

BMJ Open How does implementation of an electronic medical record system impact nurses' work motivation, engagement, satisfaction and well-being? A realist review protocol

Rebecca M Jedwab ^{1,2}, Bernice Redley ^{1,3}, Elizabeth Manias ¹,
Naomi Dobroff,^{2,4} Alison M Hutchinson ^{1,3}

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For numbered affiliations see end of article.

Correspondence to

Rebecca M Jedwab;
jedwabr@deakin.edu.au

ABSTRACT

Introduction Electronic medical record (EMR) systems are used worldwide as repositories for patients' clinical information, providing clinical decision support and increasing visibility of and access to clinical information. While EMR systems facilitate improved healthcare delivery, emerging reports suggest potential detrimental effects on clinician well-being. EMR system implementation influences on nurses' work motivation, engagement, satisfaction and well-being (including burnout) are not well understood, nor have they been examined in relation to contextual factors and mechanisms of action. This paper presents a realist review protocol to examine causal explanations to address the question: How, why and under what circumstances does the implementation of a new hospital EMR system or similar technology impact nurses' work motivation, engagement, satisfaction or well-being?

Methods and analysis The five-step method for realist review will be used to identify causal relationships, how the relationships work, for whom and under what circumstances: (1) defining the review scope; (2) developing initial program theories; (3) searching the evidence; (4) selecting and appraising the evidence; (5) extracting and synthesising the data. Initial program theories were developed using scoping review findings and qualitative data collected from nurses pre-EMR and post-EMR. Five databases will be systematically searched from 1 January 2000 to 31 October 2021 (APA PsycInfo, CINAHL, Embase, IEEE Xplore and MEDLINE Complete), and forward and backward citation searching, grey literature searching and literature recommended by the research team. Search results will be screened by two research team members. Data extracted will assist in refining program theories to develop a conceptual model that synthesises how work motivation, engagement, satisfaction and well-being may influence, or be influenced by, an EMR implementation.

Ethics and dissemination The larger project has previously obtained low-risk ethics approval. The review will be published in a peer-reviewed journal and reported as per RAMESES guidelines.

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Strengths and limitations of this study

- The proposed realist review methodology allows synthesis of data to explain multiple complex components of nurse work motivation, engagement, satisfaction and well-being that may influence, or be influenced by, electronic medical record (EMR) implementation.
- Robust initial programme theories were informed by qualitative focus group and interview data collected from nurses pre-implementation and post-implementation of an organisation-wide EMR.
- The outcomes will inform refinement of the programme theories to develop and test a conceptual model to explain changes in nurse work motivation, engagement, satisfaction and well-being in relation to EMR implementation.
- The iterative nature of realist methodology and realist review methods may limit reproducibility of the review results; however, the use of transparent and robust methods and realist review reporting standards provide research rigour.

INTRODUCTION

Over recent decades, new technologies such as electronic medical record (EMR) systems have been implemented throughout hospitals worldwide, and more recently throughout Australia. Literature has shown that although a key aim of implementing EMR systems is to facilitate efficient and effective healthcare delivery, these systems can have detrimental effects on healthcare professionals' well-being and engagement, and are associated with clinician burnout.¹ Nurses, as the largest healthcare profession, are at the forefront of EMR use and adoption in hospitals. Nurses' adoption of EMRs is crucial for successful hospital implementation.² The addition of new technology and digital workflows into nurses' already complex work environment

may affect their work, well-being, interpersonal interactions and ultimately the delivery of patient care.^{3 4} Although some factors associated with nurses' well-being and EMR use have started to be explored in the literature,⁵ associations between nurse work motivation, engagement, satisfaction, well-being and EMR implementation are poorly understood. Relationships between these concepts have not yet been examined either internationally or in an Australian healthcare context. This work takes advantage of a natural experiment; specifically, an organisation-wide EMR implementation at a large tertiary healthcare organisation in Victoria, Australia, that occurred in late 2019. The proposed research seeks to fill a current gap in the literature by answering the question: How and why does the implementation of a new hospital EMR system or similar technology impact nurses' work motivation, engagement, satisfaction and/or well-being?

Realist methodology and realist reviews

Realist research is a theory-driven methodology that does not seek to determine whether an intervention or implementation initiative achieves a desired outcome or not, but seeks to identify its causal relationships, comprising its context(s), mechanisms of action (reasoning or resources), as well as the observed outcome(s).⁶ A realist review, also referred to as a realist synthesis, can include multiple types of source documents including published and grey literature.⁶ A realist review is, therefore, typically larger in breadth and scope than a traditional systematic review as it includes multiple sources of information, different material types and is not limited to traditional peer-reviewed sources.⁷ It can be used for a range of different purposes including reviewing or testing of initial implementation or intervention hypotheses (programme theories), examining theories in different contexts, or determining the contexts in which an intervention may or may not be successful.⁸ The interactions between the context (C), mechanism(s) (M) and outcome (O) are examined in realist reviews to identify the ideas, assumptions and mechanisms by which interventions work or do not work, in what context and under what conditions.^{6 9} Realist reviews are therefore particularly useful for complex settings, such as healthcare settings, where there are often multiple competing factors that may influence behaviour related to a single intervention.

METHODS AND ANALYSIS

This review will use five steps adapted from Pawson *et al*.⁶: (1) defining the review scope; (2) initial programme theory development; (3) searching for evidence; (4) selecting and appraising the evidence; 5) extracting and synthesising the data.

Step 1: define the review scope

The main research question guiding this review is: How, why and under what circumstances does the implementation of a new hospital EMR system or similar technology

impact nurses' work motivation, engagement, satisfaction or well-being?

The review inclusion criteria will use the PICOH framework¹⁰ described as follows:

P—Population: Nurses and other healthcare professionals will be examined.

I—Intervention: Implementation of a new hospital EMR system or similar technology.

C—Comparator: If mentioned in the literature, the comparator will be paper-based records or a previous healthcare information system; however, lack of a comparator will not result in exclusion.

O—Outcomes: Any references to healthcare professionals' work motivation, engagement, satisfaction or well-being related to the implementation of a new hospital EMR system or similar technology. If effect measures are reported within papers, this will be noted in the review; however, meta-analysis of outcome data is not proposed for this realist review.

H—Healthcare context: Any healthcare setting will be included.

There are no restrictions on the data range or types of study designs eligible for inclusion. Non-English-language papers will be excluded. While nurses are the focus of this review, all healthcare professionals will be included due to the emerging nature of this field of research and in anticipation that the available literature will not sufficiently assist in addressing the research question. Existing literature on professions other than nurses may inform an understanding of factors that influence how, why and under what circumstances nurses' work motivation, engagement, satisfaction or well-being are impacted by an EMR system implementation.

Step 2: initial programme theories development

In realist methodology, an initial programme theory or theories are developed, describing the intervention or implementation initiative and how it works.¹¹ A realist review therefore includes using the initial programme theory (or theories) as a starting point to evaluate existing literature; theories may be revised or removed during the iterative process of a realist review.¹¹ Furthermore, additional programme theories may be included in the review as data extraction and synthesis occurs. For this realist review, preliminary work by the research team aided the development of eight initial programme theories. These were informed by a scoping review¹² and findings from a qualitative study of nurses' perceptions of the EMR pre-EMR¹³ and post-EMR implementation. The scoping review examined benefits of an EMR system implementation through a nursing lens and identified that EMR implementation was a burden on nurses. Inductive thematic analysis of qualitative focus group and interview data from nurses pre-EMR and post-EMR implementation revealed themes about nurses' perceptions and experiences of EMR in relation to work motivation, engagement, satisfaction and well-being. In addition, qualitative data that were coded using the Theoretical Domains Framework¹⁴

revealed perceived and actual barriers and enablers to EMR adoption and use by nurses. Integration of findings from these sources informed the eight initial programme theories that were refined by the research team.

The first two initial programme theories were established following a review of literature¹²:

1. If implementation of a new technology reduces the time and/or quality of inter-professional or intra-professional communication, then work satisfaction may decrease because interpersonal interactions help create a satisfying work environment for healthcare professionals.
2. If nurses find a new technology difficult to use, they may experience a decrease in work satisfaction because the new technology acts as an additional stressor in their everyday work.

The remaining six programme theories were informed by a combination of literature sources and the findings from analysis the focus group and interview data (both published¹³ and unpublished works):

3. If implementation of a new technology decreases time spent with patients, then work satisfaction may decrease because the new technology is acting as a barrier to nurses' work and nurses feel that an important part of their work is the time spent providing care for their patients.
4. If implementation of a new technology system acts as a supportive resource for nurses in their work by providing access to resources and supportive clinical decision-making, then work satisfaction may increase because the new technology is enabling nurses to provide the best care for their patients and supports changes in work and workflows associated with the new technology implementation.
5. If new technology hardware is challenging for nurses to use, move or access, then the nurses may be less likely to use it for contemporaneous documentation, which could result in workarounds that increase work burnout and decrease work satisfaction due to lack of accurate documentation and sharing of information.
6. If nurses have a positive attitude towards the implementation of a new technology, feel they are ready to use this new technology or are enjoying using the new technology for their nursing work, then work satisfaction and well-being may increase because they believe the new technology is a supportive resource and assists with their nursing work.
7. If nurses enjoy using the new technology because they find it easy to use, have used the technology before, are used to technology and/or are confident using computers, then their burnout levels may decrease and work satisfaction levels may increase because the new technology is not hindering their work and is contributing to work satisfaction or enjoyment.
8. If nurses work in an area that uses a hybrid workflow (some information remains on paper and some on the computer), they may experience a decrease in work satisfaction because they are not able to use the new

technology as a single point of access for patient information, and the EMR may act as another stressor in their work.

Step 3: searching the evidence

Search strategy

A detailed search strategy will be used to identify relevant literature to test and refine the initial programme theories. A systematic search of five databases related to nursing, healthcare, psychology and technology (APA PsycInfo, CINAHL, Embase, IEEE Xplore and MEDLINE Complete) will be undertaken. Search dates were chosen to ensure findings are representative of contemporary technological advances and EMR-related literature (1 January 2000–31 October 2021). The database selection and search terms were developed by the research team with the assistance of a specialist healthcare librarian. Online supplemental file 1 details the search terms for each database. As well as the database searches, four other techniques will be used to search for related evidence; forward citation searching, backward citation searching, searching grey literature, including blog articles, dissertations or commentary pieces, and literature recommended to the research team. Backward citation searching includes searching the reference list of a paper of interest for other relevant published works, while forward citation searching examines whether any publications have referenced the original paper of interest.

The realist review is an iterative process in which the search, papers included and data extracted may be reviewed and adjusted as required.¹⁵ All adjustments will be detailed in the reporting of the results and justified for transparency.

Step 4: selection and appraisal of evidence

At the title and abstract screening stage, if there are less than 10 000 results, screening will be completed independently by two researchers (including the first author). In the event that more than 10 000 results require screening at the title and abstract stage, screening will be completed by the first author and a random selection of 10% will be assessed by a second researcher. If there is less than 90% concordance, the inclusion criteria will be reviewed and a further 10% will be reviewed. The process will be repeated until a concordance rate of greater than 90% is achieved. At the full text screening stage, two researchers (including the first author) will independently complete screening and data extraction. At both the title and abstract and full-text screening stages, disagreements will be resolved through discussion. If agreement cannot be reached, a third researcher will be consulted. Covidence software will be used for screening.¹⁶

Title and abstract screening

Titles and abstracts of all papers identified in the search will be examined for relevance using the following questions:

1. Does the paper refer to the implementation of a new hospital EMR system or similar technology intervention in the healthcare setting?
2. Does the paper refer to one or more of the following concepts in healthcare professionals: work motivation, engagement, satisfaction or well-being?

Papers for which the answer is 'no' to one of these questions will be excluded at this stage.

Full-text screening

Full texts of all remaining papers will be examined for relevance to the research question and the following questions:

1. Does the paper describe the intervention (new technology)?
2. Does the paper describe the implementation process?
3. Does the paper include any observations, evidence or suggestion of causal claims?
4. Does the paper include any outcome data?

Papers for which the answer is 'no' to one of these questions will be excluded at this stage.

Quality appraisal

Realist research quality assessment examines whether studies are relevant and sufficient in their methods (eg, overall findings) and assesses for relevance and rigour,⁶ although no studies will be excluded based on an assessment of quality.¹⁷ This is because studies that may seem less methodologically rigorous may still contribute to understanding the concepts of this realist review.

Relevance will be determined based on whether the paper informs the research question or its components in some way. A rating of low, moderate or high will be assigned as well as including a comment about the paper's relevance to the review questions and initial programme theories, what is interesting about the paper and if there is any mention of causality. Three specific criteria have been developed to assist in the assessment of relevance: (1) Does the paper contain content that can be scrutinised against the initial programme theories?; (2) Does the paper describe the implementation or intervention in sufficient detail?; (3) Does the paper contain at least one statement regarding how or for whom the programme works and why? (any causal statement(s), claim(s) or inference(s)). Assessing for rigour will also include the addition of a comment on the paper's conclusions using the following guiding questions: (1) Can conclusions be sufficiently drawn from the research?; (2) Are there any 'red flags' in the paper that bring doubt to any claims?; (2) Is there a need to appraise the quantitative or qualitative methods used in the paper?

Step 5: data extraction and synthesis

Coding and data extraction

In order to fully understand the content, each paper will be read twice before data extraction is commenced. Coding will be done by highlighting or annotating next to important passages. This may include relevant

information, the context, mechanism or outcome, or any causal inferences made in the paper. A journaling approach will be used to facilitate the iterative process of a realist review. This will include compiling a short summary of the relevance of the paper to the research question as well as the screening questions. This summary will help explain how the paper is relevant to the review purpose and research questions. An explanation of the context(s), mechanism(s) and outcome(s) reported will be recorded, including what (if any) causal claims are made.

Data extraction will involve selecting key information, paragraphs or quotes which will be compiled using NVivo software (2020)¹⁸ alongside other study details such as the research design and methods, participants, settings and description of the intervention. Description of factors such as work motivation, engagement, satisfaction or well-being of healthcare professionals, as well as the tools or measures used to explore them, will be included. Any links or relationships between the context and concepts identified (mechanisms), or between the mechanisms and outcomes will be detailed. The initial programme theory statements will be used as categories for data extraction. If the data extracted do not align with any existing programme theory statement, a separate category will be created. Other information such as whether there are any statements about the impact on nurses or their work, any gap(s) identified in the literature or whether any framework or model was used will also be included. Details regarding the timing of studies in relation to the implementation of a new healthcare technology will be noted (eg, pre-implementation, during or post-implementation) because this timing will aid in the development and refinement of the theory. A narrative descriptive summary of the quantitative or qualitative results of the included papers will be included in data extraction.

Data synthesis

Once all studies are screened and data extraction is complete, preliminary data synthesis will be undertaken by the research team. The realist review will include theorising or interpretation of the extracted data to help develop and refine the initial programme theory statements. This may include adding, subtracting and revising statements. It may also include generation of rival programme theory statements that challenge or oppose the initial programme theories. These rival programme theory statements may be developed by editing existing programme theories or by creating opposing programme theories during the data extraction and synthesis stages. The research team will then discuss rival programme theory statements and supporting reference(s). The research team will meet regularly to discuss and progress data synthesis and generation and refinement of the programme theories. Differences or contradictions in findings between studies will be discussed among the research team and used for development or refinement

of the theories. Our final synthesis may include quotes from the papers with references, references only, paraphrasing (summarising) of the papers, context, mechanism and outcome configurations (which can reflect extrapolations, direct evidence or a combination of both), reflection on causation from the paper and/or links to initial programme theories and middle-range theories. All of these will be used to support our understanding, linking of concepts and middle-range theory development, from synthesis of the literature. The synthesis structure for this realist review will include (1) the initial programme theory number; (2) explanation from the literature and research team insights (can include quotes, references, paraphrasing and/or middle-range theories); (3) context, mechanism and outcome configurations (may have an accompanying title); and (4) a summary of understanding or implications.

Registration of review

Details of the protocol for this realist review were registered on PROSPERO on 28 April 2020 and can be accessed online (www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42020131875).

Patient and public involvement

No patients or members of the public were, or will be, involved in the design, management or conduct of this review.

ETHICS

Low-risk ethics approval was obtained from both the healthcare organisation (Reference: HREC/46439/MonH-2018-154603(v3)) and university Human Research Ethics Committees (Reference: 2019-003) for conduct of the focus group interviews (part of a larger research project) that informed the initial programme theory development.

Dissemination

The broader dissemination plan includes publication in peer-reviewed journals and presentation of the findings to the healthcare organisation, University, and at local, national and international conferences specific to nursing, digital health and patient safety. The review will be reported in accordance with existing guidelines for reporting developed by the RAMESES (Realist And Meta-narrative Evidence Syntheses: Evolving Standards) group.¹⁵

Limitations

Limitations associated with this realist review protocol are acknowledged. The inclusion of only English-language studies may inadvertently result in publication bias; however, funds are not available to enable translation. Limiting search results from the year 2000 was chosen to include the breadth of EMR-related literature and information. The potential for a search bias from this review has been attempted to be mitigated as much as possible

by including a broad search strategy of database searches, forward and backward citation searching, and grey literature. The iterative process of a realist review may also be seen as a limitation; however, to promote transparency, the research team will record detailed information about the literature, including its source and method of retrieval, and the review process. Any changes to the initial programme theories will be detailed and justified.

Reporting guidelines

The PRISMA-P checklist was used to guide the reporting of this realist review protocol (online supplemental file 2).¹⁹

Author affiliations

¹School of Nursing and Midwifery, Centre for Quality and Patient Safety Research, Institute for Health Transformation, Deakin University, Melbourne, Victoria, Australia

²Nursing and Midwifery Informatics, Monash Health, Melbourne, Victoria, Australia

³Nursing and Midwifery, Monash Health, Melbourne, Victoria, Australia

⁴School of Nursing and Midwifery, Deakin University, Melbourne, Victoria, Australia

Twitter Rebecca M Jedwab @becjed, Bernice Redley @berniceredley, Elizabeth Manias @emanias1, Naomi Dobroff @naomidobroff and Alison M Hutchinson @ali_candlebark

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ORCID iDs

Rebecca M Jedwab <http://orcid.org/0000-0003-3014-8797>

Bernice Redley <http://orcid.org/0000-0002-2376-3989>

Elizabeth Manias <http://orcid.org/0000-0002-3747-0087>

Alison M Hutchinson <http://orcid.org/0000-0001-5065-2726>

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