



Απόψεις και στάσεις των επαγγελματιών υγείας σχετικά με τον ηλεκτρονικό φάκελο υγείας: Μια βιβλιογραφική ανασκόπηση

Περικλής Ρόμπολας¹, Πανίκος Μασούρας², Σωτήρης Αυγουστή², Ανδρέας Χαραλάμπους³

1. RN, BSc, MSc, MEd, PhD(c), Τμήμα Νοσηλευτικής, Τεχνολογικό Πανεπιστήμιο Κύπρου
2. BSc, MSc, PhD, Επίκουρος Καθηγητής, Τμήμα Νοσηλευτικής, Τεχνολογικό Πανεπιστήμιο Κύπρου
3. BSc, MSc, PGCert, PhD, Καθηγητής, Τμήμα Νοσηλευτικής, Τεχνολογικό Πανεπιστήμιο Κύπρου

ΠΕΡΙΛΗΨΗ

Εισαγωγή: Ποικίλοι παράγοντες διαμορφώνουν θετικές απόψεις και στάσεις των επαγγελματιών υγείας σε σχέση με τον Ηλεκτρονικό Φάκελο Υγείας (ΗΦΥ) ως εφαρμογή Ηλεκτρονικής Υγείας στα συστήματα υγείας διεθνώς.

Σκοπός: Η διερεύνηση των παραγόντων που διαμορφώνουν θετικές ή αρνητικές απόψεις και στάσεις στους επαγγελματίες υγείας αναφορικά με τη χρήση του ΗΦΥ.

Υλικό και Μέθοδος: Πραγματοποιήθηκε ανασκόπηση των μελετών που έχουν δημοσιευθεί από το 2002 έως σήμερα στην ελληνική κι αγγλική γλώσσα, στις βάσεις δεδομένων: Cinahl Database | EBSCO, Google Scholar, Library and Information Science – Elsevier, PubMed, και Scopus. Η στρατηγική αναζήτησης της βιβλιογραφίας σε βάσεις δεδομένων στην αγγλική ή ελληνική γλώσσα περιλάμβανε τη χρήση των λέξεων κλειδιών ως εξής: (“electronic health record/ ηλεκτρονικός φάκελος υγείας” OR “EHR/ ΗΦΥ”) AND (“health professional/ επαγγελματίας υγείας” OR “opinion/ άποψη” OR “attitude/ στάση”). Κατά την ανασκόπηση χρησιμοποιήθηκαν ποικίλα επιμέρους κριτήρια επιλογής των μελετών.

Αποτελέσματα: Από σύνολο των δημοσιευμένων μελετών, 71 τηρούσαν τα κριτήρια ένταξης. Τα αποτελέσματα έδειξαν ότι διάφοροι παράγοντες διαμορφώνουν θετικές ή αρνητικές απόψεις και στάσεις στους επαγγελματίες υγείας σχετικά με τη χρήση του ΗΦΥ. Και στις δύο περιπτώσεις αυτοί ομαδοποιούνται σε διακριτούς θεματικούς άξονες ενώ σχετίζονται με την εργασία των επαγγελματιών υγείας, με τα δεδομένα και τις πληροφορίες υγείας και με τη φροντίδα των ασθενών.

Συμπεράσματα: Η επιτυχής εφαρμογή του ΗΦΥ ως τεχνολογικής καινοτομίας Ηλεκτρονικής Υγείας απαιτεί συντονισμένη δράση από τους σχεδιαστές πολιτικών υγείας. Σε κάθε περίπτωση κατά το σχεδιασμό και την υλοποίησή του συστήματος ΗΦΥ πρέπει να λαμβάνονται υπόψη οι απόψεις και στάσεις των επαγγελματιών υγείας.

Λέξεις Κλειδιά: Ηλεκτρονικός Φάκελος Υγείας, επαγγελματίας υγείας, άποψη, στάση.

Υπεύθυνος αλληλογραφίας: Περικλής Ρόμπολας, Γαργαλιάνων 22-24, 12131, Περιστέρι, E-mail: ps.rompolas@edu.cut.ac.cy

Opinions and attitudes of health professionals on the electronic health record: A literature review

Periklis Rompolas¹, Panicos Masouras², Sotiris Avgousti², Andreas Charalambous³

1. RN, BSc, MSc, MEd, PhD(c), Department of Nursing, Cyprus University of Technology
2. BSc, MSc, PhD, Assistant Professor, Department of Nursing, Cyprus University of Technology
3. BSc, MSc, PGCert, PhD, Professor, Department of Nursing, Cyprus University of Technology

ABSTRACT

Background: A variety of factors shape the positive views and attitudes of health professionals in relation to the Electronic Health Record (EHR) as an application of eHealth in health systems internationally.

Aim: The investigation of the factors that shape positive or negative views and attitudes in health professionals regarding the use of EHR.

Materials and Methodology: A systematic review of the literature was conducted from 2002 to 2020 in the Greek and English languages, in the databases: Cinahl Database | EBSCO, Google Scholar, Library and Information Science - Elsevier, PubMed and Scopus. The search strategy for bibliographic databases in English or Greek included the use of keywords such as: (“electronic health record” OR “EHR”) AND (“health professional” OR “Opinion” OR “attitude”). During the review, various sub-selection criteria of the studies were used.

Results: Out of a total of published studies, 71 met the inclusion criteria. The results showed that various factors form positive or negative views and attitudes in health professionals about the use of EHR. In both cases, they are grouped into distinct topics related to the work of health professionals, health data and information, and patient care.

Conclusions: The successful implementation of EHR as an eHealth technological innovation requires coordinated action by health policy makers. In any case, the design and implementation of the HER system must incorporate the opinions and perspectives of health professionals.

Keywords: Electronic Health Record, health professional, opinion, attitude.

Corresponding Author: Periklis Rompolas, Gargalianon 22-24, 12131, Peristeri, e-mail: ps.rompolas@edu.cut.ac.cy

INTRODUCTION

Human behavior is a function of behavioral tendencies, habits, mental stimuli and the conditions prevailing in the environment in which the individual acts.¹ Fishbein and Ajzen² define "Attitude" as "the general and permanent, favorable or unfavorable emotion, which refers to an object, event, or situation that precedes behavior and can change over time."

For their part, Thurstone and Chave⁴ approach "Viewpoint" as the verbal expression of attitude. Attitudes are influenced by the individual's previous experiences determining their behavior.⁵ According to Kim and Kim⁶ the acceptance of an innovation is determined by the attitude of individuals towards it and by the individual's willingness to adopt an innovation. new behavior. It is pointed out that one of the most important motivations for almost every person to adopt an innovation is the desire to gain social status.⁷ At the same time, the attitude of health professionals takes on a positive or negative character depending on the successful or unsuccessful

implementation of a technological system, a fact which is primarily expressed through its ease of use.⁸

The knowledge and interpretation of the attitudes of health professionals, regarding the use and acceptance of a technology such as the Electronic Health Record (EHR) are necessary conditions for evaluating the degree of fulfillment of its strategic goals.⁹ In particular, health professionals develop a system of beliefs, perceptions and attitudes, based on the combination of theory and practice that are interrelated situations in their sciences. The main factor in the formation of opinions and attitudes about issues of daily clinical practice are their experiences and experiences.¹⁰

AIM

The purpose of this literature review was to investigate the factors that shape positive or negative opinions and attitudes among health professionals regarding the use of EHR.

MATERIAL AND METHODOLOGY



A systematic review of the literature was conducted on the topic of health professionals' perspectives and attitudes regarding the use of EHR. The method used to search the scientific literature is crucial for producing an effective review.^{11,12} The international bibliographic databases investigated were: Cinahl Database | EBSCO, Google Scholar, Library and Information Science – Elsevier, PubMed and Scopus. The literature search strategy in English language databases included the use of keywords as follows: ((“electronic health record” OR “EHR”) AND (“health professional” OR “opinion” OR “attitude”)).

In order to complete the review, the following reading strategies were employed: overview, quick reading, exploratory reading, reading for study and critical reading.¹³ In addition, keywords in Greek or English were searched for in the title, abstract or the full text of the file retrieved during the search. A variety of individual selection criteria were used.^{12,14} The publication of the scientific material occurred between from 2002 to 2020. Publication in a scientific journal was another criterion for selection, as this ensures the content's validity and accuracy by virtue of the evaluation that precedes publication. Thus, articles on reviews and meta-analyses, as well as articles written in English and Greek, were included. No methodology restrictions were placed on the primary

research in this instance, and it could have been qualitative, quantitative, or mixed.

In addition, there was no restriction regarding the specialties of the health professionals who were the target population and research sample of the studies. In this sense, most of the studies involved physicians or nurses, with fewer involving other health professionals. Health care professionals either worked in private practice or in primary, secondary, and tertiary health care structures. On the other side, articles that addressing the opinion of citizens or administrative health care providers on EHR, as well as data mining and methods for evaluating their design or implementation, were excluded. Research articles of low quality in terms of research methodology and validity as well as articles that were under publication were excluded. In addition, student studies prepared in the context of the completion of their studies and conference papers without a referee system were excluded. Although these studies were published, neither the objectivity of their findings nor their significant impact on the scientific community were documented.

RESULTS

According to Galanis¹² the systematic review of the literature is illustrated in distinct steps. Thus, during the review, 714 files were identified, from which 437 were removed as duplicates and thus 437 were checked. From

these, for reasons mentioned above, 256 files were excluded, and 181 articles were deemed eligible. Then, for the reasons mentioned above, 110 full-text articles were excluded, and finally 71 articles were chosen.

The participants in the studies selected for the theoretical background of the present study were mostly doctors, followed by nurses and then other health professionals such as midwives or physiotherapists. The specific studies retrieved followed either quantitative methodology (n=28), qualitative methodology (n=27) or mixed methodology (n=12), while some reviews or meta-analyses (n=15) were also identified. The literature review highlighted the existence of various factors that influence the formation of positive or negative opinions and attitudes of health professionals regarding the use of EHR.

Factors that shape positive opinions and attitudes

The literature review led to the identification of various factors that shape positive views and attitudes of health professionals in relation to EHR. These factors are grouped into distinct thematic axes as they relate to the work of health professionals, to health data and information, and to patient care.

In particular, in a study by Nguyen et al.¹⁴ regarding the positive effects of the implementation of the EHR, the clinicians consider the functions of the EHR useful for

improving their efficiency, considering that they gain in relation to their performance (flow and workload). The results also agree with those of Howard et al.'s research¹⁵, while in the same research it is found that the adoption of EHRs improves the availability and accessibility of medical records, while handwritten health files are not necessary. The last point is also confirmed by other relevant studies.¹⁶⁻¹⁸ The adoption of EHR also seems not to change the time devoted by physicians to each patient according to Lo et al.¹⁹ while Banner and Olney²⁰ refer to the reduction of nurses' administrative duties in their work.

Chao et al.²¹ in their research reported as a positive element the improved efficiency of health professionals through the quick retrieval of information, a fact that is also supported by other research.²⁶⁻²⁹ Noblin et al.²⁴ particularly, emphasize the value of using models, a fact that other studies confirm.^{27,30}

In addition, according to a study by Tubaishat³¹, nurses have positive perceptions of EHRs in terms of perceived use, system quality, and satisfaction. The reported results also agree with those of the recent research by Tsai et al.³²

Chao et al.²¹ report that physicians perceive their interdisciplinary communication as improved after EHR implementation through increased access to patient information, a finding that is also confirmed in other



studies.^{15,16,27,33-36} The research of El-Kareh et al.³³ in a sample of physicians adds that improved communication seems to increase over time after the implementation of EHR, while Howard et al.¹⁵ and other researchers^{24,35} indicate that communication within the health care team improves overall. Also in other research results^{25,37} the communication that develops within a health care organization facilitates the development of channels between health professionals.

In addition, Kosmman's study²³ mentions the improved organization of work after the implementation of the NHS, with the possibility of a more equitable distribution of nurses' tasks based on the results of another related study.²² In this context, Alshime et al.³⁸ point out the development of better medical care plans by health professionals, without unnecessary forms, a fact that agrees with the results of other related researches.^{25,34,35} Also, in a research by Auefuea et al.³⁹ the majority of nurses perceive that EHR supports them in the best planning of their work.

According to some researches^{25,34} the implementation of EHR as perceived by health professionals supports better disease management and the improvement of the quality of care provided. This fact based on research data^{15,21,40} is reinforced by the extraction and monitoring of clinical quality

indicators and their identification with national planning strategies.

In addition, in other studies^{16,28} physicians report positive results of EHRs in terms of providing access to updated knowledge, while according to Kuo et al.⁴¹ informed decision-making can be supported. Of course, over time, in several studies, health professionals point out as an important benefit the improved access to information and patient records through the implementation of the EHR.^{14,24,46,47,27,35,36,38,42-45} In particular other related studies^{22,23} state that nurses believe that increased and valid access to information increases their work performance in hospital settings, which is confirmed in studies concerning primary care structures^{15,28,39} but also in places of care for the elderly.^{21,25} However, if the access of health professionals is remote, beyond the clinical area, the use of EHR is a perceived advantage^{36,48} although contrary opinions are also found in relative research.^{37,49,50}

Several studies^{14,34,39,43,51} support the perceived accuracy of the data after the implementation of EHRs. This formation of positive perceptions according to Nguyen et al.¹⁴ is related to the perceived improved quality of documentation on guidelines, a fact that is also confirmed by other researchers.^{25,52,53} Of course, opposing attitudes of professionals are also expressed regarding them.^{14,38,52} In addition, health

professionals in qualitative research^{21,42,51} point out the value of systematic storage of data and information with the creation of backup copies and the consequent reduced possibility of their loss.

Entzeridou et al.⁵⁴ point out that the adoption of EHR by health professionals is related to the improvement of the quality of care provided to patients, a fact that clearly emerges as a result in many studies.^{32,38,60-64, 42,46,53,55-59} Other researchers also refer in their studies^{14,16,48} that health professionals recognize improved patient safety due to the prevention of medication errors. In this regard, maintaining continuity of care based on common EHR standards is a perceived advantage for health professionals.^{4,23,38}

Better communication between patients and healthcare professionals is often cited as a perceived benefit after the implementation of EHRs.^{15,25,27,34,43,48,65} In addition, due to the implementation of EHRs a more cooperative relationship develops between patients and physicians, as they jointly access information and make decisions about their health issues.^{24,44} Finally, Entzeridou et al.⁵⁴ mention reduced costs as additional issues with an effect on the formation of positive opinions and attitudes among health professionals of care and Howley et al.⁶⁶ increased revenue and returns.

Factors that shape negative opinions and attitudes

The literature review also led to the identification of factors that shape negative views and attitudes of health professionals in relation to EHR. These factors are grouped as in the previous case in distinct thematic axes while they are related to the work of health professionals, to health data and information and to patient care. Thus, in contrast to research reports,^{22,23} nurses report that they spend more time using the EHR, while retrieving and locating the necessary information is difficult.⁶⁷ Research also records opinions and attitudes of health professionals towards the EHR, since it is considered that its use has a negative impact on their efficiency^{24,27,37} in relation to the perceived decrease in the efficiency of health professionals due to EHR.^{68,69}

Healthcare professionals have expressed concerns and frustration about the slowness of the systems^{38,70,71} and the time-consuming nature of clinical documentation.^{14,15,49,72-77,17,20,21,27,34,36,37,47} At the same time, the lack of usability leads to a perceived reduced performance of health professionals,^{15,17,21,37} while the lack of standards, as well have a negative impact on the attitudes and opinions of health professionals. software of the applied EHR.^{32,68}

Nevertheless, the reduced frequency of direct communication between health professionals



can also be recognized as an expressed negative parameter by health professionals,^{14,27} whereas Asan et al.⁷⁸ emphasize the perceived lack of teamwork support. Moreover, the poor integration of workflows with the participation of various health professionals and the poor interface with other health care organizations contribute to an increase in workload.^{15,17,18} The need for multiple documentation in different systems and double-checking for multiple sources of information also have a negative impact.^{15,67,70,71}

In a related study by Arndt et al.⁷⁹ primary care physicians appear to spend more time interacting with the EHR during and after work hours. In this context, research has documented the negative effect of stress and burnout of physicians in relation to the use of the EHR,^{76,80,81} while the same seems to be true for nurses as well.^{77,80} Additionally health professionals also consider the education, training and learning related to EHR as an additional burden.^{24,34,54}

Besides these, the changing work flow has a negative effect on health professionals in relation to their attitude towards the EHR.^{34,38,48,54,58,67,82,83} In this context Assis-Hassid et al.⁸⁴ underline that possible failures in the design of the EHR create problems in its subsequent functionality as a result of a lack of standardized work flows.

On the other hand, the concerns of health professionals regarding the reduction of time spent with patients and the consequent absence of personalized care are recorded in research.^{22,23,27,34} Also Chao et al.²¹ and Noblin et al.²⁴ point out that reduced face-to-face contact makes direct communication between patients and physicians difficult because physicians are busy entering information into EHRs while losing eye contact with patients.

DISCUSSION

The purpose of the present systematic literature review was to investigate the factors that shape positive or negative opinions and attitudes of health professionals in relation to the use of EHR. After extensive literature review in international databases 71 relevant studies were identified.

The findings of these studies show that various factors are related to the formation of positive or negative opinions and attitudes of health professionals regarding the use of EHR. These factors are related either to the work of health professionals, or to data and information management, or to aspects of patient care.

Regarding the work of health professionals, the perceived performance, efficiency, productivity, communication and organization of work in combination with workload lead to the formation of positive or negative opinions and attitudes of health

professionals. Perceived diagnosis and disease management support, as well as clinical decision-making support, have a parallel effect. In relation to data and information, their perceived accessibility, availability, quality and accuracy in relation to their storage and retrieval, as well as the creation of backups, lead to the formation of positive or negative opinions and attitudes of health professionals.

Regarding patient care Increased quality of care, the presence of interdisciplinary communication, communication between health professionals and patients and support of care plans contribute to the formation of positive or negative opinions and attitudes among health professionals. This assertion is supported in combination with the speed and documentation of decision-making, the degree of development of quality indicators and use of standards, the prevention of errors and the perceived financial benefits.

A key finding of the studies is the necessity of monitoring all influencing factors throughout the spectrum of health service provision that have an impact on the successful implementation of EHR and its adoption by health professionals. Also important is the role of existing or non-existent education and training of health professionals and the degree of their support from the authorities in matters of Electronic Health and the use of EHR in particular.

It should also be pointed out that the study of the opinions and attitudes of health professionals should be done both during the design of the EHR system and during its implementation in order to plan and implement appropriate interventions by the policy makers of Electronic Health. Finally, in the studies carried out, the social and cultural context of the health systems in which the health professionals operate must be considered.

LIMITATIONS

The present literature review has some limitations that should be mentioned. First, although the literature review was extensive, it is likely that there are studies that have not been published in scientific journals, which introduces significant bias into the review. In addition, studies published only in Greek and English were reviewed, which means that there may be studies related to the specific topic published in other languages and not included. Furthermore, the degree of correlation with the cultural characteristics of the samples included in the individual studies was not studied.

CONCLUSIONS

The review of the literature led to various findings regarding the factors that shape positive or negative opinions and attitudes among health professionals regarding the use

of EPH. Although the formation of positive attitudes and attitudes outweighs over time some of the countervailing factors such as increased workload and dysfunctional work flows, they seem to have a stability in their negative effect.

Health systems, through eHealth policy designers, must consider the EHR implementation framework as reflected by the formed opinions and attitudes of health professionals as users. This fact will be a critical parameter for the successful implementation of EHR's technological innovation, that will effectively meet the citizen's needs for quality.

REFERENCES

1. Triandis HC. Values, attitudes, and interpersonal behavior. Nebraska: University of Nebraska Press; 1980.
2. Fishbein M, Ajzen I. Belief, attitude, intention and behavior: An introduction to theory and research. MA: Addison-Wesley, Reading; 1975.
3. Thurstone L, Chave E. The Measurement of Attitude: A psychophysical Method and Some Experiments with a Scale for Measuring Attitude toward the Church. In: Further Studies of Validity. Chicago: University of Chicago; 1932. p. 83–9.
4. Kiesler C, Collins B, Miller N. Attitude change: a critical analysis of theoretical approaches. New York: Wiley; 1969.
5. Kim I, Kim MI. The effects of individual and nursing-unit characteristics on willingness to adopt an innovation. *Comput Nurs.* 1996;13(1):183–7.
6. Rogers EM. Diffusion of Innovations. New York: Free Press: Free Press; 1983.
7. Perreault LE, Wiederhold G. Medical informatics: Computer applications in health care. In: System design and evaluation. MA: Addison-Wesley Publishing Company; 1990. p. 151–78.
8. Sultana N. Nurses' attitudes towards computerization in clinical practice. *J Adv Nurs.* 1990;15(1):696–702.
9. Mezirow J. Η Μετασχηματίζουσα Μάθηση. Αθήνα: Μεταίχμιο; 2007.
10. Galanis P. Basic principles of literature searching in PubMed. *Hellenic Journal of Nursing.* 2013;52(1):25–34.
11. Galanis P. Looking for scientific evidences on the Internet. *Hell J Nurs* [Internet]. 2013;52(1):13–24. Available from: <http://hdl.handle.net/11400/5735>
12. Galanis P. Systematic review and meta-analysis. *Archives of Hellenic Medicine.* 2009;26(6):826–41.
13. Patelarou E, Brokalaki H. The methodology of the systematic review and meta-analysis. *Nosileftiki.* 2010;49(2):122–30.
14. Nguyen L, Bellucci E, Nguyen LT. Electronic health records implementation: An evaluation of information system impact and

- contingency factors. *Int J Med Inf.* 2014;83(11):779–96.
15. Howard J, Clark EC, Friedman A, Crosson JC, Pellerano M, Crabtree BF, et al. Electronic health record impact on work burden in small, unaffiliated, community-based primary care practices. *J Gen Intern Med.* 2013 Jan;28(1):107–13.
16. Jha AK, Bates DW, Jenter C, Orav EJ, Zheng J, Cleary P, et al. Electronic health records: Use, barriers and satisfaction among physicians who care for black and Hispanic patients. *J Eval Clin Pract.* 2009;15(1):158–63.
17. McAlearney AS, Robbins J, Hirsch A, Jorina M, Harrop JP. Perceived efficiency impacts following electronic health record implementation: An exploratory study of an urban community health center network. *Int J Med Inform [Internet].* 2010;79(12):807–16. Available from: <http://dx.doi.org/10.1016/j.ijmedinf.2010.09.002>
18. Waterson P, Glenn Y, Eason K. Preparing the ground for the “paperless hospital”: A case study of medical records management in a UK outpatient services department. *Int J Med Inform [Internet].* 2012;81(2):114–29. Available from: <http://dx.doi.org/10.1016/j.ijmedinf.2011.10.011>
19. Lo HG, Newmark LP, Yoon C, Volk LA, Carlson VL, Kittler AF, et al. Electronic Health Records in Specialty Care: A Time-Motion Study. *J Am Med Informatics Assoc.* 2007;14(5):609–15.
20. Banner L, Olney C. Automated clinical documentation: does it allow nurses more time for patient care? *Comput informatics, Nurs.* 2009;27(2):75–81.
21. Chao WC, Hu H, Ung COL, Cai Y. Benefits and challenges of electronic health record system on stakeholders: A qualitative study of outpatient physicians. *J Med Syst.* 2013;37(4).
22. Kossman SP, Sceidenbelm SL. Nurses’ perceptions of the impact of electronic health records on work and patient outcomes. *CIN - Comput Informatics Nurs.* 2008;26(2):69–77.
23. Kossman SP. Perceptions of impact of electronic health records on nurses’ work. *Stud Heal Technol Inf.* 2006;122:337–41.
24. Noblin A, Cortelyou-Ward K, Cantiello J, Breyer T, Oliveira L, Dangiolo M, et al. EHR implementation in a new clinic: A case study of clinician perceptions. *J Med Syst.* 2013;37(4).
25. Zhang Y, Yu P, Shen J. The benefits of introducing electronic health records in residential aged care facilities: A multiple case study. *Int J Med Inform [Internet].* 2012;81(10):690–704. Available from: <http://dx.doi.org/10.1016/j.ijmedinf.2012.05.013>
26. Poissant L, Pefreira J, Ntamblyn R, Kawasumy Y. The Impact of Electronic Health Records on Time Efficiency of Physicians and



- Nurses: A Systematic Review. *J Am Med Inf Assoc.* 2005;12(5):505–16.
27. Grabenbauer L, Skinner A, Windle J. Electronic Health Record Adoption - Maybe it's not about the Money. *Appl Clin Inform.* 2011;2:460–71.
28. Secginli S, Erdogan S, Monsen KA. Attitudes of health professionals towards electronic health records in primary health care settings: A questionnaire survey. *Informatics Heal Soc Care.* 2014 Jan;39(1):15–32.
29. Chao C. The impact of electronic health records on collaborative work routines: a narrative network analysis. *Int J Med Inform.* 2016;94:100–11.
30. Yau GL, Williams AS, Brown BJ. Family physicians' perspectives on personal health records: qualitative study. *Can Fam Physician.* 2011;57(5):178–84.
31. Tubaishat A. Evaluation of electronic health record implementation in hospitals. *CIN - Comput Informatics Nurs.* 2017;35(7):364–72.
32. Tsai CH, Eghdam A, Davoody N, Wright G, Flowerday S, Koch S. Effects of electronic health record implementation and barriers to adoption and use: A scoping review and qualitative analysis of the content. *Life.* 2020 Dec 1;10(12):1–27.
33. El-Kareh R, Gandhi TK, Poon EG, Newmark LP, Ungar J, Lipsitz S, et al. Trends in primary care clinician perceptions of a new electronic health record. *J Gen Intern Med.* 2009;24(4):464–8.
34. Goldberg DG, Kuzel AJ, Feng LB, DeShazo JP, Love LE. EHRs in primary care practices: Benefits, challenges, and successful strategies. *Am J Manag Care.* 2012;18(2):48–54.
35. O'Malley AS, Draper K, Gourevitch R, Cross DA, Scholle SH. Electronic health records and support for primary care teamwork. *J Am Med Informatics Assoc.* 2015 Mar 1;22(2):426–34.
36. Pizziferri L, Kittler AF, Volk LA, Honour MM, Gupta S, Wang S, et al. Primary care physician time utilization before and after implementation of an electronic health record: A time-motion study. *J Biomed Inform.* 2005;38(3):176–88.
37. Sockolow PS, Bowles KH, Lehmann HP, Abbott PA, Weiner JP. Community-based, interdisciplinary geriatric care team satisfaction with an electronic health record: A multimethod study. *CIN - Comput Informatics Nurs.* 2012;30(6):300–11.
38. Alsohime F, Temsah M, Al-Eadhy A, Bashiri S, Househ M, Jamal A. Satisfaction and perceived usefulness with newly-implemented electronic health record system among pediatricians at a university hospital. *Comput Methods Programs Biomed.* 2019;169:51–7.
39. Auefuea S, Nartthanarung A, Pronsawatchai P, Soontornpipit P. The

Perspective of Users after the Trial of the Electronic Record System in Home Health Care Unit. In: Proceedings of the 2018 International Electrical Engineering Congress (iEECON). Krabi: iEECON; 2018. p. 1-4.

40. Burton D, Bartlett S. Key Issues for Education Researchers. London: Sage Publications; 2009.

41. Kuo AMS, Thavalathil B, Elwyn G, Nemeth Z, Dang S. The Promise of Electronic Health Records to Promote Shared Decision Making: A Narrative Review and a Look Ahead. *Med Decis Mak.* 2018;38(8):1040-5.

42. Baudendistel I, Winkler EC, Kamradt M, Brophy S, Längst G, Eckrich F, et al. Cross-sectoral cancer care: views from patients and health care professionals regarding a personal electronic health record. *Eur J Cancer Care (Engl).* 2017;26(2):1-11.

43. Bobadilla J. RC. EP. LJ. SC. Leveraging electronic health record implementation to facilitate clinical and operational quality in an ambulatory surgical clinic. *J Ambul care Manag.* 2017;40(1):9-16.

44. Doyle RJ, Wang N, Anthony D, Borkan J, Shield RR, Goldman RE. Computers in the examination room and the electronic health record: Physicians' perceived impact on clinical encounters before and after full installation and implementation. *Fam Pract.* 2012;29(5):601-8.

45. Meyerhoefer CD, Sherer SA, Deily ME, Chou SY, Guo X, Chen J, et al. Provider and

patient satisfaction with the integration of ambulatory and hospital EHR systems. *J Am Med Informatics Assoc.* 2018 Aug 1;25(8):1054-63.

46. Raglan G, Margolis B, Paulus R, Schulkin J. Electronic Health Record adoption among obstetrician/ gynecologists in the United States: Physician practices and satisfaction. *J Healthc Qual.* 2017;39(3):144-52.

47. Walker J, Leveille S, Bell S, Chimowitz H, Dong Z, Elmore JG, et al. Erratum: Correction: OpenNotes After 7 Years: Patient Experiences With Ongoing Access to Their Clinicians' Outpatient Visit Notes (Journal of medical Internet research (2019) 21 5 (e13876)). Vol. 22, *Journal of medical Internet research.* NLM (Medline); 2020. p. e18639.

48. King J, Patel V, Jamoom EW, Furukawa MF. Clinical benefits of electronic health record use: National findings. *Health Serv Res.* 2014;49(1 PART 2):392-404.

49. Holanda AA, do Carmo e Sa HL, Gomes Fernandes Vieira AP, Fontenelle Catrib AM. Use and Satisfaction with Electronic Health Record by Primary Care Physicians in a Health District in Brazil. *J Mes Syst.* 2012;36:3141-9.

50. Krousel-Wood M, McCoy AB, Ahia C, Holt EW, Trapani DN, Luo Q, et al. Implementing electronic health records (EHRs): Health care provider perceptions before and after transition from a local basic EHR to a commercial comprehensive EHR. *J*



- Am Med Informatics Assoc. 2018 Jun 1;25(6):618–26.
51. Tubaishat A. The effect of electronic health records on patient safety: a qualitative exploratory studies . Informatics Heal Soc care. 2019;44(1):79–91.
52. Sockolow PS, Bowles KH, Adelsberger MC, Chittams JL, Liao C. Impact of homecare electronic health record on timeliness of clinical documentation, reimbursement, and patient outcomes. Appl Clin Inform. 2014;5(2):445–62.
53. Yontz LS, Zinn JL, Schumacher EJ. Perioperative Nurses' Attitudes Toward the Electronic Health Record. J Perianesthesia Nurs. 2015 Feb 1;30(1):23–32.
54. Entzeridou E, Markopoulou E, Mollaki V. Public and physician's expectations and ethical concerns about electronic health record: Benefits outweigh risks except for information security. Int J Med Inf. 2018;110:98–107.
55. Al-Rawajfah O, Tubaishat A. Barriers and facilitators to using electronic healthcare records in Jordanian hospitals from the nurses' perspective: A national survey. Informatics Heal Soc care. 2019;44(4):1–11.
56. Bush RA, Connelly CD, Pérez A, Chan N, Kuelbs C, Chiang GJ. Physician perception of the role of the patient portal in pediatric health. J Ambul Care Manage. 2017;40(3):238–45.
57. Creber RMM, Grossman L V., Ryan B, Qian M, Polubriaginof FCG, Restaino S, et al. Engaging hospitalized patients with personalized health information: a randomized trial of an inpatient portal. J Am Med Informatics Assoc. 2019 Feb 1;26(2):115–23.
58. Denton CA, Soni HC, Kannampallil TG, Serrichio A, Shapiro JS, Traub SJ, et al. Emergency Physicians' Perceived Influence of EHR Use on Clinical Workflow and Performance Metrics. Appl Clin Inform. 2018 Jul 12;9(3):725–33.
59. Dobrow MJ, Bytautas JP, Tharmalingam S, Hagens S. Interoperable Electronic Health Records and Health Information Exchanges: Systematic Review. JMIR Med Informatics. 2019 Jun 6;7(2):e12607.
60. Eberts M, Capurro D. Patient and Physician Perceptions of the Impact of Electronic Health Records on the Patient-Physician Relationship. Appl Clin Inform. 2019;1(4):729–34.
61. Hamamura FD, Withy K, Hughes K. Identifying Barriers in the Use of Electronic Health Records in Hawai'i. Vol. 76. 2017.
62. Khan UR, Zia TA, Pearce C, Perera K. Perceptions and Experiences of General Practice Users about My Health Record. In: Siuly S, editor. Health Information Science. Cham, Switzerland: Springer; 2018. p. 3–16.
63. Ochoa A, Kitayama K, Uijtdehaage S, Vermillion M, Eaton M, Carpio F, et al. Patient

- and provider perspectives on the potential value and use of a bilingual online patient portal in a Spanish-speaking safety-net population. *J Am Med Informatics Assoc.* 2017 Nov 1;24(6):1160–4.
64. Yeung T. Local health department adoption of electronic health records and health information exchanges and its impact on population health. *Int J Med Inf* . 2019;128:1–6.
65. Archer N, Cocosila M. A Comparison of Physician Pre-Adoption and Adoption Views on Electronic Health Records in Canadian Medical Practices. *J Med Internet Res* 2011;13(3)e57
<https://www.jmir.org/2011/3/e57> [Internet]. 2011 Aug 12 [cited 2021 Nov 11];13(3):e1726. Available from: <https://www.jmir.org/2011/3/e57>
66. Howley MJ, Chou EY, Hansen N, Dalrymple PW. The long-term financial impact of electronic health record implementation. *J Am Med Informatics Assoc.* 2015;22(2):443–52.
67. Blijleven V, Koelemeijer K, Jaspers M. Identifying and eliminating inefficiencies in information system usage: a lean perspective. *Int J Med Inf.* 2017;107:40–7.
68. Kaipio J, Kuusisto A, Hyppönen H, Heponiemi T, Lääveri T. Physicians' and nurses' experiences on EHR usability: Comparison between the professional groups by employment sector and system brand. *Int J Med Inform.* 2020 Feb 1;134.
69. McDowell J, Wu A, Ehrenfeld JM, Urman RD. Effect of the Implementation of a New Electronic Health Record System on Surgical Case Turnover Time. *J Med Syst.* 2017;41(3):42–5.
70. Dudding KM, Gephart SM, Carrington JM. Neonatal Nurses Experience Unintended Consequences and Risks to Patient Safety with Electronic Health Records. *Comput informational Nurs.* 2018;36(4):167–76.
71. Strudwick G, McGillis Hall L, Nagle L, Trbovich P. Acute care nurses' perceptions of electronic health record use: A mixed method study. *Nurs Open.* 2018 Oct 1;5(4):491–500.
72. Bani-Issa W, Al Yateem N, Al Makhzoomy IK, Ibrahim A. Satisfaction of health-care providers with electronic health records and perceived barriers to its implementation in the United Arab Emirates. *Int J Nurs Pract.* 2016;22(4):408–16.
73. Baumann LA, Baker J, Elshaug AG. The impact of electronic health record systems on clinical documentation times: A systematic review. *Health Policy (New York).* 2018;122(8):827–36.
74. Bloom M V., Huntington MK. Faculty, resident, and clinic staff's evaluation of the effects of EHR implementation. *Fam Med.* 2010;42:562–6.
75. Doberne JW, Redd T, Lattin D, Yackel TR, Eriksson CO, Mohan V, et al. Perspectives



and uses of the electronic health record among US pediatricians: A national survey. *J Ambul Care Manage.* 2017;40(1):59–68.

76. Gardner RL, Cooper E, Haskell J, Harris DA, Poplau S, Kroth PJ, et al. Physician stress and burnout: the impact of health information technology. *J Am Med Informatics Assoc.* 2019 Feb 1;26(2):106–14.

77. Harris DA, Haskell J, Cooper E, Crouse N, Gardner R. Estimating the association between burnout and electronic health record-related stress among advanced practice registered nurses. *Appl Nurs Res.* 2018;43:36–41.

78. Asan O, Nattinger AB, Gurses AP, Tyszka JT, Yen TWF. Oncologists' Views Regarding the Role of Electronic Health Records in Care Coordination. *JCO Clin Cancer Informatics.* 2018;(2):1–12.

79. Arndt BG, Beasley JW, Watkinson MD, Temte JL, Tuan WJ, Sinsky CA, et al. Tethered to the EHR: Primary care physician workload assessment using EHR event log data and time-motion observations. *Ann Fam Med.* 2017;15(5):419–26.

80. Gregory ME, Russo E, Singh H. Electronic health record alert-related workload as a predictor of burnout in primary care providers. *Appl Clin Inform.* 2017;8(3):686–97.

81. Robertson SL, Robinson MD, Reid A. Electronic Health Record Effects on Work-Life

Balance and Burnout Within the I3 Population Collaborative. *J Grad Med Educ.* 2017 Aug 1;9(4):479–84.

82. Despins LA, Wakefield BJ. The Role of the Electronic Medical Record in the Intensive Care Unit Nurse's Detection of Patient Deterioration: A Qualitative Study. *Comput Informatic, Nurs.* 2018;36(6):284–92.

83. Graham T, Ballermann M, Lang E, Bullard M, Parsons D, Mercur G. Emergency physician use of the Alberta Netcare Portal, a province wide interoperable health record: multimethod observational study. *JMIR Med Inf.* 2018;6(3).

84. Assis-Hassid S, Grosz BJ, Zimlichman E, Rozenblum R, Bates DW. Assessing EHR use during hospital morning rounds: A multifaceted study. *PLoS One.* 2019;14(2):1–15.