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Implementing Electronic Health Records – Activities, Actors, AI

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Abstract. Electronic health records (EHRs) support healthcare professionals in their treatment of patients. To fulfil this function, EHRs include increasing numbers of artificial intelligence (AI) components to analyze images, recommend actions, and issue warnings. Because of their numerous technical features, EHRs affect many groups of actors and require their competent performance of a variety of activities. As a result, the implementation of EHRs in hospitals and other healthcare institutions is a major undertaking, which has received sustained attention in computer-supported cooperative work (CSCW) and related research communities. This workshop aims to provide a forum

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for participants to get updated on current CSCW studies of EHR implementations and create connections with a select group of CSCW researchers who study such implementations. Within the overall theme of implementing EHRs, the workshop specifically focuses on the activities, actors, and AI involved in implementing and using EHRs. The key activities at the workshop will be presentation of the participants' position papers and thematic group discussion.

Introduction

Information technology is instrumental to the coordination, documentation, and safe conduct of healthcare work, but it also introduces extra work, increases clinicians' workload, and creates new classes of medical errors. The multisided interactions between technology and healthcare have received sustained attention in computer-supported cooperative work (CSCW) research (Fitzpatrick and Ellingsen, 2012). This long-term attention continues in studies of the implementation and use of electronic health records (EHRs), which over the last decades have replaced paper records in countries worldwide (WHO, 2016). New studies appear every year in CSCW as well as in health informatics, human-computer interaction, information systems, and other fields. This workshop is the third in a series that started at the ECSCW conference in Trondheim and continued in Rimini (Hertzum et al., 2023; Ellingsen et al., 2024). The workshop provides a forum for getting updated on current studies and creating connections with other CSCW researchers who study the implementation and use of EHRs.

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. Meeting this objective involves numerous *activities*. Many of these activities relate directly to patient treatment by assisting diagnostic decisions (Zhang et al., 2024), improving access to patient information (Boyer et al., 2010), and avoiding medication errors (Bates, 2000). However, EHRs also lead to troublesome activities, such as those associated with increased documentation burden (Joukes et al., 2018) and EHR-related errors (Carayon et al., 2017). These negative outcomes of EHR use are often associated with poor user interfaces. For example, the user interfaces of EHRs tend to necessitate considerable navigation within and between displays to enter or collect the information involved in a task (Roman et al., 2017). In addition, the process of implementing EHRs is itself lengthy and labor consuming. Franks et

al. (2024) found that 44% of the optimizations made during a four-months period after an EHR went live were discoveries of functionality available in the EHR but unknown to the users. This finding reiterates the need for local follow-up activities after go-live to benefit from EHRs (Simonsen and Hertzum, 2022). Another 35% of the optimizations were workflow adjustments that became necessary because a digital fix for EHR limitations was deemed impossible (Franks et al., 2024). That is, workarounds are also a common activity in the implementation of EHRs. One reason for the EHR limitations that lead to workarounds is ineffective user participation in the many decisions that precede go-live (Zahlsen et al., 2023). Several CSCW studies have investigated the activity of user participation in EHR projects to understand how it is organized and why it is often ineffective (e.g., Büscher et al., 2009; Ellingsen et al., 2022; Mehmood and Farschchian, 2021; Zahlsen et al., 2023).

To perform the many activities that are part of implementing and using EHRs, a variety of *actors* are involved. The variety is increasing with the increasing scope of EHRs. Large-scale EHRs, such as the EHR suites supplied by CERNER and EPIC, cover still more intra-organization information but also increasingly support interorganizational workflows (Solvang et al., 2024). For example, the EPIC implementation in Finland spans acute healthcare at hospitals, long-term care in nursing homes and home care, and parts of social care in the municipalities (Hertzum et al., 2022). While acknowledging that integrated suite-type systems have advantages when it comes to documentation, Tjora and Scambler (2009) find that '*It is not at all obvious that large integrated systems will produce the most effective and reliable results, especially if introduced in ignorance of the hospital as a negotiated order.*' By emphasizing negotiated order, they emphasize the actors.

Hospital physicians are well-represented in studies of the implementation and use of EHRs (e.g., van Swol et al., 2020). Their specialist needs may overshadow the needs of healthcare providers with more generalist tasks, including general practitioners (GPs) who worry that interorganizational EHRs will mainly be designed for hospitals rather than for general practice (Ellingsen et al., 2022). Nurses are also well-represented in studies and employed in hospitals as well as municipal healthcare. Overall, nurses tend to be more satisfied with EHRs than physicians are (e.g., Lääveri et al., 2025). Many other staff groups are also involved in EHR implementations but less commonly represented in studies. For example, EHRs have facilitated task shifts that increase pharmacists' role in keeping tabs on the side effects of psychiatric patients' medication (Bech et al., 2024). Furthermore, studies have called attention to the importance of secretaries in healthcare work though they are often disregarded in the design of EHRs and in the preparation of EHR implementation (Møller et al., 2020). Healthcare actors often work in interprofessional teams that experience tension when EHRs are used for tasks

that cross organizational boundaries (e.g., Marcu et al., 2021). Healthcare actors also participate in EHR development and implementation projects and, thereby, collaborate with analysts, designers, change managers, and others (e.g., Branco et al., 2024; Papoutsi et al., 2021). To bridge the participants' different competencies, such collaborations require careful planning from the outset of a project, clear communication throughout the project, and ample time for the design process to unfold (Mangal et al., 2024). In spite of such efforts, clinicians often feel ill-equipped to participate in development activities (Martikainen et al., 2012).

Lately, *artificial intelligence (AI)* has emerged as yet another actor in relation to EHRs. In radiology, AI-based EHR modules achieve good performance for tasks such as analyzing patients' medical images (Yildirim et al., 2024). In sepsis detection, AI has been successfully integrated in routine clinical care and supports the early detection of this life-threatening infection (Sendak et al., 2020). In making medical documentation more accurate and complete, AI supports clinical specialists by scanning EHR data and auto-suggesting documentation codes based on natural language processing (Bossen and Pine, 2023). While AI has been successful in some real-life settings, it has in many others proven difficult to transfer promising results in tests to actual benefits in routine practice. These difficulties have led to a discourse about the last mile of EHR implementation (Cabitza et al., 2020; Coiera, 2019). This discourse highlights the obstacles that annul, complicate, or delay the realization of the benefits expected from the AI components in EHR implementations. Often, the success of AI is dependent on substantial manual work to provide high-quality data in sufficient amounts for the AI to perform accurately (Mønsted, 2019; Sun et al., 2023). In the successful cases, the early AI performance is sufficiently good to motivate more and better data recording, which in turn improves AI performance, motivates even better data recording, and so forth. In the other cases, the implementation enters a vicious cycle, in which performance and motivation drive each other downward rather than upward. These processes show that EHR implementation is dynamic and intricately sociotechnical. It continues locally after the initial organization-wide efforts to train users, change procedures, and go live with the new EHR. The complete implementation process can be described as one of circumspection (Aanestad, 2024).

Aim

In continuation of the workshops at the two previous ECSCW conferences, 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. In addition to this primary aim, we hope that bringing the workshop participants together will lead to cross-fertilization among their empirical cases, their conceptual frameworks, and their guiding questions. Finally, 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.

Workshop themes

The workshop is about the activities, actors, and AI involved in implementing and making use of EHRs. Within this overall topic, the workshop themes include, but are not limited to, the following:

- Case analyses of implementation activities at different stages of EHR projects – from vendor selection, through configuration and training, to design-in-use
- Investigations of how AI components are incorporated in EHR use – from model training, over data work, to the last mile of implementation
- Studies of the many groups of actors that are affected by EHRs and of the conditions for these groups to make their voices heard in EHR projects
- Analyses of the human work introduced by AI components that analyze images, recommend actions, or issue warnings on the basis of EHR data
- Conceptual pieces that propose models or individual concepts for understanding implementation activities or actor perspectives on EHRs
- Discussions that expound critical features of EHR implementation, such as reduced data redundancy, errors caused by algorithm bias, and so forth
- Methodological reflections on how to conduct studies, manage research data, and behave ethically amid clinicians, patients, and EHR vendors

Participant recruitment and selection

In addition to the organizers, the workshop can accommodate a maximum of ten participants. They will be recruited from CSCW and related research communities, such as health informatics, human-computer interaction, and information systems. The organizers will reach out to these communities by circulating a call for participation in their extended research networks and on relevant mailing lists. 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 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 their relevance to the workshop and the development of their content. If the number of submitted position papers exceeds the capacity of the workshop, 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 make it possible for practitioners to participate, 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*. 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 conclude the workshop, the break-out groups will summarize their discussions in plenum. The organizers will also inquire into the interest in follow-up activities 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 four workshop organizers have a longstanding engagement with the CSCW community. Furthermore, they have investigated EHR implementations for many years and are currently involved in research projects about such implementations in different European countries.

Morten Hertzum is professor of computing and digitalization 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 suite in the Nordic countries.

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

Tinja Lääveri, MD PhD, is a postdoctoral researcher at the Aalto University, Espoo, Finland. She has studied EHR end-user experiences and participation in development since 2010, not only among physicians but also among registered nurses and social welfare professionals. She worked in the procurement and implementation of the Finnish EPIC EHR between 2012 and 2024. She is also a practicing physician at the department of infectious diseases, HUS Helsinki University Hospital, where she uses the EHR she implemented.

Babak Farshchian is an associate professor of information systems and software engineering at the Norwegian University of Science and Technology (NTNU). His research focuses on digital transformation, with an emphasis on the sustainable digitalization of health and welfare services. He publishes in the fields of CSCW and Information Systems and teaches research methods, software engineering, and public sector digitalization. Babak holds a PhD and a master's degree from NTNU and has over 25 years of experience in both industry and academia.

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