

BMJ Open Exploring the impact of an electronic health record implementation on user experiences across clinical programmes in a large Canadian community hospital: a qualitative study

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ABSTRACT

Objective This study explored experiences with implementing and using the Epic electronic health record (EHR) across different clinical programmes within a single Canadian hospital system and specifically examined how local configuration decisions and implementation of its features and functionalities integrated well or introduced friction within workflows.

Design Qualitative description methodology involving semistructured interviews analysed using thematic analysis.

Setting A large community hospital in Canada.

Participants Healthcare providers, administrative staff and clinical leaders from seven clinical programmes.

Results 66 individuals participated in interviews. Participants described that Epic's implementation impacted communication and teamwork, workflow and efficiency, and patient care, with these impacts varying across different programme settings. Participants reported that Epic improved inpatient care and safety, communication and teamwork, workflow and efficiency. However, several programmes also experienced challenges, including information overload and increased clerical tasks, impacting workflow efficiency. In programmes with an outpatient component, such as surgery and oncology, there were additional difficulties, such as connecting with external partners, user interface complexities that hindered task completion and concerns about potential compromises in patient care quality.

Conclusion Health systems must consider the diverse needs of various clinical programmes when implementing an EHR. Customising the system interface and iteratively codesigning how health system staff incorporate the technology into their workflows are crucial to ensure an EHR seamlessly integrates across different settings, fosters high-quality care delivery and minimises user friction.

INTRODUCTION

Despite the benefits of electronic health records (EHRs), implementing an EHR can

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ We interviewed a diverse sample of healthcare providers, administrative staff and clinical leaders from multiple clinical programmes with varying experiences (eg, those with additional training or who found using the electronic health record (EHR) challenging or easy).
- ⇒ Implementation of the EHR was conducted during the COVID-19 pandemic, potentially influencing participant experiences and perspectives and impacting the implementation process, training and workflow customisation.
- ⇒ Our study was conducted in a single organisation, which helped to tease apart factors impacting EHR implementation that stemmed from the organisational versus clinical programme context.
- ⇒ Participant experiences may vary in transferability to hospitals with different organisation structures, sizes, clinical programmes or EHR systems.

be challenging.¹⁻³ Perceived complexity, insufficient user training, resistance stemming from limited understanding of EHR benefits, and poor fit between workflow and technology can all hinder the integration process.^{1 4 5} With increasing health system complexity and decreasing workforce capacity for additional tasks and responsibilities, an EHR must be flexible and cater to the needs of those who use it.^{2 5 6} When EHRs are customised, implemented and integrated into care, the varied priorities, care networks and cultures of teams across different clinical environments must be considered to optimise their use.

While EHRs have been evaluated at the organisation level^{2 5 6} and in some specialties such as emergency medicine and oncology,⁷⁻¹⁰ there is a gap in contrasting how EHRs have

differential impacts and interface with workflows across programmes within a single organisational context. In our study, we were more likely to tease apart factors that differentiate clinical programmes and hospital systems by keeping the latter consistent. While the literature examines experiences from different clinical programmes in different organisational contexts, a challenge remains in teasing apart organisation context and clinical programme factors that may impact EHR implementation. Incorporating technology in clinical practice is a sociotechnical phenomenon, involving the interaction between people, social systems and technology, requiring a fit between these elements to be successful.^{9 11 12} Given the varying contexts EHRs are deployed in, there is a need to understand how different practice settings (often within the same organisation) and people experience their associated benefits and challenges to guide future EHR implementations or improve existing ones. Our objective was to understand unique user experiences of an EHR implementation across different clinical programmes, and how, why and in what circumstances its features and functionalities are well integrated or introduce friction.

METHODS

Setting

This study took place at Trillium Health Partners (THP), a large Canadian community hospital serving Mississauga and West Toronto. THP operates three sites with 1457 inpatient beds, recorded over 1.7 million patient visits in 2023–2024,¹³ and offers emergency, inpatient, surgical, rehabilitation services, specialising in oncology, nephrology, cardiac and neurosurgery. Epic, a globally used EHR,¹⁴ was implemented across all THP sites in October 2020. Prior to its implementation, each site had separate instances of legacy systems that not only fragmented continuity of care but also lacked modern features such as computerised provider order entry and electronic documentation. In collaboration with the vendor, working groups comprised of select leaders and providers from clinical programmes were established to make software configuration decisions prior to implementation to reflect the workflow and operational realities of our organisation.

Study design

This study was part of a larger multi-method evaluation assessing the effect of Epic's implementation on patient outcomes and experiences, provider experiences, productivity and cost. Our objective was to explore how users in different clinical programmes experienced the integration and potential friction points associated with Epic's features and functionalities. As our focus was on implementing technology in a healthcare setting, we used the Consolidated Framework for Implementation Research (CFIR) and Human Technology Organisation fit (HOT-fit) concepts to explore the relationship between Epic, the clinical programmes, and the users involved.^{11 12}

Following Standards for Reporting Qualitative Research guidelines, we conducted a qualitative description study to describe seven clinical programmes' (mental health, oncology, rehabilitation, surgery, medicine, palliative care and emergency care) interactions with Epic in the first few years of implementation.^{15 16} These programmes were chosen due to their diverse contexts, professional teams and patient needs, enabling a comparative analysis of how a single EHR system differentially impacts provider workflows across a variety of clinical programmes within one hospital system.

Participants

We recruited healthcare providers (registered nurses, registered practical nurses, physicians, allied health professionals and pharmacists), leaders (clinical managers, directors, chiefs and division heads) and administrative staff (registration clerks) from each programme. Our recruitment strategy included purposive sampling, maximum variation and snowball sampling.¹⁷ Purposive sampling ensured participants were associated with one of the seven programmes and used Epic. Maximum variation sampling was used to recruit individuals with a wide range of experiences and perspectives, including variation in health professions, prior experiences with an EHR, additional training with Epic, involvement in implementation and perceived ease with the transition to Epic. Participants were recruited through poster advertisements, emails from leaders and word of mouth. Potential participants were directed to contact a research associate, who ensured they would bring a unique perspective to the study's aim, addressed their questions and provided an informational sheet on the study. The THP Research Ethics Board approved this study (#1062).

Data collection

Participants were invited to one semistructured interview with a qualitative researcher (CLH). Participants provided verbal consent at the start of the interview. Interviews were conducted between 12 May 2022 and 20 April 2023, via Zoom or telephone. Interviews lasted between 18 and 80 min and were audio-recorded and transcribed verbatim. Data collection continued until information power was achieved. Specifically, we defined this as interviewing a minimum of five respondents across at least three roles, representing a broad range of perspectives and skill levels in each clinical programme, and ensuring alignment with the study's purpose, sample specificity, dialogue quality and analysis strategy.¹⁸

Participants were asked to describe their experiences with Epic both at the time of implementation and during the interview, including positive experiences, challenges and opportunities for improvement. The interview guide was informed by CFIR and HOT-fit concepts,^{11 12} focusing on the perceived fit of human, organisation and technology, but with space to explore other emergent topics (online supplemental material).

Data analysis

We conducted the analysis in two phases. In the first phase, a thematic analysis¹⁹ was conducted, where CLH and JN initially familiarised themselves with the interview data, generating codes and developing a draft codebook. This codebook, along with some transcripts, was shared with the broader team for feedback and then revised. Prioritising intersubjectivity, CLH, JN, LS and SV applied the codebook to the remaining transcripts, resolving coding discrepancies through discussion to ensure shared understanding of recurring patterns and concepts. Each transcript was then reviewed by another team member (RG, ST, SV, JN, CLN and LS) to further ensure coding consistency. High-level codes differed from subthemes, which provided more detail within the broad categories. Through rounds of collaborative discussion with the broader team, the recurring patterns and concepts were then defined as themes. These themes were analysed to understand how they contributed to user experiences within and across different clinical programmes. In the second phase, RG, ST and SV used the codebook to apply a constant comparative method²⁰ to examine the similarities and differences in user experiences between programmes. NVivo 12 was used for qualitative analysis.

Patient and public involvement

As healthcare providers and health system staff are the sole users of Epic and participants in this study, we did

not involve patients or members of the public in its development or conduct. We acknowledge that Epic has a role in impacting patient care, but given the study objectives to explore provider experiences and perceptions of Epic, patient and public involvement did not seem appropriate. Members of the study team (TT, CH) are healthcare providers and contributed their perspectives to the study's design, data collection and analysis.

RESULTS

66 individuals across seven clinical programmes were interviewed: 37 healthcare providers, 4 administrative staff members and 25 leaders. Table 1 summarises participants and their clinical programme settings.

Participants from each clinical programme shared their experiences about Epic's impact on interprofessional collaboration, workflow and efficiency, and patient care, which are summarised in themes below. While Epic's implementation was hospital-wide, the perceived benefits and challenges varied by programme according to the unique needs, patient populations, multidisciplinary healthcare provider teams and structure of each.

Impacts on interprofessional collaboration

Participants perceived that Epic's messaging feature improved communication and care planning, facilitating

Table 1 Clinical programme participants and characteristics

Programmes	Participants	Description of setting
Emergency	n=8 Five healthcare providers, three leaders	High acuity and time pressure due to the need for rapid assessment, intervention and decision making in urgent or critical situations. Providers have no longitudinal relationship with patients.
Surgery	n=12 Five healthcare providers, two administrative staff and five leaders	Encompasses both ambulatory and acute care settings, involving surgical procedures and outpatient clinics.
Oncology	n=8 Three healthcare providers, two administrative staff and three leaders	Ambulatory focus (with some acute care) involves complex treatment regimens for longitudinal and pathway-driven care.
Medicine	n=11 Six healthcare providers, five leaders	High information needs due to diagnostic reasoning, long-term management of chronic illnesses for complex patients and coordination of care across multiple specialties. Ambulatory and acute inpatient care.
Mental Health	n=9 Five healthcare providers, four leaders	Addresses patients' psychosocial needs through collaboration with interdisciplinary teams and community partners, with less reliance on diagnostic services and more on patient narratives. Ambulatory and inpatient care.
Palliative Care	n=6 Four healthcare providers, two leaders	Provides comprehensive care to inpatient, ambulatory and at-home patients. Characterised by complex needs and extensive care coordination, there are many interfaces with the community.
Rehabilitation	n=12 Nine healthcare providers, three leaders	Non-acute area integrated with community-based programmes to care for patients recovering from illness or injury.

collaboration and reducing reliance on sourcing information from emails, pages and phone calls.

You're able to send a message around a specific patient to five or ten different specialists, even nurses, administrators and the clinic leaders who all come together. Radiologists, gastroenterologists, they all come together for the betterment of patient and find that many times I was able to arrange a certain step for patient care in an effective, timely fashion thanks to messaging feature (Surgery, Physician 09).

Although messaging offered benefits, there were some unintended consequences of this new communication route. Participants in medicine and emergency programmes highlighted challenges such as information overload from multiple irrelevant messages, decreased face-to-face interactions and distractions while attempting other tasks. For example, in the high-pressure, fast-paced emergency room, messages became a burden to sift through, particularly when crucial updates were buried by non-essential information.

There's a chat function that I do find helpful, in some situations. Like if I want to, you know, send somebody an email, that I've seen their patient, and it's 4 o'clock in the morning, I can say, hey, by the way, your patient was here, I've sent them home. This is what's happened to them, and that's helpful. But on the flip-side, nurses can also send me chats and sometimes it gets overused. Every time I try to do something, I get these pop-up screens with people telling me what so and so had for breakfast. That's not necessarily like a problem related to Epic. Sometimes people over-use it or are almost too communicative (Emergency, Physician 13).

While Epic created a comprehensive overview of patients' medical histories, challenges persisted in teams collaborating on patient care. Participants from all programmes expressed difficulties finding the same information or updating a chart due to varying role-specific interfaces. For example, a physician and a nurse viewing a patient chart may see the same information displayed differently, resulting in wasted time searching for or cross-validating information rather than providing care.

In palliative care and rehabilitation, there are challenges in collaborating with community partners, where Epic is not the primary EHR. This prevents timely updates from being reflected in Epic, leading to gaps in care coordination and forcing providers to rely on inefficient workarounds. These gaps existed prior to the EHR implementation and were not resolved with Epic.

Impacts on workflow and efficiency

Epic had a mixed impact on workflow and efficiency; while participants in some programmes reported streamlined tasks and improved care, others faced challenges that required workarounds that may have hindered care quality.

Streamlining workflow processes

Individuals from all programmes noted the advantages of centralising records for multiple hospital sites and clinical units, which enabled easy access to documentation across encounters and eliminated challenges with deciphering handwritten notes or contacting colleagues for patient updates. In programmes such as medicine that have a high volume of information, Epic enabled comprehensive and timely care:

[...] it's a lot easier to—like say if I'm covering for a colleague who's post-call and a family needs information about their loved one, I can go to Epic. I can quickly figure out exactly what (my colleague is) thinking from their last note or from all the information that's available and I can go into that room, and I can provide them (the patient) with a reasonably good update. [...] You weren't able to do that before (Medicine, Physician 04).

In rehabilitation, emergency and surgery, where orders or tasks are frequently repeated, Epic's flowsheets (where clinical data are routinely documented), prepopulated templates and lists improved documentation and efficiency. In surgery, photo documentation supported better care management and template lists helped prepare daily schedules and follow-up tasks. Epic's documentation requirements facilitated smoother provider handoffs and fostered training opportunities for consistent care delivery.

And it just makes people more accountable, which I like. Because then I can go back and see if somebody did something, like put a cast on and it wasn't done properly. Then I can follow up and re-teach them and see where there are issues. Where before it was difficult because it was all writing, so you would sign but sometimes you can't tell what they signed or who wrote it (Surgery, Allied Health 06).

Surgery, rehabilitation, mental health and palliative care participants noted the advantage of access to Epic through a mobile app, enabling them to view and update information remotely. Palliative care, where home visits are common, significantly benefitted from remote access, citing streamlined workflows and enhanced communication with patients.

Workflow and efficiency hurdles

Programmes with outpatient components such as oncology, palliative care, mental health, rehabilitation and surgery faced difficulties with the user interface, which differs for inpatient and outpatient settings, despite organisational efforts to customise how Epic serves different programme contexts prior to implementation. Many participants noted that the system prioritises inpatient needs, overlooking outpatient tasks such as booking appointments and sending prescriptions to pharmacies.

Like the whole system itself where we feel very left out, in that our day-to-day functionality of it we feel—our perception is that we weren't maybe asked—maybe somebody was there being asked, but we definitely feel like there's a lot of things missing or weren't considered for the outpatient setting. So, it does make our lives a little bit more challenging of us having to kind of find workarounds (Oncology, Nurse 10).

Previously simple tasks such as charting, placing orders and administering medications became more complex in Epic. For instance, many physicians formerly used paper requisitions, selecting orders and handing them to administrative staff to process. However, with the new system, physicians were required to complete these tasks themselves, adding to their workload. Outpatient healthcare providers in surgery, oncology and emergency reported seeing fewer patients due to these extra processes, which exacerbated challenges with high patient volumes.

When the doctor goes in and sees the patient it's usually like a one [minute], two [minutes] conversation. They look at the X-ray, they say, OK, everything looks good, we'll see you in two weeks. They go the computer and then they're spending time doing all those clicking and then they've got to move to the next patient. So, before where they were able to get to 25 people in half an hour, they can't do that anymore (Surgery, Allied Health 06).

While flowsheets and templates improved workflows in surgery and rehabilitation, participants in oncology and palliative care found these features to be confusing and inadequate. Providers were offered multiple locations to document the same information within a patient's chart, which led to redundancy and wasted time when looking for or documenting information. One palliative care physician stated that due to the prescriptive nature of Epic's flowsheets and templates, some narrative aspects of patient care were not captured, lacking significant contextual information that is needed for comprehensive care.

[...] But I'm really missing the idea of, 'Well my friend nurse, what do you think of this patient? How do you feel they're doing? Are they coping, are they not coping? Are they better than they were yesterday, are they worse?' When you hand over to your colleague, 'Have you noticed a deterioration or have you not?', there's nowhere to really document that in Epic very well. So, I find that communication between me and the nurse, I have to chat with the nurse in order to understand, and if the nurse doesn't know what happened the day before then they don't really have a great assessment to tell me, so I feel things are missed (Palliative Care, Physician 06).

Impact on patient care quality and efficiency

Participants perceived that increased accountability in charting and administering medications that Epic provided led to improved patient safety, although some in rehabilitation and medicine expressed that medication barcode scanning could be tedious.

And even myself trying to give a medication, like you're scanning through stuff and something as simple as slapping a medication onto a bag and then signing it off that you've given it it's now become like such a complex process. Which I know in terms of patient safety that it's great to improve that, but in terms of workload, it does affect the workload (Medicine, Nurse 18).

Individuals across all programmes noted that even though a patient-facing portal was not yet available at THP, Epic helped with bedside communication through quick access to charts on mobile devices. However, a few providers in emergency and rehabilitation expressed concerns that patients perceived they were inattentive or distracted by technology, potentially hindering their overall relationship.

[...] I think it's disrespectful if they've been waiting hours and hours to see me and the least I can do is give them my attention for five or 10 minutes that I'm in the room. So I won't (type notes in front of a patient). But again, because I choose not to do that, I have to then go back and sit down and do all—do the dictation, which probably takes me a little bit longer than it might otherwise (Emergency, Physician 13).

In addition to providing patients with comprehensive updates, participants in emergency and rehabilitation programmes described how Epic allowed them to quickly create after-visit summaries for patients using templates, which supported continuity of care and efficiency.

DISCUSSION AND CONCLUSION

This study explored experiences of implementing the Epic EHR across seven different clinical programmes in one large Canadian health system. Our 66 participants shared that Epic's implementation affected collaboration and teamwork, workflow and efficiency, and patient care in distinct ways depending on their clinical programme. For instance, communication within multidisciplinary teams improved in all programmes, but for outpatient-focused programmes such as rehabilitation and palliative care, integrating services with external community partners was challenging. Epic improved real-time documentation clarity and comprehensiveness in multiple programmes, such as surgery and medicine, by providing the ability to use photos, remote charting features and templates in patient records. However, it sometimes lacked consistency for where information was recorded, simple tasks became more complex, and some providers in multiple programmes expressed concern about sacrificing their

available bandwidth to deliver high-quality care and build relationships with patients because of additional time they spent in the system.

The standardised infrastructure of a common EHR for a differentiated multiservice hospital presents a sociotechnical challenge⁹ that impacts local implementation, acceptability and perceived clinical utility at the programme level. This challenge arises from the need to balance the benefits of standardisation with the unique requirements and preferences of clinical programmes. Even though Epic's interface and features were customised to some extent pre-implementation, some participants felt opportunities to participate in this process were insufficient and that the organisation could have better configured Epic to integrate well with their workflows. Following Epic's implementation, participants described navigating the new system and working through challenges either independently or with their local teams, but iterative codesign and adjustments following implementation could have further reduced friction and optimised how healthcare providers continually adjusted to Epic.²¹

While respondents agreed that communication and patient safety improved with Epic, inpatient programmes tended to experience more advantages than outpatient ones due to their structured workflows and relatively centralised healthcare providers and staff teams. Outpatient programmes, particularly those that foster long-term patient relationships, faced difficulties maintaining up-to-date patient records and communicating with external care providers. These challenges were further exacerbated in programmes such as emergency, which often serves new patients and involves interactions with various clinical units.

Existing literature aligns with our results^{8 9 22–24} and highlights the variable impacts of EHR implementation across clinical programmes' differing workflows and efficiencies, team dynamics and patient needs. For instance, Brockstein *et al* reported enhanced efficiency in an oncology hospital setting, notably in documentation and interprofessional communication.¹⁰ Conversely, Price *et al* found that while EHR implementation in emergency medicine made some tasks easier and enhanced patient care, many staff members perceived that efficiency was not improved.⁸ Especially when healthcare providers and staff are required to prioritise documentation or clerical tasks over patient care, the risk of burnout increases, which jeopardises health system capacity and high-quality healthcare.²⁵ Exploring options for customising the EHR, such as role-based functionalities and streamlined communication channels between outpatient programmes and external service providers, could mitigate these challenges. Implementing a codesign approach where a diverse group of EHR users from different clinical programmes is involved in ongoing modifications and updates both pre- and post implementation can also support a more user-friendly, agile and efficient system.

Strengths and limitations

Our study provides understanding of the benefits and challenges of EHR implementation across different clinical contexts in a unified system. We included a diverse sample of healthcare providers, administrative staff and clinical leaders from multiple programmes with varying experience: those who received additional training; those who found the implementation difficult; those who found it easy and those who joined the organisation after implementation. Using a single interviewer (CLH) fostered a reflective approach, allowing for ongoing adaptation of the interview guide through team discussions about adding new questions and revising existing ones to capture new ideas. This, combined with a 2-year post implementation interview period, allowed for a thorough understanding of the implementation experience over time.

This study also had limitations. Unique organisational attributes of our hospital system could mean that some findings may not be transferable to hospitals with different structures, sizes or programmes, or a different EHR. Epic was implemented and most interviews were conducted during the COVID-19 pandemic, and the experiences and perspectives of participants may have been driven by the unique demands, challenges and pressures of that time. Additionally, some interviews were conducted over a year post implementation, which may have made it difficult for participants to recall particular details, potentially introducing a recall bias. While we attempted to mitigate this by building on earlier ideas shared by others to assess resonance, the potential for this bias cannot be entirely discounted. The pandemic also significantly impacted Epic's implementation, as border closures prevented onsite vendor support and staff redeployment necessitated a temporary project pause. These factors, coupled with the closure of outpatient clinics, hindered the ability to tailor Epic to specific workflows and adequately train staff.

Recommendations

Our findings offer several recommendations for other unified health systems implementing an EHR, particularly in health systems with similar structures, connectivity and EHR adoption readiness to those in Canada. Far in advance of and following implementation, EHR customisation and codesign with a diverse group of staff is imperative to understand how technology can support everyday routines, streamline tasks and foster better communication, documentation and patient care with minimal friction. Rather than individual users navigating challenges following implementation, ongoing engagement and iterative optimisation can support program-specific needs, better provider work experiences, standardised workflows and higher quality care. Although Epic streamlined communication and enabled comprehensive and organised documentation in our study, sometimes these benefits became areas of friction when too many communication channels or different record-keeping options

were introduced. Establishing communication and documentation standards for core functionalities could maximise the benefits of these features. Overall, participants viewed Epic as a useful tool that offered more benefits than drawbacks; despite these benefits and the proactive approach taken in our context to mitigate challenges, a universal ‘big bang’ EHR implementation created friction in the initial stages of implementation. Proactivity, extensive staff support and engagement, and context-driven consideration around how EHRs are implemented and continuously integrated into diverse clinical environments are key to support good healthcare provider experiences and high-quality care.

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Patient consent for publication Not applicable.

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