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THE EVALUATION OF ELECTRONIC HEALTH RECORD ADOPTION AMONG HEALTH PROFESSIONALS IN HOSPITAL SETTING

Evaluasi Adopsi Rekam Kesehatan Elektronik di Kalangan Profesional Kesehatan dalam *Setting* Rumah Sakit

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ABSTRACT

Background: *Electronic Health Record (EHR) utilization has been improved nowadays and it is believed that the adoption of Information Technology (IT) that has been implemented in various setting may also accelerate qualified implementation in health care setting. This study aimed to evaluate EHR utilization in various settings by systemic literature review.* ***Methods:*** *systemic literature research was conducted with keywords "(evaluat* model OR evaluat* framework) AND (health professional* OR health staff*) AND (electronic health record OR EHR) AND (us* OR engagement OR implementation OR adoption) AND hospital".* ***Result:*** *833 literatures found at the beginning of literature search, after apply limitations, remove duplicates and exclude of irrelevant literatures, finally total 7 articles were included in the review.* ***Conclusion:*** *there are benefits and drawbacks of EHR utilization among health professional in different healthcare settings in some countries that included in this review. Some health professionals had positive experience of using EHR that its use can improve clinicians' involvement, better clinicians' representation and decrease workload. Meanwhile, others had different views that EHR use are ineffectiveness due to inability of the systems to meet users' need, poor integration with existing workflows, poor IT skills among users and limited resources and training of EHR.* ***Recommendation:*** *Therefore, it is important to improve better design of EHR system with customized functionalities so it could improve the implementation and adoption of EHR by health professionals as end user.*

Keywords: *Evaluation, Electronic Health Record, EHR, Health Information Technology*

ABSTRAK

Latar Belakang: Pemanfaatan *Electronic Health Record* (EHR) yang semakin meningkat saat ini dan diyakini bahwa adopsi Informasi Teknologi (IT) yang telah diterapkan di berbagai setting juga dapat mempercepat implementasi yang berkualitas dalam setting pelayanan kesehatan. Studi ini bertujuan untuk mengevaluasi pemanfaatan EHR dalam berbagai pengaturan dengan tinjauan literatur sistemik. **Metode:** penelitian literatur sistemik dilakukan dengan kata kunci "(evaluasi * model ATAU evaluasi * kerangka kerja) DAN (tenaga kesehatan * ATAU staf kesehatan *) DAN (catatan kesehatan elektronik ATAU EHR) DAN (kami * ATAU keterlibatan ATAU implementasi ATAU adopsi) DAN rumah sakit ". **Hasil:** 833 literatur ditemukan pada awal pencarian literatur, setelah menerapkan batasan, menghapus duplikat dan mengeluarkan literatur yang tidak relevan, akhirnya total 7 artikel dimasukkan dalam review. **Kesimpulan:** Ada keuntungan dan kerugian dari penggunaan EHR di kalangan profesional kesehatan dalam pengaturan perawatan kesehatan yang berbeda di beberapa negara yang termasuk dalam ulasan ini. Beberapa profesional kesehatan memiliki pengalaman positif dalam menggunakan EHR yang penggunaannya dapat meningkatkan keterlibatan dokter, representasi dokter yang lebih baik, dan mengurangi beban kerja. Sementara itu, yang lain memiliki pandangan berbeda bahwa penggunaan EHR adalah ketidakefektifan karena ketidakmampuan sistem untuk memenuhi kebutuhan pengguna, integrasi yang buruk dengan alur kerja yang ada, keterampilan IT yang buruk di antara pengguna dan sumber daya yang terbatas serta pelatihan EHR. **Saran:** Oleh karena itu, penting untuk meningkatkan desain sistem EHR yang lebih baik dengan fungsionalitas yang disesuaikan sehingga dapat meningkatkan implementasi dan adopsi EHR oleh tenaga kesehatan sebagai pengguna akhir.

Kata Kunci: Evaluasi, Rekam Kesehatan Elektronik, EHR, Teknologi Informasi Kesehatan.

BACKGROUND

Many studies represent findings that Information Technology (IT) healthcare system will improve quality of healthcare provision since it can reduce the inefficient use of paper-based healthcare system (Adler-Milstein & Bates 2010). Some advantages of Electronic Health Record (EHR) in improving care includes e-prescribing, safety, decision support, improvement of productivity, cost-effectiveness, and patient-centeredness (Narcisse et al. 2013). In addition, health information technology also potential to improve efficiency in modern era of health care system (Shu et al. 2014). This idea gave opportunity to accelerate the implementation of Electronic Health Record in numerous health care provider worldwide.

However, there are also disadvantages of EHR use such as logistical problem, interoperability, lack of training and competence, feelings of imposition, decrease quality of care that perceived by health staffs and heterophily (Narcisse et al. 2013). Some of these drawbacks might be considered as the reasons for the slow uptake of EHR adoption by health professionals. In fact, some studies found that one of the major challenges for EHR adoption is mainly due to low acceptance among health providers including health professionals and staffs (Boonstra & Broekhuis 2010 cited in Cresswell & Sheikh 2013; Triantafillou 2017). As consequence, these facts come up with the contradictions regarding IT ability to improve productivity and quality of care and provide efficient health care delivery (Lapointe et al. 2011).

Moreover, Triantafillou (2017) mentioned that even though there are an adequate electronic information system adoption in certain countries, but the take up is higher in general practice rather than in hospitals (Triantafillou 2017). These finding gives insight to analyze further about the aspect of "How is EHR acceptance among health professionals especially in hospital setting?" and proceed with "How to evaluate EHR acceptance?" as well as to find out certain evaluation models or frameworks that are used to describe and analyze EHR adoption and acceptance among health staffs in hospitals.

REVIEW PROCESS

A systemic literature research was conducted to gather academic papers about topic of interest. A combination keywords are used along with Boolean operators such as "AND" and "OR" to capture literatures at the beginning of research process. Furthermore, to find appropriate keywords, the topic is formulated in PICO format to generate a research question. The research question is: "How to evaluate Electronic Health Record adoption among health professionals in hospital settings?".

Table 1. Keywords for Literature Search

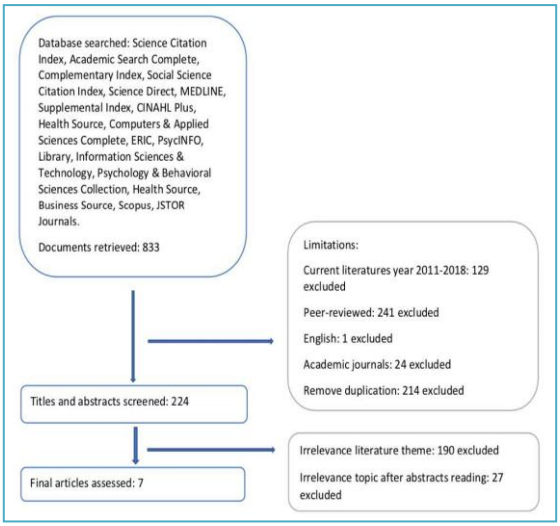
PICO Components	Alternative Words
Population	health professional* OR health staff*
Intervention or Interest	electronic health record OR HER
Comparison	Not Applicable
Outcome	us* OR engagement OR implementation OR adoption

In addition, since the interest of this topic is about the evaluation aspect, the final keywords generated for the search are: "(evaluat* model OR evaluat* framework) AND (health professional* OR health staff*) AND (electronic health record OR EHR) AND (us* OR engagement OR implementation OR adoption) AND hospital". Furthermore, the limitations were applied including full-text academic journals, peer-reviewed, English, current literatures between 2011 and 2018.

RESULTS

Initially, the search of databases identified 833 literatures. Certain limitations were applied, these includes only accepting current academic literatures in the past 8 years, peer-reviewed articles and English literatures only. Furthermore, after duplicates were removed, 224 articles were retrieved. Based on titles and abstract reading, 217 irrelevant literatures were excluded, because of irrelevant topics or because the content is outside of EHR context, such as Electronic Medical Record (EMR) or Electronic Personal Record (EPR). Finally, total 7 articles were included in the review.

Figure 1. Literature Search Results Relevant Information and Analysis



In Denmark, the use of EHR is mandatory and based of this fact, a mixed-methods study by Bossen et al. (2013) evaluate comprehensive EHR implementation using DeLone and McLean model for IS success. The study shows that generally all health staffs including physicians, nurses, physiotherapists and medical secretaries had positive experience of using Electronic Health Records. This positive response specifically related to operation reliability, response time, login and support system that serves by EHR. However, among them, physicians still argued about the development and the use of overview professional data which is challenging to be operated (Bossen et al. 2013).

Similarly, a recent case study evaluation of EHR development in four regional hospitals in Denmark was conducted within six consecutive years between 2004 and 2010, with four groups of end user such as clinicians, administrators, IT personnel and vendors are included in this evaluation research (Høstgaard et al. 2017). The authors argue that the adoption of EHR has leads to a problem such as lack of awareness of end user involvement in the establishment of EHR. Hence, the study was utilizing a Constructive eHealth Evaluation Method (CeHEM) and its evaluation framework to support and facilitate end user involvement in EHR development (Høstgaard et al. 2017).

The study result shows that there are three aspects of consideration in EHR development and implementation, these includes prior clinicians' involvement, better clinicians' representation and workload reduction (Høstgaard et al. 2017). After these recommendation aspects are disclosed among health professionals, it was shown that physicians' involvement was improved and as a result they experienced an ownership and had positive attitude towards the system (Høstgaard et al. 2017).

Another official evaluation study was conducted to assess EHR adoption derived by HITECH (Health Information Technology for Economic and Clinical Health) Act in United States (Gold & McLaughlin 2016). The review accounted qualitative and quantitative data that gathered from global assessment. The assessment result show that EHR adoption by health care providers is relatively undemanding, which might be due to availability of HITECH incentives provision rather than improvement of EHR system infrastructure to accelerate system functionalities to gain Meaningful Use (MU) as its central concept of achievement

(Gold & McLaughlin 2016).

Specifically, physicians that use EHR mentioned that financial incentives or penalties as major influence of the system used by them. In addition, the study found that the adoption rates of EHR is uneven, the rates of adoption of EHR increased among hospitals that are eligible for incentives, so they also gain better implementation of the system due to HITECH and MU incentives (Gold & McLaughlin 2016). On the other hand, the adoption of EHR still low among health professionals in small rural hospitals (Gold & McLaughlin 2016).

Additionally, physician engagement with the system capabilities such as transfers of health information, provide electronic patient's visit or health summary, electronic information exchange was varied because it depends on EHR system provided by vendors (Gold & McLaughlin 2016). Hence, different types of EHR have resulted in various engagement and different capabilities served by health care providers and health professionals for their patients.

On the other hand, a study by Narcisse et al. (2013) has narrower focused on gaining an understanding of EHR use among advanced practice nurses (APNs) in United States, using non-experimental research and Roger's theory of diffusion of innovation as a theoretical framework (Narcisse et al. 2013). The study finds that around two-thirds of APNs are EHR users. APNs who working at hospitals setting are more likely to use EHR compared to those working in clinics or office. In addition, APNs with long professional years' experience are also more likely to use EHR (Narcisse et al. 2013, p. 130). Despite the existing HITECH incentives payments for eligible health professionals, the EHR system were not implemented well, hence EHR adoption still need to be optimized among APNs (Narcisse et al. 2013).

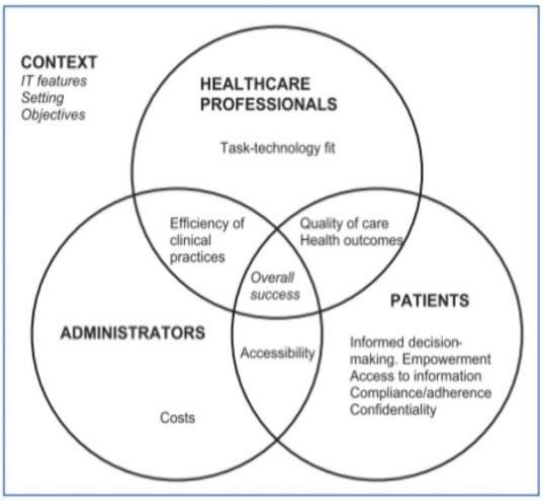
Another study by Ser et al. (2014) conducted qualitative evaluation research by interviewing health staffs in two mental health hospitals in UK (Ser et al. 2014). The study aimed to analyze the perception and implementation of national EHR among hospital staffs in mental health setting aspects (Ser et al. 2014). Using conceptual model of reasons for workarounds, overall, there are four main factors contribute to lack of EHR implementation. First, operational factor includes inability of EHR systems to meet perceived users' need and poor EHR integration with existing workflows. Second, cultural factor considers the IT skills among users and resistance to change. Third, organizational factor includes limited resources and training of EHR. Fourth, technical factors refer to lack of local technical infrastructure (Ser et al. 2014).

Additionally, despite of these factors may applied in system implementation in various setting, but there are several factors specifically accounted in the integration within mental health hospitals setting such as lack of specific system functionalities and option related to mental health and clinicians unable to operate EHR while handling or managing distressed psychiatric patients (Ser et al. 2014).

Furthermore, Lapointe et al. (2011) proposed HIT (Health Information Technology) impacts assessment framework, which developed by qualitative method study drawn up from interviews of group of health professionals including physicians, nurses and administrators in three different hospitals. The result of the study shows wide range of impacts were presented by health staffs in all cases, these include clinical processes, quality of care, security, privacy, organizational aspects and power distribution (Lapointe et al. 2011). The physicians, nurses and administrators pointed their views about the use of the system based on their perspectives, some views considered supporting and positives but other views discourage the use of the system (Lapointe et al. 2011). As a result, it is important to taken into account different stakeholder's

perspective in developing, introducing and adopting eHealth and EHR system (Lapointe et al. 2011).

Figure 2. HIT Impact Assessment Framework



Moreover, based on the assessment framework, it is important to identify and measure appropriate impacts of the system, consider system utilization context, support multi-level perspectives includes personal, group and organizational and embrace a range of perspectives of health professionals, managers and patients (Lapointe et al. 2011). Therefore, HIT impact assessment framework may beneficial as a general guidance to assess HIT impacts including EHR system impacts among health professionals.

Lastly, Hadji et al. (2016) conducted a study regarding acceptance evaluation survey in Pompidou European University Hospital (HEGP) in Paris, France. The data were collected using surveys within 4, 6 and 10 years after first adoption of Clinical Information System (Hadji et al. 2016). Even though the system is not limited to EHR only, but the overall results were also considering EHR acceptance factors. There are six acceptance aspects considered in the study includes "CIS quality (CISQ), facilitating conditions (FC), perceived usefulness (PU), confirmation of expectations (CE), use, and global satisfaction (GS)" (Hadji et al. 2016).

The result shows that the system acceptance is significantly improve over time. However, at the early adoption period, there was low perceived usefulness (PU) of EHR by medical staffs (Hadji et al. 2016). In other words, at the beginning of system deployment, the health professionals might be skeptical regarding the functionalities that served by the system and whether it could provide usefulness to the health care. But in the following years, the perceptions are changing since there were improvement of global satisfaction (GS) determined by system quality, confirmation of expectation (CE) that also influence perceived usefulness (PU) dimensions further (Hadji et al. 2016).

DISCUSSION

Health professionals considered as catalyst of better EHR adoption. As consequence, it is important to find practical ways in improving EHR technology adherence, as well as to use take up the technology in effective and efficient ways among health professionals. It is crucial to make them aware that EHR technology is very beneficial in terms of understanding of its usefulness in daily health practice, be able to utilize it to drawn up decision making, to gain comprehensive idea that EHR technology is the best option not only for the health staff but also for their patients (Narcisse et al. 2013).

CONCLUSION AND RECOMMENDATION

Conclusion

There are various evaluation models and frameworks that can be used to assess Health Information Technology system adoption as well as its acceptance among health professionals. Particularly, in the literatures included in this review, the models or theories are DeLone and McLean Model, Roger's Theory of Diffusion of Innovation, Constructive eHealth

Evaluation Method (CeHEM), Theory of workarounds, HIT Impact Assessment Framework, Acceptance Model and Framework of Global Assessment of HITECH. In addition, the data collection of evaluation study can also be varied either quantitative, qualitative or mixed-methods.

Some models, frameworks and theory has been proven to evaluate EHR development and adoption such as Constructive eHealth Evaluation Method (CEHEM). CeHEM provides a framework to analyze EHR users feedback, learning and utilize those aspects in the development of EHR. As a result, CeHEM could provide a broader context in eHealth evaluation especially in building one of the main success factors, which is end-user involvement in eHealth development (Høstgaard et al. 2017).

Recommendation

It is important to emphasize the evaluation of EHR use among end-users, taking into account their perspectives regarding system usage and functionalities as well as allows and encourages their involvement in EHR establishment. By doing this, it can improve the 'sense of belonging' and improve applicability and utilization of the system.

Also, reflecting to the utilization of EHR in mental health hospitals, even though the EHR system is designed to accommodate health services in various setting, but specific functionalities in certain health sectors is important to be considered and developed, because system incompatibility may cause physicians or clinicians become reluctant to utilize the system. In conclusion, a better design of EHR system with appropriate functionalities will hopefully improve the implementation and adoption of the system by health professionals in various health care settings.

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