure all processes run smoothly.

Moreover, Respondent 6 pointed out that, “The use of this system helps in reducing error in dispensing when the handwritings could not be read”. Furthermore, a respondent informed the researcher that CIS implementation helps save space; she mentioned that, “The clinic does not need space to store patients’ record cards and all they are all kept well in the database”. Some respondents felt that the implementation of CIS has brought obstacles in terms of high cost of starting the implementation of the system since each system is very pricey and has different packages. They also agree that CIS implementation will support the paperless project in the health sector.

Dimension 2: Satisfaction

Level of user satisfaction shows the success or otherwise of a system from its users’ points of view. ‘Satisfaction’ based on Gugerty et al. (2006) refers to general user satisfaction on the usage, training adequacy, and effectiveness and handling feedback. All respondents agreed that CIS is also very easy to understand and studied by all level in the organisations. As mentioned by Respondent 7, CIS is, “as easy as ABC”. It shows that training can be done by the current user straightforwardly.

The implementation of the CIS could increase patient satisfaction and reduce waiting time for treatment. This is proven when all the processes involved are easier and faster. As one respondent noted, “Patients only need to state the identification card number, patient name or identification cards to the clinic for the purpose of registration. With the information, all patient history can be accessed directly through the system”. Furthermore, Respondent 8 pointed out the disadvantages of using a card. “It is not easy to find the name of the patient. Sometimes the patients have the same name. Therefore it takes a long time to find the card. If the card is lost or misplaced, they have to register a
new card for the patient and duplication of patient information will exist once the card is found. With CIS, these problems can be solved, as well improving service quality of the clinic. There are no more complaints from patients that they are tired of waiting for treatment”. However, Respondent 8 also mentioned that there are advantages for using a card system rather than a computer system, as mentioned, “With card, they need to write only what the patient’s problem and prescribed medicine meanwhile a lot of files they should refer to when using the computer system and sometimes it is difficult to understand computer system requirements. This caused complicates to their work and take the time to record patient information”.

Dimension 3: Technical Difficulty
The findings show that technical difficulties are linked to the duration of system use. Most of the systems used for more than five years will have some technical issues; some of these are stated as the system will stop working in the middle of usage (R1); the data are missing (R5, R8); it takes longer to find the data (R6); and the system is unstable (R7). At this point of usage, having backup data is compulsory since the collection of data is crucial. As Respondent 6 mentioned, “Every night, staff will do the backup data process”. However, Respondent 5 declared that they do not have backup data, as they pointed out, “If the system is corrupted, the data will be lost since we don’t have backup data.”

Dimension 4: Ownership
The ownership dimension is not applicable for the respondents since they acted as the final consumers of the system. They do not give feedback on design and they are not involved in system development.

4.4 GPs Willingness towards data integration
The respondents positively agreed on data sharing between private and public healthcare. In addition, respondents’ 1 and 2 stated that access to the system in all sectors of healthcare should reliable and robust; to handle problems of access and any required data can be accessed easily and quickly. Other respondents (R5) did not agree on the implementation of sharing data. Their opinions were that clinical information and patient illness should be confidential since there are patients who want their illness to be kept secret.

5.0 Conclusion and Recommendation
The aim of this preliminary study was to identify implementation of CIS (CIS component implemented, CIS implementation effectiveness and willingness towards data integration) in the GPs’ clinics. This study contributes to the discourse on Malaysia healthcare to assess readiness of sharing data from the perspectives of GPs’ clinics. Findings indicated that the GPs’ system infrastructure is prepared and equipped with CIS. Even though they used different types of CIS software, the components are similar and related to public primary care CIS. Meanwhile, the effectiveness of CIS implementation is shown, via the dimensions assessed; it has a positive impact on the individual and the organisation; user satisfaction is achieved on training and handling feedback; and the system technical difficulties have been overcome. Moreover, the GPs’ clinics have the same opinion on the data sharing between public and private healthcare for future benefits. Therefore, the possibility for sharing the data is promising. In the future, it is expected that further research is conducted in looking at the mechanism of data sharing such as shared worksheet, so that the data integration can be carried out.

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