

A changed understanding of health care processes
rooted in the concepts of CSCW to address
the challenges in new work practices with the Next Generation EHR

Abstract for the workshop
Next Generation of Electronic Health Records

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In 2016-17 the Capital Region of Denmark implemented a new electronic health care system, Epic, to improve quality of patient care. However, Epic changed the conditions for the clinicians' work as well as for the managers' steering processes, resulting in unforeseen challenges.

Health care processes are commonly seen as the result of interactions between nurses, doctors, medical secretaries and other health care professionals (HCPs). Non-human actors, such as the medical record, are historically considered less instrumental for improvements, since the structure is defined far from operational management and outside the clinical context. Analyses and plans to solve problems during the implementation phase seemed overall based on this common notion.

Following the launch of Epic the complexity of health care processes has increased, as Epic interacts directly with caregivers as a *coordinating artefact* [1,2]. Epic weaves into all levels of care, aiming to standardize work processes, communication, and documentation, and by doing so, at the same time, aiming to reduce the need for human coordination. However, the common notion cannot grasp this new complexity in health care, which calls for a revised understanding on how to comprehend, act, and interact in the care processes.

For more than two decades researchers within the field of computer supported cooperative work (CSCW) have studied the health care domain, focusing on how work is done, with the aim of designing computer systems to support those work practices [3–5]. Studies have shown that an intended automation and standardization cannot account for all aspects of the work, leading to local work practices and coordination and communication work, also called *articulation work* in CSCW [1,6]. However, the analytical concepts used within the field of CSCW are not easily accessible, as they might appear abstract for non-scientists, and as they are spread in articles published within very different fields [7].

Hence, we aim to pursue the hypothesis that CSCW can constitute a common notion, which can grasp the increased complexity introduced as a consequence of the Next Generation HER, and, across professions and hierarchies, can serve as a platform for building a common understanding of the new work processes.

Firstly, the concepts should be gathered and translated into the context of health care. In order to do so, in the fall of 2016, 50 students from the studies of Communication and IT at University of

Copenhagen had their lectures relocated to Gentofte Hospital, where they used the concepts from the field of CSCW to analyse the cooperative work of ward rounds. After the implementation of Epic, ward rounds and associated processes such as doctors' review of test results and nurses' communication with caregivers from the municipality, were filmed on smartphones by nurses and doctors from a ward of internal medicine. The films served as the empirical data for the students' analyses and discussions.

Based on discussions during students' lectures, where a doctor and a nurse attended, it emerged that in order for the CSCW concepts to become clear and relevant for all, the abstract concepts should be demonstrated in the clinical context by a well-known and simple clinical process, recognized by all as important to patient care.

The observation of patients' wellbeing is such a process. Tied to this process is the *Early Warning Score* (EWS), an internationally acknowledged composite score to identify patients with a high risk of aggravation in their clinical condition [8]. The score is calculated on the basis of the values of vital signs such as blood pressure, pulse, saturation of oxygen in the blood, frequency of respiration, temperature, consciousness and the amount of oxygen delivered to the patient. An algorithm is associated with EWS, which, based on the score, dictates the frequency of EWS measurements and the appropriate actions to be taken by doctors and nurses, such as optimizing circulation and respiration or asking for assistance from a senior doctor or an anaesthesiologist.

Epic comprises all elements involved in patient observation with EWS, i.e. features for the registration of vital signs and calculation of EWS, screens to display and track EWS, the algorithm and systems to notify and advise on action in response to abnormal EWS, and finally systems for clinicians to document actions. Hence, Epic has the characteristics of a *Computational Coordination Mechanism* according to the CSCW frame [2].

Secondly, in the light of the considerations mentioned above, and as an action to unintended events with a lack of appropriate follow-up on high EWS, a study was carried out to uncover the socio-technical network related to patient observation and to EWS. The study was completed in the fall of 2017 in a gastroenterological ward on Bispebjerg Hospital. The study applied ethnographic research methods to get an insight to clinicians work practices. In addition, an in-

depth analysis of the functionalities of Epic was carried out to get an insight to the intended digital workflow. This analysis was made by reviewing regional standard operational procedures (SOP) and Epic manuals and by exploring Epic in a tutorial copy with dummy patients. The tutorial copy was frequently updated.

Not surprisingly the study revealed a gap between the actual workflow and the workflow intended in Epic. More surprisingly, the analysis did not identify a SOP or manual providing a comprehensive overview on how patients' clinical condition should be reflected and processed in the digital workflow. Hence, it was not outlined how HCPs should interact on the digital level, and, consequently, how the behaviour of e.g. nurses and doctors would interact in a mutual dependent manner. On the contrary, manuals for key-functions were split and dedicated different skill types, which seemed counterproductive in the search for an overview.

The lack of overview of the intended digital workflow was also found in the ethnographic data. E.g. none of the doctors used or knew a feature to give patients *temporarily acceptable values*. A feature, which for ill, but stable, patients in appropriate care, could alter the calculation of EWS, reduce the score, and thereby imply the algorithm would request less frequent measuring by nurses. This would furthermore, lead to a reduction in the number of unnecessary notifications to nurses that a doctor should be contacted.

Our next step to pursue the hypothesis that CSCW can constitute a common notion to grasp the increased complexity in work practices is to give meaning to the concepts of CSCW in words of the perspectives of EWS and in light of the findings of our study. Subsequently, we intend to evaluate whether the notion based on CSCW gives nurses, doctors, medical secretaries, managers and other stakeholders a more profound understanding of the new complex work practices related to care processes on condition of the Next Generation EHR, and whether it enables them to identify other solutions to address problems in health care.

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