**DIGITAL
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Understanding the role and impact of electronic health records in labor and delivery nursing practice: A scoping review protocol

Crystal A Bignell (iD) and Olga Petrovskaya (iD)

Abstract

Background: Electronic health records have a significant impact on nursing practice, particularly in specializations such as labor and delivery, or acute care maternity nursing practice. Although primary studies on the use of electronic health records in labor and delivery have been done, no reviews on this topic exist. Moreover, the topic of labor and delivery nurses' organizing work in the electronic health record-enabled context has not been addressed.

Objective: To (a) synthesize research on electronic health record use in labor and delivery nursing and (b) map how labor and delivery nursing organizing work is transformed by the electronic health record (as described in the reviewed studies).

Methods: The scoping review will be guided by a modified methodology based on selected recommendations from the Joanna Briggs Institute and the Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Reviews. A comprehensive search will be conducted in the following databases: CINAHL Complete, MEDLINE, Academic Search Complete, Web of Science, Scopus and Dissertations and Theses Abstracts and Indexes. Included sources will be primary research, dissertations, or theses that address the use of electronic health records in labor and delivery nursing practice in countries with high levels of electronic health record adoption. Data extracted from included sources will be analyzed thematically. Further analysis will theorize labor and delivery nurses' organizing work in the context of electronic health record use by utilizing concepts from Davina Allen's Translational Mobilization Theory. Findings will be presented in tabular and descriptive formats.

Conclusion: The findings of this review will help understand transformations of nursing practice in the electronic health record-enabled labor and delivery context and identify areas of future research. We will propose an extension of the Translational Mobilization Theory and theorize nurses' organizing work involving the use of the electronic health record.

Keywords

Nurses, nursing, nurse's role, nursing care, maternal–child nursing, obstetric nursing, perinatal care, obstetrics, electronic health records, hospital information systems

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Introduction

Electronic health records (EHRs) are being widely integrated into healthcare. These longitudinal records collect, sort, and store patient data in a digital format for interoperable use. This implementation has a significant effect on nurses. EHRs facilitate nursing awareness and prioritization through customizable alerts, reminders, and decision support systems[1,2] allowing for timely responses and communication with the interprofessional team. While nurses remark that EHRs facilitate information access and sharing,[2] they also report an increased amount of time spent retrieving patient information.[3,4] EHRs further impact nursing time allocation by affecting the amount of time spent documenting. While sources conflict on

School of Nursing, University of Victoria, Victoria, BC, Canada

Corresponding author:
Crystal Bignell, School of Nursing, University of Victoria, P.O. Box 1700 STN CSC, Victoria, BC V8P 5C2, Canada.
Email: cbignell@uvic.ca

whether EHRs improve documentation burden or not, redistribution of nursing time requires changes in processes and workflows.[4–8] Nurses also describe an increased workload and cognitive burden following EHR implementation which affects their well-being and practice.[2,4,5] Though EHR use results in adaptive practice changes,[3,6] nurses are largely being ignored in the development and research of these technologies.[9] Further, analyzing healthcare technology, nursing theoretical literature tends to perpetuate the limited "love-hate relationship" between nursing and technology.[10] An alternative approach is to recognize technology such as the EHR as an agent entering and transforming the networks of relationships among human actors and artifacts constituting healthcare practices.[10] In sum, nursing work is being shaped by technologies that have been developed with limited insight into the sociotechnological implications of their use.

Despite the widely shared image of the nursing profession as centering on nurse–patient relationships and direct caregiving, ethnographic studies of nursing work reveal its significant non-direct care components and administrative responsibilities.[11,12] It is estimated that nurses spend up to 70% of their time engaged in what Allen[11] calls invisible *organizing work*. This essential work includes knowledge creation and management, articulation of resources (e.g. people and technology) for work progression, management of patient flow and resource capacity (e.g. bed allocation), and facilitating patient transitions throughout the healthcare system.[11] As a result of field studies of acute care nursing practice and drawing on the sociological practice theory, Allen[11,13] developed the *Translational Mobilization Theory* to identify and describe the mechanisms of nurses' invisible organizing work, including object formation, reflexive monitoring, articulation, translation, and sensemaking. For the purpose of this review, nursing practice refers to this invisible organizing nursing work or patient care trajectory management. This includes accessing records to create knowledge in order to support the ongoing delivery of care, providing handovers, documentation, intra- and interprofessional communication happening within the EHR, internal and external transfers of care facilitated by the EHR, organizing patient flow, etc. Thus, documentation is only one aspect of this much larger scope of work. Though it accounts for the greatest amount of time for the largest group of healthcare workers, organizing work is often studied as a distraction from patient care rather than critical work itself.[11] To the best of our knowledge, no studies exist that focus specifically on whether and how nurses' organizing work is transformed when the EHR, a relatively novel sociomaterial agent, enters nursing practice. It is therefore crucial to understand how EHRs are shaping nursing practice including organizing work.

Labor and delivery (L&D) nurses, or acute care maternity nurses, work in rapidly changing, high-acuity environments. Their work is based on the knowledge and skills from multiple specialties (e.g. obstetrics and gynecology, emergency medicine, medical-surgical care, perioperative nursing, neonatology, child and family health, lactation, and mental health care) focused on a distinct population, patient and families experiencing pregnancy and neonates. Due to its highly specialized nature, L&D practice requires unique EHR capabilities,[9] including the integration of multiple technologies (e.g. electronic fetal monitoring and intraoperative systems) and specialized interfaces (e.g. peripartum and newborn flowsheets, order entry, intraoperative and recovery templates, obstetrical triage and acuity scoring, etc.). Thus, L&D nursing is uniquely affected by the implementation and use of EHRs.[9]

There is currently very little primary research on how EHRs are affecting L&D clinical nursing[9] and no summaries of research on this topic. A preliminary search on Google Scholar and CINAHL Complete resulted in only a handful of references regarding EHRs and nursing organizing work in the L&D setting. Therefore, to explore the breadth and depth of the literature,[14] we will conduct a scoping review. By understanding the body of research available, this review will be able to "map and summarize evidence, inform future research, and identify or address knowledge gaps"[14] related to this topic.

Methods

We will follow a modified scoping review methodology previously used by OP in published studies.[15,16] This methodology is based on selected recommendations from the Joanna Briggs Institute (JBI) for scoping reviews[17] and the Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) checklist[18] (see Supplemental File). As this review will utilize publicized literature, the Human Research Ethics team at the University of Victoria approved an ethics waiver for this protocol and no informed consent will be required. This project will be undertaken by a team of reviewers, led by CB and overseen by OP.

Registration

The International Prospective Register of Systematic Reviews (PROSPERO) does not accept scoping reviews for registration.[14,17] Though open platforms are available for prospective registration of scoping reviews, this step is optional. As such, this protocol has not been registered.

Review questions

The review will be guided by the following research questions: What is known about EHR use and its effects on L&D nursing practice? What methodological approaches and theoretical perspectives have been used in research on this topic? According to research, how are EHRs

transforming and transformed by, nursing work in the L&D clinical setting?

Additionally, our modified methodology seeks to map the findings of the included studies across the concepts of Davina Allen's *Translational Mobilization Theory*.[11] This will address the question: In what ways can the available research expand the theoretical understanding of L&D nurses' organizing work in the EHR-enabled context?

Eligibility criteria

Sources will be considered for inclusion based on clearly defined criteria, specifically related to the posed research question.[17] Inclusion and exclusion criteria are categorized by participants, concept, context (PCC), and types of evidence.[17]

Participants. This scoping review is particularly focused on nurses and nursing work. For the purposes of this review, perinatal nurses will be of specific interest. Perinatal nurses care for patients and families across the peripartum experience. These nurses provide care for a variety of conditions including but not limited to:

- antepartum risk (i.e. pregnancy-induced hypertension, gestational diabetes, antepartum bleeds, multiple gestation, etc.),
- labor, including spontaneous and induced labor, and delivery (i.e. spontaneous/assisted vaginal and cesarean delivery),
- perinatal loss,
- the immediate postpartum period, for the mother, infant, and family, including newborn feeding support and post-operative care,
- newborn risk (i.e. hyperbilirubinemia, increased weight loss, feeding challenges, etc.).

Sources not focused on registered nurses or an equivalent designation in the perinatal specialization as the participant population will be excluded. If the study includes various healthcare providers, we will include it and extract the nursing-related data. As this work is focused on the clinical work of practicing nurses, nursing students will be excluded from the final review.

It should be noted that many countries utilize midwives for perinatal care. Midwifery educational and registration requirements vary by geographical jurisdiction. As an example, registered midwives in the UK[19] and Australia[20] complete different educational pathways depending on whether or not they have a background in nursing. However, studies do not typically specify whether the midwives participating in the research have a nursing background or not.[1] Though midwives act as primary care providers with an advanced scope of practice, their role in the acute care maternity setting overlaps with the L&D nursing role. Therefore, excluding midwives from our search may unintentionally eliminate relevant studies. Thus, we will include keyword and subject heading terms for midwives in our search strategy.

Concept. Our key concept is the EHR technology. Included sources will directly focus on the use of EHRs in clinical practice. We will include studies describing existent, in-use EHRs. Included studies will focus on the use of EHR or its components such as patient lists, documentation, and provider notes, medication administration records, electronic provider order sets or order entries, clinical decision support systems, safety alerts, referral and scheduling entries, internal and external communication tools, laboratory and diagnostic imaging results, as well as handover and accountability tools. Studies that describe EHR implementation, hypothetical or anticipated use, and prototype testing will be excluded unless they describe actual nurses' work, or applicable midwifery work, involving the EHR.

Context. Included sources will focus on the clinical setting of L&D, including any hospital-based, maternity care setting that provides care to pregnant women during the antepartum, intrapartum, or immediate postpartum periods. This includes L&D, maternity or birthing units, labor-delivery-recovery-postpartum (LDRP) units, postpartum units, and operating/recovery rooms for cesarean section and childbirth. In contrast, primary care, obstetric, fertility, family planning, and lactation outpatient clinics will not be included in the review, nor will studies focused on home/community care or neonatal intensive care units. These settings are contextually unique, with work processes and EHR systems being dissimilar to those in acute perinatal care. Thus, the effects of EHRs in these care settings require separate analyses and are outside the scope of our review.

A note on terminology is warranted. "Labor and delivery nurses" provide care for pregnant individuals during the four stages of labor, in addition to neonatal and infant care. Whereas "maternity nurses" or "perinatal nurses" provide care throughout the whole pregnancy. Though "perinatal nurses," "maternity nurses," and "L&D nurses" are at times interchangeable terms, their exact roles and responsibilities can vary by hospital context. As such, the term "labor and delivery" better suits the inpatient, clinical focus of this review. Additionally, a preliminary observation by the authors is that more research comes from the United States, where "labor and delivery" is primarily used. Therefore, this protocol predominantly makes use of the term "labor and delivery." However, in an attempt to be exhaustive, synonymous terms will be included in the database searches.

To increase the homogeneity of the sample and thus the meaningfulness of results, our review will be limited to

countries with the highest levels of EHR adoption, for example, the Netherlands and Scandinavian countries, the US, Australia, the UK, Canada, among others. To increase the homogeneity of the sample and thus the meaningfulness of results, our review will be limited to countries with high levels of EHR adoption. We will include countries in which 70% or more physicians and hospitals are using electronic records, triangulating this list with the list of countries reporting EHR adoption in over 90% of their hospitals from 2016 and 2021.[21] Additionally, as EHR implementation requires considerable infrastructure and expenditure, studies originating from most middle- and low-income countries will be excluded as context-specific and requiring a separate analysis. To achieve this, the list will be further triangulated by the top 30 countries for health spending.[22] The finalized country inclusion list can be found in the Appendix.

Table 1. Sample search strategy for CINAHL complete (EBSCO).

#	Query
S1	nurs*
S2	(MH "Nurses+") or (MH "Nursing Role") or (MH "Nurse Attitudes") or (MH "Nursing Practice+") or (MM "Labor and Delivery Nurses") or (MH "Perinatal Nurses+")
S3	midwi*
S4	(MH "Midwives+") OR (MH "Midwifery Service+") OR (MH "Midwifery+") OR (MH "Midwife Attitudes")
S5	S1 OR S2 OR S3 OR S4
S6	maternal-child or obstetric* or matern* or perinatal or postnatal or prenatal or intrapartum or antepartum or postpartum or "labour and delivery" or "labor and delivery" or cesarean or caesarean or pregnan*
S7	(MH "Obstetric Care+") or (MH "Surgery, Obstetrical")
S8	S4 OR S5
S9	EHR or "electronic health record*" or EMR or "electronic medical record*" or EPR or "electronic patient record*" or "electronic chart*"
S10	(MH "Patient Record Systems+") or (MH "Electronic Health Records+") or (MH "Clinical Information Systems+") or (MM "Nursing Informatics")
S11	S7 OR S9
S12	S3 AND S6 AND S9
S13	S3 AND S6 AND S9 Narrow by Language – English

Types of sources. We will include primary research of any design, quantitative, qualitative, or mixed-methods. Dissertations and theses will be the only form of grey literature. The analysis of other grey literature sources is outside the scope of this study. Moreover, articles not available in English and as full text, preliminary studies, frameworks, and protocols will be excluded. Reviews will be tracked but excluded from analysis.

Information sources

We will search CINAHL Complete (EBSCO), MEDLINE (OVID), Academic Search Complete (EBSCO), Web of Science (Clarivate), and Scopus (Elsevier). As grey literature will be limited to theses and dissertations, a search of Dissertations and Theses Abstracts and Indexes (ProQuest) will also be completed.

Search strategy

A three-step strategy will be utilized.[17] First, we conducted an initial limited search of CINAHL Complete using the following approach: (electronic AND record*) AND ("labour and delivery" OR "labor and delivery" OR matern* OR perinatal OR obstetric*) AND nurs*. The titles and abstracts of sources from this initial search were analyzed for other common keywords and subject headings. Second, these terms were utilized in the development of the search strategy. In consultation with a research librarian, CB developed a comprehensive search strategy for all six databases listed above. The search strategy was adapted for each particular database. All six strategies utilized a keyword search. Additionally, subject heading searches were done in CINAHL Complete, MEDLINE, and Academic Search Complete. A sample search strategy for CINAHL Complete is included in Table 1. Moreover, a handful of seed articles, that is, sources that meet all eligibility criteria, were identified. The presence of these seed articles in the search results was used to ascertain the effectiveness of the search strategy and adjust the searches accordingly. In step three, CB will manually search the reference lists of all included full-text articles for additional eligible sources.

Due to the language skills of the screeners involved in this scoping review and the feasibility of the project, we will include sources available in English. To ensure screening and analysis of the full source is possible, only sources with full-text availability will be included. There will be no restriction on the publication date.

Citation management and evidence selection

Following the database searches, all identified citations will be imported into Covidence for screening. Covidence will

automatically remove duplicate sources prior to screening initiation. A two-step screening process will be performed by two independent reviewers.[17] The first step is a review of titles and abstracts of identified sources for inclusion based on the eligibility criteria previously outlined. The full-text PDFs of all references passing this first screen will be retrieved using Zotero, or a manual search of the library databases, and uploaded to Covidence for the second step of screening. In this second step, the two independent reviewers will evaluate the eligibility of full-text sources using the same inclusion criteria. Any disagreements will be resolved by consensus. Reviewers will keep a record of their rationale for source exclusion in both steps. A narrative description of the selection process will be provided in the final review, along with a completed PRISMA flow diagram.[23]

Critical appraisal

Though a critical appraisal of sources is not mandatory for scoping reviews (as per JBI),[17] we will assess the quality of included studies, using the 2018 version of the Mixed Methods Appraisal Tool (MMAT).[24,25] This tool is appropriate for assessing empirical studies of different study designs (qualitative, quantitative, or mixed methods).[24,25]

Table 2. Preliminary data extraction tool: study characteristics.

Citation
Origin of study
Purpose of study
Theoretical framework
Methods
Study design
Setting
Participants and sample
Intervention: EHR technology
Data collection
Data analysis
Limitations
Implications (recommendations)
Key findings relevant to current review

As recommended by the MMAT authors,[24] first CB will assess the quality of all included studies. Then a second independent reviewer will check the information for validity and completeness. Any disagreements will be resolved by consensus. The quality appraisal results will be reported in a table in the final review. We anticipate that no studies will be excluded based on their quality assessment (following the recommendation of the MMAT authors),[25] but the methodological limitations will be noted in our review.

Data extraction

Using an instrument developed by the first author, and based on guidance from JBI,[17] data will be extracted from all sources included in the review. The extraction instrument is meant to record "information about the 'process' of each programme or intervention included in the review so that its 'outcome' is contextualized and more understandable."[(26, p.16)] In addition to citation details, information about how each source addresses this review's research questions will be included, following the PCC format.[17] This includes details regarding population (type of nurses included and sample characteristics), concepts (EHR technology of focus and concepts of organizing work discussed), and context (specifics of setting and country of origin). When provided in the article, information regarding patient demographics and conditions will be extracted. Study findings will be extracted to address the question: What is known about EHR use and effects in L&D nursing practice?

Details related to the type of study will also be extracted, including study design, purpose, and methods of data collection and analysis.[17] To further contextualize the results of included studies, information will be extracted regarding theoretical frameworks used in each study to answer the research question: What methods and frameworks have been used to study this topic?

Data extraction will be completed with a focus on how EHRs are used in nursing practice both in direct and indirect patient care, making sure we capture all the nuances provided in the original source. Analysis of the contextualized outcomes and mapping them across the domains of *Translational Mobilization Theory* (i.e. knowledge management, articulation, bed management, and transfers of care)[11,13] will provide information regarding the interrelationship between L&D nurses' organizing work and EHR use.

A preliminary version of the extraction tool is provided in Table 2. This table will be formatted in a shared Excel spreadsheet for data extraction. Peters et al.[17] described data extraction as an iterative process. Therefore, the extraction tool will be modified and revised as required during the review process. CB will extract data from 100% of included sources, whereas two other reviewers will each independently verify data extracted from 10% of non-overlapping, randomly chosen sources.

Data analysis

Data analysis and synthesis will provide a logical, descriptive summary of the research.[17] We will summarize study characteristics and undertake a three-step analytical process. First, we will outline and quantify the various methods and frameworks used in the included research. This will answer the question: What methods and frameworks have been used to study this topic?

Second, using the process outlined by Braun et al.,[27–29] we will conduct a thematic analysis of the findings in order to identify and analyze patterns within the extracted data. This inductive analysis will be grounded in the original data, that is, it will integrate the themes and sub-themes present in the reviewed studies. In this stage, themes will be identified through a semantic-level analysis.[27,29] Data will be organized to discern patterns and then interpreted to determine "their broader meanings and implications."[(27, p.84)] These analytical steps will address the research questions: What is known about EHR use and its role in L&D nursing work? How is L&D nursing work shaped by the presence of EHRs?

Third, a separate thematic analysis at the latent level[27,29] will "identity or examine the underlying ideas, assumptions, and conceptualizations … that are theorized as shaping or informing the semantic content of the data."[(27, p.84)] This approach will combine induction, deduction, and abduction processes[30] sensitized by concepts and insights from sociomateriality, actor-network perspectives, and *Translational Mobilization Theory*.[11,13] Findings from the included studies will be mapped[17] onto a reference table which outlines and defines key concepts of organizing work. This table was developed by CB in collaboration with OP. Table 3 is a sample of this table. This approach is informed by assumptions regarding sociotechnical relationships and nursing practice as encompassing both clinical, and direct caregiving as well as organizational work. This step of analysis will address the research questions: How can we recognize nursing organizing work in a particular source? How has EHR use shaped L&D nurses' organizing work? What are the implications of EHRs for nursing practice and professional identity? Our team of reviewers, comprised of experienced L&D nurses and academic counterparts with expertise in conceptual underpinnings of the *Translational Mobilization Theory* and review methodology, is well-positioned to undertake this project.

Presentation of the results

Results from the analysis will be presented in tabular and narrative forms.[17] These two methods of presentation will outline study characteristics, summarize what is known in the current research about the topic of study, and seek to extend the *Translational Mobilization Theory*[11,13] to theorize nurses' organizing work in the context of EHR-enabled L&D nursing practice. Our findings will also expose gaps in the current literature.[17] This phase is also iterative and will be refined as researchers increase their awareness and consideration of the literature.[17]

Discussion

Nursing specializations, such as maternity, are particularly affected by the use of electronic health records. To address a current gap in the literature, this protocol proposes the completion of a scoping review. The scoping review aims to (a) summarize research on EHR use in maternity nursing and (b) map how nursing work is transformed by the EHR (as described in the reviewed studies) across the domains of nurses' organizing work.

Limitations

Despite the development of a comprehensive search strategy, it is possible that this review will miss relevant sources. Limiting sources to only English-language documents may impair the comprehensiveness of the results. This review will be further limited by the restrictions on grey literature. Including dissertations and theses as the only form of grey literature may impact the conclusions of this review. Additionally, as this scoping review is limited to geographical contexts associated with high levels of EHR adoption, some novel organizing work concepts may be missed.

Implications

The findings of this review will contribute to the understanding of nursing work that is transformed by the EHR. As the profession of nursing continues to evolve in response to shifting sociomaterial and contextual influences, the definition of nursing work must also evolve. At a time of shortage and reform, understanding the profession and work of nurses is critical to providing the credibility this profession requires. Reframing of nursing care and holism based on the realities of practice versus the ideals of historical theory will shape not only the identity of nursing, but our approaches to training, education, and advocacy. Further, findings from this scoping review have the potential to inform future research on how EHRs are shaping nursing organizing work in specialty areas. Identifying the limitations and restrictions of available literature on this topic can provide a rationale for future studies.

Conclusion

This protocol proposes a scoping review on the use of EHRs in labor and delivery nursing. A review of this type will allow for an understanding of how this subject is currently being explored in the literature, including any gaps in knowledge. Additionally, an overview of current research into this topic will allow for an analysis of how EHRs are shaping, and being shaped by, nursing organizing

Table 3. Preliminary data extraction tool: organizing work.

	Organizing work key concepts		Included literature	
Domain	Sub-domain or mechanism	Definition	Citation	Findings
Knowledge Management	Object formation	The way in which actors use the resources available to them in order to create objects of practice around which work can be organized		
	Trajectory narratives	Dynamic stories created and circulated by nurses which summarize a patient's ongoing care		
	Reflexive monitoring	How actors evaluate and review the patient's care, the clinical environment, and the health organization to generate situational awareness, ensuring the coordination of actions with intended goals		
	Sense making	"… refers to the activities involved in interpreting information pertinent to trajectory management (which may be clinical or organizational), identifying any inconsistencies and resolving gaps in understandings, and detecting abnormal patterns and processes" (Allen, 2019, p. 769)		
	Translation	Processes which allow the sharing of a practice object (i.e. patient) to facilitate the alignment of goals/concerns and a cooperative effort		

Note. This table contains one of the four domains of organizing work.[11] The final table, containing all four domains with corresponding sub-domains and mechanisms, will be provided in the completed review.

work in labor and delivery. As EHRs grow in use globally, it is important to understand the implications of this technology on the work of nurses.

ORCID iDs: Crystal A Bignell [iD] https://orcid.org/0009-0002-1789-6627
Olga Petrovskaya [iD] https://orcid.org/0000-0001-5929-3598

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Appendix

List of countries for inclusion (alphabetized)

Studies originating from the following countries will be included in the final review:

- Australia
- Austria
- Belgium
- Canada
- Czech Republic
- Denmark
- Finland
- Germany
- Iceland
- Israel
- Italy
- Korea
- Latvia
- Lithuania
- Luxembourg
- The Netherlands
- New Zealand
- Norway
- Portugal
- Slovenia
- Sweden
- Switzerland
- The United Kingdom
- The United States