Implementing Electronic Health Records – Objectives, Obstacles, Outcomes

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Abstract. Electronic health records (EHRs) support healthcare professionals in their treatment of patients by providing the means to order, document, and follow up on the steps taken to care for each patient. To fulfil this function, EHRs are complex systems with numerous features and associated work processes. As a result, the implementation of EHRs in healthcare institutions is a major undertaking, which has received sustained attention in computer-supported cooperative work (CSCW) and other research fields. This workshop aims to provide a forum for participants to get updated on current CSCW studies of EHR implementations and create connections with a select group of researchers who study EHR implementations from a CSCW perspective. Within the overall theme of implementing EHRs, the workshop specifically focuses on the objectives, obstacles, and outcomes of such implementations. The key activities at the workshop will be presentation of the participants' position papers and thematic group discussion.

Introduction

The use of information technology for supporting the coordination, documentation, and safe conduct of healthcare work has received sustained attention in computer-supported cooperative work (CSCW) research (Fitzpatrick and Ellingsen, 2012). This long-term attention continues in studies of the many recent and ongoing implementations of electronic health records (EHRs), which are the healthcare sector's equivalent of large-scale enterprise resource planning systems (e.g., Bossen and Piras, 2020). While this research has a strong footing in CSCW, it extends into health informatics, human-computer interaction, information systems, and other fields. A bewildering array of new studies appears every year; it is difficult to stay up to date. This workshop is the second in a series that started at the previous ECSCW conference (Hertzum et al., 2023). The workshop provides a forum for getting updated on current studies and creating connections with other CSCW researchers who study EHR implementation.

EHR implementation and use

The overarching objective of EHRs is to support patient treatment by providing healthcare professionals with the means to order, document, and follow up on the steps taken to care for each patient. This overarching objective entails a number of more specific objectives, such as avoiding medication errors (Bates, 2000), improving interprofessional communication (Winman and Rystedt, 2012), reducing data fragmentation (Bansler et al., 2011), and increasing the reuse of EHR data for statistical and research purposes (Pine et al., 2016). In many EHR implementations, the objectives are stated in an atmosphere of high expectations. While this atmosphere helps create momentum, the expectations sometimes result in promises about outcomes that appear very optimistic. For example, the CIO of one of the two healthcare regions in a recent Danish EHR implementation stated during the preparations for go-live (Hertzum et al., 2022):

> We are lowering our cost, we are getting better quality, we are getting better patient satisfaction, and we are getting better processes and so forth. It is a win-win all round […] There is absolutely no reason not to move in this direction.

Large-scale EHR suites, such as those supplied by CERNER and EPIC, integrate still more intra-organization information into one database and also increasingly support interorganizational workflows (Winblad et al., 2011). However, the increased information sharing among healthcare professionals is also realized through smaller projects that employ bottom-up and user-driven processes. In these smaller projects, EHRs and EHR extensions enter use through processes of gradual enrolment rather than mandated adoption (Aanestad and Jensen, 2011; Dæhlen and Grisot, 2021).

While the objectives may dominate during the processes of project chartering and implementation preparations, obstacles often take center stage when EHRs go live and start having consequences for clinical work and patient treatment. Because EHR implementation is a complex endeavor, only some of the consequences of the EHR outputs can be planned ahead; the rest emerges in use and will likely include both positive and negative surprises. These surprises have led to a discourse about the last mile of EHR implementation (Cabitza et al., 2020; Coiera, 2019). This discourse highlights the obstacles that delay, redirect, or discontinue EHR implementations. Sometimes systems are rejected by the intended user group and, instead, adopted by another user group for related, but different, purposes. For example, Aarts and Berg (2006) found that a computerized physician order entry (CPOE) system was rejected by the physicians but adopted by the nurses, who saw it as an opportunity to document nursing care. On other occasions, the implementation efforts involve multiple innovation tactics to create conditions conducive for adoption, yet adoption remains unattained (Gyldenkærne et al., 2024). The obstacles that cause the delays, redirections, and discontinuations include slow and unintuitive user interfaces (Aarts and Berg, 2006), mismatches between the EHR and the work processes it is intended to support (van den Hooff and Hafkamp, 2017), errors in the interfaces for integrating the EHR with other health information systems (Viitanen et al., 2011), and concern among the users that, once implemented, the EHR will be a 'huge colossus' that is difficult to adapt to clinical needs, which evolve continuously (Ellingsen et al., 2022). Among the underlying reasons for these issues, researchers point to ineffective user participation in the many decisions that precede go-live (Zahlsen et al., 2023) and insufficient understanding of user practices among IT staff (Eikey et al., 2015).

Despite the obstacles, the use of EHRs is associated with several positive outcomes. For example, the 1727 physicians surveyed by King et al. (2014) found that EHR use enhanced patient care overall (78% of respondents), alerted them to potential medication errors (65%), and notified them of critical lab values (62%). In addition, 30-50% of the surveyed physicians reported that EHR use had benefits related to providing recommended care, ordering appropriate tests, and facilitating patient communication. Relatedly, Rotenstein et al. (2022) surveyed 291 primary care physicians about their EHR use and found that each additional 15 minutes of daily EHR use was associated with significant increases in the quality measures of hemoglobin A1c control, hypertension control, and breast cancer screening rates. However, these positive outcomes are tempered by findings that EHRs obstruct the building of a coherent patient history (Varpio et al., 2015), necessitate workarounds to coordinate clinical workflows (Mörike et al., 2024), and lead to increased documentation burden (Baumann et al., 2018). In some cases, the increased documentation burden has led to burnout or even to physicians who hate their computers (Gawande, 2018). These unintended outcomes show that the consequences of EHRs become salient to clinicians after the EHRs have entered

daily use and after decisions about their design and planned use have been made (Wagner and Newell, 2007). However, the unintended outcomes also show the need for continuing implementation activities during use. These continued implementation activities are needed to mitigate negative effects and to realize benefits that have not yet materialized but still appear attainable. In these implementation activities, it is important to avoid using new EHRs to mimic old ways of working but rather to exploit the opportunities for creating better clinical practices (Islind et al., 2019).

Aim

In continuation of the workshop at ECSCW2023, this workshop aims to provide a forum for participants to get updated on current CSCW studies of EHR implementation and create connections with a select group of CSCW researchers who study such implementations. Three additional aims supplement this primary aim. By bringing the workshop participants together, we hope that cross-fertilization will ensue among their focal questions, their conceptual frameworks, and their empirical cases. Second, we will collaboratively reflect on what CSCW contributes to the study of EHR implementation and how we, as individuals and a community, can facilitate the transfer of these contributions to practice. Third, we will discuss the interest in further networking initiatives about investigating EHR implementation from a CSCW perspective; the possibilities include a third workshop at the next ECSCW conference.

Workshop themes

The workshop is about the objectives, obstacles, and outcomes of implementing EHRs. Within this overall topic, the workshop themes include, but are not limited to, the following:

- Case analyses of EHR implementations at different stages of completion – from vendor selection, through configuration and training, to design-in-use
- Conceptual pieces that propose models or frameworks for understanding EHR implementation and begin to apply, refine, and validate them
- Discussions that expound critical features of EHR implementation, such as increased documentation burden, reduced data fragmentation, and so forth
- Studies of the many stakeholder groups that are affected by EHRs and of the conditions for these groups to make their voices heard in EHR projects
- Methodological reflections on how to conduct studies, manage research data, and behave ethically amid clinicians, patients, and EHR vendors

- Comparative studies that call attention to how situated practices determine EHR outcomes across the modules, groups, or sites in an implementation

Participant recruitment and selection

The workshop can accommodate a maximum of ten participants (in addition to the organizers). Participants will be recruited from the CSCW, health informatics, human-computer interaction, and information systems communities. The organizers will reach out to these communities through their extended research networks and by circulating a call for participation on relevant mailing lists, such as EUSSET. Detailed information about the workshop will be made available at our workshop website.

Participation in the workshop requires the submission of a position paper. We encourage potential participants to explain their interest in the workshop and particularly welcome position papers that address one (or more) of the workshop themes outlined above. Position papers are limited to a maximum of six pages (excluding references) in the ECSCW paper format.

The submitted position papers will be reviewed by the organizers on the basis of the relevance and development of their content. If the number of people interested in attending the workshop exceeds its capacity, the organizers will prioritize submissions that make for rich presentations and discussions, while also seeking diversity among the participants. We encourage both junior and senior researchers to submit position papers. To promote participation from practitioners, we also offer the option of submitting alternative material of rough equivalence to a position paper (e.g., an experience report or abridged implementation plan).

Workshop activities

The workshop is a half-day, on-site event. Online participation will not be possible. The agenda will involve four activities:
- *Introductions*. The organizers introduce the aim and agenda of the workshop. Participants introduce themselves and their interest in EHR implementation.
- *Paper presentations*. All participants present their position paper, followed by discussion. The discussion is key and should provide for cross-presentation issues to emerge. The organizers have a special responsibility for drawing attention to such issues.
- *Thematic discussions*. Participants split into break-out groups of about four people to explore the workshop themes further. The aim of these discussions is to delve deeper into issues from the presentations and to provide room for inspiration and debate.

- *Wrap-up*. To summarize the workshop, the break-out groups give highlights from their discussions. The organizers will also probe the interest in a third workshop at the next ECSCW conference or in other initiatives to support further networking and collaboration.

Equipment needs

In addition to a room with wifi and projector, we will merely need flipchart-size paper and markers.

Organizers

The workshop is organized by four senior researchers who have investigated EHR implementations for decades and are currently involved in research projects about such implementations in different European countries. The workshop organizers have a longstanding engagement with the CSCW community.

Gunnar Ellingsen is professor in health sciences at UiT - The Arctic University of Norway, Department of Health and Care Sciences. Gunnar has for several years studied the implementation and use of large-scale EHRs in Norwegian hospitals. Currently, he is engaged in the Norwegian implementation of EPIC's EHR, artificial intelligence in radiology practices, and electronic medication management. His research interests are in information systems, CSCW, and health informatics.

Miria Grisot is associate professor in Information Systems in the Digital Innovation group at the Department of Informatics, University of Oslo. Her research interests are in information systems, CSCW, and health informatics with a focus on user-driven approaches, information infrastructures, and continuous design. Currently she is involved in projects about the implementation and scaling of technologies for remote care in Norway and China, and about the development and design-in-use of interorganizational infrastructures in primary care.

Morten Hertzum is professor of digital technology and welfare at Roskilde University, Denmark. His research interests are in CSCW, health informatics, human-computer interaction, participatory design, and organizational implementation. He has been studying the implementation of information technology in healthcare for the past two decades. Currently, he is involved in projects about electronic medication management and the implementation of EPIC's EHR in the Nordic countries.

Anna Sigridur Islind is associate professor in information systems at the Department of Computer Science at Reykjavik University in Iceland. Her area of interest is information systems, CSCW, and health informatics in general and data-driven research with a focus on co-design, development, and use of digital platforms, mobile applications, and emerging technologies for improving human

conditions, in particular. She leads the digital innovation in Sleep Revolution, a 15 million Euros project funded by the European Union with a large-scale consortium of 39 partners across Europe.

Acknowledgments

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