

THE EFFECTIVENESS OF SCENARIO-BASED TRAINING OF CLINICIANS IN THE USE OF ELECTRONIC HEALTH RECORDS – A SYSTEMATIC REVIEW

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ABSTRACT

The digitalisation of healthcare represents another change challenge for clinicians, and the most prominent of these is the Electronic Health Record (EHR). Adopting the EHR, including the training of clinicians of all disciplines, often does not occur effectively, which increases the risk of adverse events and the reduction in the quality and safety of clinical care. The competent use of the EHR requires clinician user training. One form of training is scenario-based. The questions asked of the literature in this SLR are what evidence exists as to the effectiveness of using scenarios to train clinicians in using the EHR, and is there a research gap in this evidence to inform future research?

To undertake this systematic review of the literature, the researchers implemented the PRISMA Method. Only highly ranked, health-related academic databases accessed through an electronic library catalogue were used to search for relevant peer-reviewed/refereed articles. The decision to apply the PRISMA method was based on the PRISMA statement, which safeguards comprehensive reporting and transparency to ensure inferred recommendations and interventions are based on the best available evidence.

6,898 records were returned from Boolean searches for articles published between November 2018 to November 2021. Five articles were included for greater analysis following exclusions by title review, abstract review, and quality assessment. Quality assessment of articles reporting empirical studies relating to the effectiveness of using scenarios in this type of training was performed using the standard quality assessment scoresheet by Kmet [48].

Three themes emerged from the literature. The centrality of workflow, clinician engagement are key, and scenario-based training is one of many training strategies implemented.

The authors found that further rigorous research studies are required to enhance the evidence body for the continued usage of scenario-based training of clinicians to effectively use the EHR, particularly as the digital landscape within health continues to evolve. Moreover, the authors posit that further research on scenario-based EHR training of clinicians should include:

1. Scenario-based training is just one part of a broader and blended EHR training suite.
2. Ensuring future studies encompass a diversity of all fields of clinical roles within the research and,
3. Include standardised terminology naming for clinicians' scenario-based EHR training within the studies.

KEYWORDS

Electronic Health Record, Electronic Medical Record, scenario based training, usability training.

INTRODUCTION

The digitalisation of healthcare is another change for clinicians [1] in a constantly changing clinical environment. One of the most significant changes in the digital health environment is the electronic health record (EHR), which improves documentation, clinical risk management, and prevention of errors [1]. This systematic literature review (SLR) establishes an evidence-base for scenario-based training of clinicians in the use of the EHR. The rationale for this project was to determine what empirical evidence is available to underpin the use of scenario-based training and if a research gap exists relating to the effectiveness of scenario-based training of clinicians in their adoption of the EHR.

The adequacy and appropriateness of clinical documentation are important considerations with patient complexity surging [2], clinical staff workloads increasing [3] and the ever-present need to document the quality and safety of clinical interventions and interactions increases. Also, budgetary pressures are ever-present and growing [4].

There are challenges to adopting Electronic Health Records (EHRs) for health professionals working clinically if EHR implementation does not occur effectively. An ineffective implementation may increase the risk of adverse events and a concomitant reduction in the quality and safety of patient care [5]. Implementing an EHR within a healthcare organisation requires extensive planning and preparation to avoid significant patient safety and efficiency implications, thus highlighting the need for effective training of clinicians in the use of the EHR utilising best-practice methods [1].

One method implemented for training in using and applying EHR systems is scenario-based training. This method is traditionally incorporated as a key training tool for clinicians to learn new skills within healthcare and utilises real-life situations related to the clinical workflow for staff to increase their level of competency within a training environment [6].

BACKGROUND

The contemporary EHR is advancing rapidly in modern healthcare's socio-technical environment. The quality and safety of future healthcare look more certain as digital

integration between various systems, and medical devices evolve, as clinical decision support systems CDSS assist further and as the design and usability of EHR platforms improve [7-9]. Further technological development of the EHR with the added application of deep learning and artificial intelligence involvement embedded within the EHR will further help diagnose and manage disease [10-12]. The likelihood of the future EHR assisting the physician as a trusted clinical tool and guide is now more a reality than a concept [7, 12].

TRADITIONAL APPROACHES TO EHR TRAINING FOR CLINICIANS

Current models of EHR clinician training consist of initial user training covering EHR terminology, features and functionality taught by trainers within the classroom setting [13]. Fourteen years ago, Rockswold and Finnel found that this classroom-based training style was an insufficient training method [19]. These researchers found that 43% of participants experienced the training as inadequate, with 95% of participants reporting the training could be improved [19]. This traditional style of EHR training focuses primarily on basic EHR use and not on individual clinician workflows [13, 14]. Scenario-based EHR training could offer clinicians EHR workflow proficiency, tailoring EHR training to the clinician's unique workflow and information needs [13, 14].

THE RESEARCH QUESTION

The research question posed in this systematic review of the literature was:

What evidence supports the effectiveness of clinician scenario-based training as a training method in the competent use of electronic health records?

Findings from this SLR will help establish the evidence-base for using training strategies for clinicians as part of a broader training program and identify any research gap that exists. This research will help guide the necessity of future digital training programs in healthcare within Australia and globally.

LITERATURE REVIEW

THE CHALLENGES ASSOCIATED WITH PAPER BASED RECORDS

Healthcare documentation within paper-based medical records has historically borne witness to the usage of inadequate documentation practices causing misinterpretation and have led to errors, adverse events,

and litigation [1, 7]. The literature reports poor documentation practices within paper-based health record systems. This includes the use of inconsistent and inappropriate terminologies and abbreviations and illegible writing of care plans by the broad health profession disciplines document in the health record [8]. Additionally, incomplete, and repetitive clinical documentation is more likely to have medico-legal implications [7, 9]. The evidence suggests that there is significant time spent retrieving and looking for medical records, and when these are retrieved the paper base of these records cause an inability of multiple clinicians to view a clinical record simultaneously and in real-time [1, 10]. Moreover, data extracted from paper-based medical records provides challenges for researchers and clinical coders due to the labour-intensive nature of searching for the relevant information from volumes of medical records [7, 9, 10]. To further confound efficient and effective clinical practice and research activities, data extraction is challenging because of the lack of standardised documentation and non-coded jargon observed within paper-based medical records [9].

THE BENEFITS OF ELECTRONIC HEALTH RECORDS (EHRS)

The use of the EHR has improved health care quality and aims to reduce the known issues with paper-based records [15]. There is increasing use of the data available from EHRs through concept extraction and standardised coding systems within clinical research, quality and safety measurements, capturing of occasions of service for funding purposes, and aiding CDSS [15]. There is significant evidence available to link the use of the EHR with improved patient outcomes such as:

1. Improved quality of care and lower mortality rates [16, 17].
2. EHR contributes toward stricter adherence to clinical practice guidelines [18].
3. Better standardisation of practice [19].
4. Superior medication safety through advanced monitoring of drug therapies [20].
5. A reduction in clinical errors [5].
6. Contributes to improved legibility of clinical documentation with easier interpretation and more proficient clinician workflow planning [5, 14].

Compared to paper-based health records, a major advantage of EHRs is the ease of retrieval and presentation of accessible data [21, 22]. Other reported benefits claim

that clinical staff are more capable of patient prioritisation after EHR implementation, managing their time, and achieving greater service activity [23]. Communication within healthcare, particularly non-information technology (IT) related communication, has improved due to EHR usage [24]. The EHR may decrease costs for healthcare organisations [14]. Sharing health information has improved healthcare expenditure when health data is shared from the EHR with health information exchanges (HIE) throughout health services, communities, and regions, thus improving access to patient health information and lowering provider costs [14, 25]. The use of the EHR presents several challenges and issues for clinicians and service providers to overcome. Calder-Sprackman and colleagues found that implementing a new EHR affected emergency physician task allocation and efficiency [26]. Understanding how an EHR will impact workflow changes is essential to developing strategies that will uphold the quality of patient care [26].

Intensive care physicians report that their workflow in the intensive care unit became less efficient after using EHRs [27]. These researchers also reported that EHR navigation patterns amongst clinicians were highly variable and recommended a user-centred, task-based, case-scenario training framework as a suggested form of initial digital EHR training. It is apparent from the literature that organisations implementing an EHR must implement strategies to manage and mitigate these negative outcomes with insightful and clinician centric approaches.

There is an association between the type and quality of EHR training and user attitude [28]. Longhurst and colleagues described EHR training as directly correlating with EHR user satisfaction. An effective EHR training approach should focus beyond the initial beginner training and on user training and competency over time [32]. Kuek and Hakkennes assessed digital literacy levels and attitudes towards information systems amongst clinical staff before EHR implementation and found that 20% of staff reported anxiety using information systems [29]. These findings highlight the need to ensure effective staff engagement with targeted training to improve staff's digital literacy levels and confidence using the EHR [29]. This will lead to improvements in the quality of patient care and the preparedness of staff to use the EHR.

The utilisation of a case scenario training method of using virtual patients within a simulated electronic health record environment has some positive benefits regarding reducing

medication errors and improving clinicians' attitudes and perceptions of their readiness to use electronic health records for real-world healthcare [30, 31]. Integrating simulated electronic health records into a digital training program can address clinician documentation deficiencies, inefficiencies, and time-consuming clinician chart reviews, thus giving clinicians more one-to-one time for patient-oriented clinical work [30].

The deployment of scenario-based training, hypotheticals or simulation-based training within user training has seen improvements to patient safety [6]. Using a scenario-based training approach has served effectively within critical care, particularly latent threat identification training for critical, low frequency events, invasive procedural training, and training aimed at improving teamwork. Less evidence exists regarding the effectiveness of scenario-based training utilisation for implementing new technologies within the healthcare setting [6]. Forthcoming studies should evaluate interactive, scenario-based digital forms of training and report on outcomes related to costs, patient outcomes and clinician skills and behaviour [32].

CHALLENGES OF EHR IMPLEMENTATION

Despite the proposed benefits of EHR implementation, the transformation to digital healthcare could be cumbersome due to some required changes needed to models of care, service design, and notable changes to clinicians' workflows in how they carry out their job [1]. There is evidence of a relationship between EHR usage with clinician inefficiency and fatigue [33, 34]. As an example of this inefficiency, clinicians report spending a significant share of their time at work interacting with the EHR from perusing increasing amounts of patient-related data and from the substantial burden caused by the amount of documentation required. This demand has led many clinicians to work extra hours with the EHR outside of work periods, increasing the likelihood of clinician burnout [13]. Melnick and colleagues found a strong relationship between EHR usability and the risk of burnout amongst physicians, stating that the current EHR technology usability level is significantly lower than other technologies [35]. Clinician burnout can be directly associated with self-reported medical errors linked to poor EHR usability [13, 35, 36]. A focus on usability issues in training would be a beneficial approach to help reduce clinician burnout [33, 35]. Scenario-based approaches with patient simulation to better prepare clinicians to navigate and use the EHR more efficiently would benefit [37, 38].

Specifically relating to clinician usage of an EHR, incorporation of a computer within most patient encounters are required to ensure timely capture of that data [39]. In conjunction with the heightened privacy, confidentiality and security risks associated with having the live EHR on a computer within the patients' area, the computer itself within these patient encounters negatively impacts the clinicians' ability to build therapeutic relationships with patients, and the utilisation of scenario-based training has better prepared clinicians for computer-patient encounters [39].

Unsafe EHR clinician practices involving unfinalised notes and orders, pre-population and CDSS alert fatigue have led to safety errors [40]. Graber and colleagues found that safety errors related to EHR usage can be attributed to inadequate training [40]. The incorporation of education on safety issues and appropriate EHR digital use practices should feature in an effective training program [1, 40], and a blended scenario-based training approach has shown signs of reducing potential safety errors and improving clinician knowledge of possible risks in using an EHR [5, 41]. In preparation to manage the challenges mentioned above and issues related to EHR usability, potential interventions will need to focus on evidence-based training strategies to solve the problems associated with EHR training. This may include adjusting clinical workflows to function better with the EHR and improving the usability of the EHR through re-design in line with optimal workflows [1, 13, 28].

SCOPE

This systematic literature review sourced articles that were research reports, systematic literature reviews and meta-analyses that focussed on scenario-based training of clinicians. Articles were peer-reviewed and available online with full text, including an abstract. Articles were written in English and published between November 2018 and November 2022. This time interval chosen because of the rapid changes occurring in the digital health space meant that the most contemporary literature was reviewed systematically.

Inclusion and exclusion criteria incorporated within this SLR are set out in Table 3. For the reasons already outlined above. The Standard Quality Assessment Scoring Tool [46] was used to examine the quality of the remaining studies

further and each of the studies were assessed against the criteria-referenced statements in the tool. The quality of each of the studies included in the SLR were allocated a score out of a maximum of 100 and indicating the study's quality. In accordance with requirements set out by Kmet and colleagues [42], a score of more than 80% indicates a strong study, 70-80% indicates good quality, 50-69% is adequate, and less than 50% indicates the study was of poor quality. Any inconsistencies in scores between the reviewers were resolved via discussion until a consensus reached. The assessed quality of the included studies included in the review are presented in Table 3.

METHOD

To undertake this systematic review of the literature, the researchers implemented the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Method [43]. In accordance with this method, highly ranked, health-related academic databases accessed through the Griffith University electronic library catalogue were used to search for relevant peer-reviewed/refereed articles. Databases searched for article retrieval were Scopus, ProQuest, PubMed, and Web of Science. The decision to apply the PRISMA method was based on the PRISMA statement, which safeguards comprehensive reporting and transparency to ensure inferred recommendations

and interventions are based on the best available evidence [44].

This review employed five keyword search strings using Boolean operators and truncation symbols listed in table 3., to search the Griffith University electronic library catalogue. Preliminary screening of articles firstly examined the title and excluded articles with titles not matching the inclusion requirements. Abstract screening followed with an examination of the abstracts of each article to assess their relevance to the research question relating to scenario-based training and its effectiveness in the training of clinicians in the use of EHRs as reported in Table 4.

Before the inclusion in the SLR the Kmet quality assessment score was applied to each included paper [45]. The 10-item checklist for qualitative studies and the 14-item checklist for quantitative studies are presented in Tables 1 and 2. These checklists provided Standard Quality Assessment Scores (SQAS) for each included paper undergoing quality analysis in this review [45] and determined if a paper met the scoring threshold for inclusion. For inclusion eligibility within this SLR, each study needed to score a quantitative SQAS of greater than or equal to 21 or a qualitative SQAS greater than or equal to 17. Mixed method studies were assessed using quantitative or qualitative SQAS depending on the design of the mixed methods study.

TABLE 1 - STANDARD QUALITY ASSESSMENT SCORESHEET (SQAS) FOR QUALITATIVE STUDIES

Criteria		YES 2 points	PART 1 point	NO 0 points
1	Question/Objective sufficiently described?			
2	Study design evident and appropriate?			
3	Context for the study clear?			
4	Connection to a theoretical framework or wider body of knowledge?			
5	Sampling strategy described, relevant and justified?			
6	Data collection methods clearly described and systematic?			
7	Data analysis clearly described and systematic?			
8	Use of verification procedure(s) to establish credibility?			
9	Conclusions supported by the results?			
10	Reflexivity of the account?			

Kmet and Colleagues [45]

TABLE 2- STANDARD QUALITY ASSESSMENT SCORESHEET (SQAS)FOR QUANTITATIVE STUDIES

Criteria		YES 2 points	PART 1 point	NO 0 points
1	Question/Objective sufficiently described?			
2	Study design evident and appropriate?			
3	Method of subject/comparison group selection or source of information/input variables described and appropriate?			
4	Subject (and comparison group, if applicable) characteristics sufficiently described?			
5	If interventional and random allocation was possible, was it described?			
6	If interventional and blinding of investigators was possible, was it described?			
7	If interventional and blinding of subjects was possible, was it described?			
8	Outcome and (if applicable) exposure measures(s) well defined and robust to measurement/misclassification bias?			
9	Sample size appropriate?			
10	Analytic methods described/justified and appropriate?			
11	Some estimate of variance is reported for the main results?			
12	Controlled for confounding?			
13	Results reported in sufficient detail?			
14	Conclusions supported by results?			

Kmet and Colleagues [45]

TABLE 1- CRITERIA FOR INCLUSION AND EXCLUSION WITHIN THE SLR

INCLUSION CRITERIA	EXCLUSION CRITERIA
Articles published between November 2018 to November 2021. Scenario-based training of clinicians that mentions its effectiveness on clinicians using the electronic health record Peer-reviewed/Refereed Academic journal articles, literature, and systematic reviews Full text online (with abstraction available) Articles published in the English language	Articles published before November 2018. Articles that do not include "clinicians" or "training" or "EHR/EMR." Articles with a Qualitative SQAS Score <17. Articles with a Quantitative SQAS Score < 21.

RESULTS

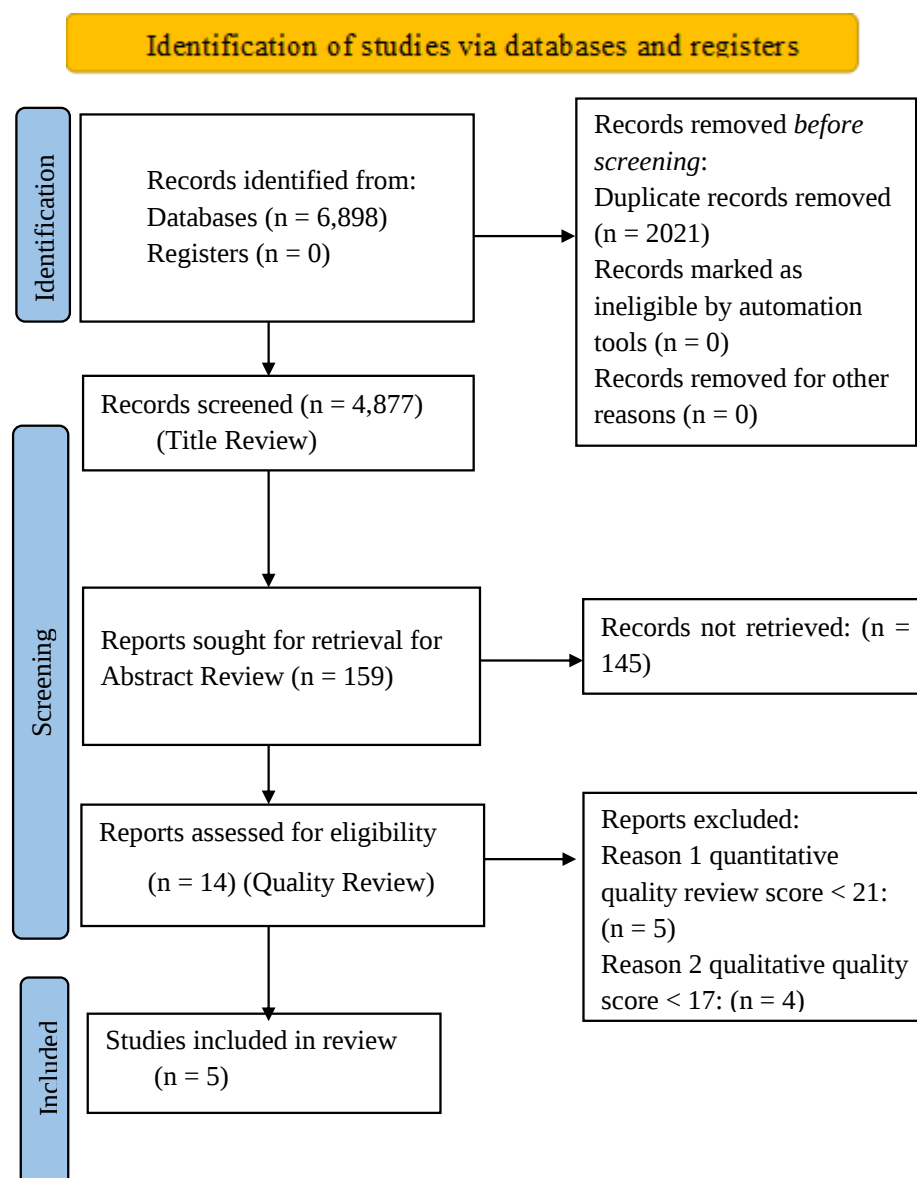
The results are reported in three distinct but related areas of keyword search string results (Table 4), the PRISMA flow diagram completion (Figure 1), and the thematic analysis of included articles to identify themes in the included

literature. Table 4 reports the results returned from searching databases for each of the keyword search strings reported with a total of 6,898 records returned for all search strings. Table 4., also breaks down the records returned for each of the five search strings used.

TABLE 4- BOOLEAN SEARCH STRING RECORD RETRIEVAL RESULTS

Number	Keyword Search String	Records Returned
1	hypotheticals* AND training AND clinicians AND (electronic health record)	525
2	hypotheticals* AND training AND clinicians AND (electronic medical record)	509
3	(case scenarios*) AND training AND clinicians AND (electronic health record)	2720
4	(case scenarios*) AND training AND clinicians AND (electronic medical record)	2693
5	(integrated workflow scenarios) AND training AND clinicians AND electronic medical record)	451
	TOTAL	6898

FIGURE 1- PRISMA FLOW SHEET [46]



Assessment of Articles for Inclusion in the SLR

The following table summarises the main thesis, findings and SQAS scores for the five articles included in this SLR.

TABLE 5- SUMMARY OF INCLUDED STUDIES

No.	Author	Title	Main Thesis and Findings	SQAS
1	Coons and Colleagues [37]	Virtual Electronic Health Record Technology with Simulation-Based Learning in an Acute Care Pharmacotherapy Course	This quantitative study explores whether incorporating a virtual EHR in conjunction with patient simulation provides a more authentic case scenario patient encounter in training pharmacy students; and if this approach better prepares pharmacy students for real world pharmacotherapy decision making. The main aims of this paper were to evaluate the influence the virtual EHR and patient simulation have on pharmacotherapy student learning efficiency and perception of their learning, namely: clinical skills, communication skills, and satisfaction. The findings were that using a virtual EHR in conjunction with patient simulation in training improved learning efficiency (measured by the time taken to the most suitable therapeutic recommendation) compared to just patient simulation. Students' perceptions of clinical skills, communication skills, and learning satisfaction were also improved from this type of approach. The paper concludes that the virtual EHR complements patient simulation by integrating a workflow into training that aligns with realistic patient encounters, therefore helping pharmacy students practice crucial pharmacist functions in a safe, interactive, simulated setting.	22 Quant
2	Smith and Scholz [31]	Impact of a simulated electronic health record on	The quantitative study examined the effect of using a simulated	21

No.	Author	Title	Main Thesis and Findings	SQAS
		pharmacy students' perceptions of preparedness for clinical practice	EHR in the training of third year pharmacy students within practice labs and via case studies course series. Student performance and students' perceptions of preparedness to use an EHR in clinical practice after using the simulated EHR were evaluated. Student performance was measured before and after implementing a simulated EHR within the pharmacy training regime. Student grades were compared using acute patient care and ambulatory care Advanced Pharmacy Practice Experiences (APPEs), comparing student performance for those who received the simulated EHR intervention (class of 2016) against those who did not (class of 2015). A questionnaire was used to determine students' perceptions of preparedness to use an EHR. The study's findings were that there were no significant differences in the implementation of a simulated EHR within the third-year pharmacy student training compared to overall student performance on acute patient care and ambulatory care APPEs. Students' perception of preparedness to use an EHR was significantly improved from the pre and post intervention questionnaire after incorporating simulated EHR within the pharmacy training program.	(Quant)
3.	Ting and colleagues [41]	Nursing education and training on electronic health records systems: An integrative review	This integrative review explores interventions to facilitate the best available evidence-based education and training for nurses on EHR systems. Data were extracted from diverse designs, including fifteen eligible studies	19 (Qual)

No.	Author	Title	Main Thesis and Findings	SQAS
			evaluated using a mixed-method appraisal tool. The findings were organised into three common themes: delivery method, education and training content, and evaluation of outcomes. Outcome measures were evaluated through users' self-reported confidence, knowledge, satisfaction, and perception of the efficacy of the EHR systems training. The integrative review highlighted using authentic blended training approaches rather than just classroom based learning to enhance clinician EHR training. The approaches to training recommended methods that target the nursing clinical workflow, encompassing interactive material with simulation training, e-learning and nurse superusers or peer coaches, thus effectively engaging nurses in the integration of the EHR within their daily nursing workflow and improving EHR adoption. The review also cited an absence of and a need for early and ongoing collaboration with frontline nurses (end-users) to understand unique clinical workflows in addressing their EHR learning needs.	
4	Scott and colleagues [1]	Going digital: a checklist in preparing for hospital-wide electronic medical record implementation and digital transformation	This study sought to develop a checklist to prepare hospitals for EHR implementation and digital transformation. The checklist development encompassed formal methodologies, including literature reviews, interactive multidisciplinary workshops with informatic leads from across Queensland and reviews and feedback from senior clinical	17 (Qual)

No.	Author	Title	Main Thesis and Findings	SQAS
			leaders. The study resulted in developing comprehensive evidence based checklist with several focus areas including organisational considerations, technical considerations, cultural considerations, management of digital disruption syndromes, plans for further improvement of patient care, and training considerations. The checklist's suggestions regarding training factors concentrated on user training, go-live planning, and sequence, point of care "at the elbow" digital support, and prioritisation of digital training of staff. The study recommended training to focus on EHR use in specific clinical work environments, with the utilisation of hands-on demonstration sessions and hands-on dress rehearsals within simulated work environments using mock patient profiles within EHR training domains ('sandpits') to engage and allow staff to practice various clinical scenarios and workflows in a practice setting. Scenario-based training utilising clinical workflow was also to be further supported by: web-based tutorials and portals containing comprehensive training resources and materials; usage of practice laboratories and EHR related problem-solving exercises, access to frontline superuser and digital support staff and help desks; and proficiency testing of user competence to efficiently interact with the EHR.	
5	Champagne-Lanabeer and	Integrating Diverse Disciplines to Enhance Interprofessional	This study examined interprofessional education (IPE) clinical simulation training using	18 (Qual)

No.	Author	Title	Main Thesis and Findings	SQAS
	colleagues [47]	Competency in Healthcare Delivery	an EHR, and Standardised Patients (SP) had on interprofessional collaboration and communication. This paper included student participants from diverse disciplines such as medicine, nursing, dentistry, public health, and informatics. A pre and post-test quasi-experimental design were employed, where data was collected via the Interprofessional Collaborative Competency Attainment Survey (ICCAS) and through qualitative evaluations from SPs. The objective of this study was to evaluate the data from ICCAS and SPs as to whether IPE EHR simulations improved professional communication and collaboration. Some findings demonstrated how interprofessional simulation based EHR training improved collaboration by 15.9% between pre and post-test scores. Additionally, other ICCAS competencies of communication, teamwork and conflict management were also observed to show significant improvements after IPE EHR simulations. This study concluded that improved collaboration is fostered when blending clinical and non-clinical roles within clinical EHR simulations.	

DISCUSSION

The thematic analysis that examined the major themes explored in each included study were extracted exploring the kinds of relationships or associations demonstrated by the included study positive or adverse effects of scenario-

based clinician training and the number of studies that found a positive or negative association between variables explored in the paper. It must be emphasised that some papers could be classified into more than one of the identified themes as can be observed in the results reported in table 5. From this thematic analysis three definitive themes relative to scenario-based training of clinicians to use the EHR emerged:

TABLE 6- EMERGED THEMES FOLLOWING THEMATIC ANALYSIS

No	Theme	Articles Included in Theme
1	Centrality of Workflow	[1, 37, 41]
2	Clinician Engagement is Key	[1, 31, 37, 41, 47].
3	One of Many	[1, 37, 41].

CENTRALITY OF WORKFLOW

Contemporary scenario based EHR training of clinicians should encompass and cater for all clinical specialties, environments and disciplines and their specific, unique clinical workflows [1, 37, 41]. Incorporating a virtual EHR complements patient simulation when integrating the clinician's specific workflow into training aligns with more realistic patient encounters, thus helping clinicians practice vital clinical functions within the EHR in a safe, interactive, and simulated setting [37]. Scott and colleagues suggest 'hands-on' dress rehearsals within simulated work environments using mock patient profiles within EHR training domains to engage and allow staff to practice various clinical scenarios and clinical workflows in a practice setting [1].

Workflow incorporation in training has improved EHR usage by clinicians when there is the added utilisation of nurse superusers or peer coaches within the scenario-based training, to effectively engage clinicians within daily clinical workflow [1, 41]. Once clinicians are working in the live system, continued utilisation of these support staff will further enhance EHR adoption by clinicians [1].

CLINICIAN ENGAGEMENT IS KEY

The engagement of clinicians, who are the end-users of the EHR, within the design and delivery of scenario-based training is imperative to ensure EHR training is designed with designated clinical workflows in mind and delivered by clinical staff who understand these workflows [1, 41]. The review by Ting and colleagues cited that currently, within EHR training programs, there was an absence of and a need for early and ongoing collaboration with frontline nurses to understand their unique clinical workflows in addressing clinicians' distinctive EHR learning needs [41]. In developing training regimes, the engagement of multidisciplinary team members and clinical leads regarding their specific clinical workflows is important [1].

Scenario-based EHR training has empowered clinicians to have an improved perception of skills and preparedness to use the EHR [31, 37]. Students' perceptions of clinical skills,

communication skills, and learning satisfaction have improved when using scenario based EHR training [37]. Clinicians' perception of preparedness to use an EHR was evident in pharmacy training that utilised a simulated EHR, and it is asserted that this finding should also be a factor in any clinician EHR training program [31]. Broader research throughout clinical disciplines, outside of the pharmacy sphere, regarding clinician perception of skills and preparedness, would further support this evidence base. The use of interprofessional simulation based EHR training when a diverse mix of clinical and non-clinical roles are included in the training sessions has seen substantial improvements in fostering interprofessional collaboration [47]. These researchers also assert that communication, teamwork, and conflict management within the interdisciplinary team significantly improved after the interprofessional EHR simulations were completed.

ONE OF MANY (TRAINING STRATEGIES)

Scenario-based training is an important part of just one of many necessary training strategies within a broader catalogue of EHR training offerings. Scenario-based EHR training of clinicians has improved their ability to use the EHR [38] effectively. These researchers found the usage of a virtual EHR in conjunction with patient simulation in training improved learning efficiency, as the time clinicians took to arrive at the most suitable therapeutic recommendation improved compared to just patient simulation alone [38].

A blended EHR training approach targeting individual clinician workflow and interactive scenario-based training and simulation, with the added employment of frontline nurse superusers, peer coaches and classroom-based proficiency testing of user competence to interact with the EHR [1, 42] efficiently, is proposed. Complimentary wider-ranging training modalities as part of a training package with scenario-based EHR training, such as e-learning, web-based tutorials and portals containing comprehensive training materials and access to practice laboratories with EHR related problem-solving exercises have also been put

forward as part of an effective blended EHR training approach [1, 41].

IMPLICATIONS FOR FUTURE EHR PROJECTS

Further high-quality vigorous research studies are required to enhance the evidence body for the continued usage of scenario-based training of clinicians to effectively use the EHR, particularly as the digital landscape within health continues to evolve. Considerations for further research on scenario based EHR training of clinicians should include:

1. Scenario-based training is just one part of a broader and blended EHR training suite.
2. Ensuring future studies encompass a diversity of all fields of clinical roles within the research and,
3. Include standardised naming of the terminology for clinicians' scenario based EHR training within the studies.

CONCLUSION

This systematic review of the literature demonstrates a considerable research gap that will prove fertile ground for ongoing research and, therefore, the development of effective and efficient training of all health professional disciplines to use this important digital transformation of healthcare consumers' clinical records. This is evidenced by only five papers meeting the inclusion criteria. These five papers found a positive relationship between scenario-based training of clinicians and their effective usage of the EHR. However, further robust and high-quality studies are required to bridge the apparent research gap in this area. Although existing limitations of studies and the identified research gap, the body of evidence is strong enough to suggest scenario-based training is effective for training clinicians in the use of the EHR. However, it is recommended that scenario-based training is used as just one part of a more comprehensive clinician EHR training approach.

RECOMMENDATIONS

It is recommended that:

1. Scenario-based training is incorporated within EHR training programs to effectively train clinicians and used as part of a broader suite of EHR training modalities within a training package.
2. The utilisation and engagement with the breadth of interdisciplinary clinicians spanning the array of known clinical settings within the development and delivery of scenario based EHR training programs for clinicians are essential.

3. Engagement with front end clinicians will help facilitate the embedding of unique clinician workflows within specific EHR training tailored to the individual nuances of each clinical role, serving to improve their ability to use the EHR.

LIMITATIONS

The limitations of this Systematic Literature Review include those caused by the usage of non-standard and sometimes broad definitions. As a result, there is a lack of standardised terminology for scenario-based training. The terms: case scenarios, simulation, dress rehearsals and virtual EHR were used relating to studies focusing on scenario based EHR training of clinicians.

More equitable representation of clinical disciplines and their specialities is required and it is recognised that there was an under-representation of some clinical specialties and disciplines within the evidence base. This highlights the need for more diversity within the roles of clinician participants in studies enquiring into scenario-based training of clinicians in their use of the EHR. This limitation illustrates that not all healthcare professional disciplines that require the use of the EHR have garnered sufficient evidence about the success or otherwise of scenario-based training to use EHR, which is discipline-specific.

Finally, there is a limitation in this SLR due to the lack of credible research contextualised to the Australian experience.

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