Data-work in Healthcare: The New Work Ecologies of Healthcare Infrastructures

Abstract
The workshop focuses on the new work ecologies emerging from implementation and use of information infrastructures in healthcare (IIH). As IIH "grows" through organizational and regulatory mechanisms, CSCW researchers grapple with the shifting nature of healthcare data. CSCW has long been concerned with coordination, cooperation, and communication among interdisciplinary occupations in healthcare. Yet, while medical record keeping is still a primary function of IIH, second order data usages are increasingly large foci of IIH design and use. Facilitating development of health data practice and infrastructure is an area ripe for CSCW research. Critical topics include but are not limited to: re-use of clinical data for second order usages; design of artifacts and infrastructures; politics of creating and using data; algorithmic authority of IIH and effects on the exercise of expertise and discretion of healthcare professions; new forms of healthcare data work, including new occupations; and data-driven accountability and management in healthcare.

Author Keywords
Accountability; coordination; cooperation; data; data-driven management; healthcare; information infrastructures; transparency; work.

ACM Classification Keywords
H.5.m. Information interfaces and presentation: Miscellaneous

Introduction
In this workshop, we focus on challenges that information infrastructures in healthcare (IIH) generate. Digitization of healthcare has developed from occurring predominantly through small, stand-alone
systems for documentation and coordination of healthcare work or clinical databases for research to include, in many settings, large-scale healthcare infrastructures (most notably integrated Electronic Patient Records, or "EPRs", and Electronic Health Records, or "EHRs") that cut across roles, professions, wards, hospitals and regions (Pagliari et al. 2007; Bansler & Kensing, 2010; Monteiro et Al., 2013; Ellingsen and Røed, 2010; Cabitza et al. 2015).

The emergence of large-scale IIH has enabled the use of health data for a range of new purposes related to data-driven management, accountability, and performance resource management as well as providing a new source and foundation for healthcare and medical research data. As an illustration, EPRs are increasingly expected to become ‘meaningful audit tools’ by general practitioners (Winthereik, van der Ploeg & Berg 2007). Healthcare IT for coordinating work in operation rooms and IT systems used to support hospital portering services are additional examples of instances where the production of aggregate data derived from IT allow for inquiry into the performance of activities that are also supported by the IT (Bardram & Hansen 2010; Bossen 2015). The widespread adoption of HIT and IIH and the increasing capacity to store and analyze heterogeneous (and often big) data mean that increasing expectations are developing for the types and depth of biomedical and organizational research that can be using second order data from these systems. Hence, healthcare data are expected to support inquiries such as: What drugs work best for which subgroup of patients with a certain diagnosis? How can operating rooms most optimally be staffed and used? Which surgeons are the quickest and least error-prone? More generally, how can IIH be used as a foundation for data-driven quality assessment and business process management and how can they ensure best practices and better healthcare?

The growth of digital IIH and increasingly widespread availability of data tools such as SAP in healthcare organizations, as well as the proliferation of tools and consulting services that promise to make healthcare organizations “data-driven”, are rapidly shifting the organization and management of healthcare practice. In the process, the socio-technical setup is reconfigured, from in situ, socially negotiated practice to seemingly objective, rational, and scientific logics on an institutional scale. Hence, there is a pressing need to explore how healthcare data and data-driven management contributes to this reconfiguration. How is the role of medical professions changing? How is the nature of the professional expertise changing, and what are the implications for the autonomy and discretion long enjoyed by clinicians?

Along similar lines, external actors such as the general public, accreditation, and state authorities increasingly demand that healthcare organizations become more transparent and accountable by providing data through performances measures (Pine & Mazmanian 2014). This is spurred by a demand to see that healthcare organizations deliver services of high quality and according to the best healthcare standards (Christensen and Ellingsen, 2014), as well as attempting to ensure that funding and resources are used optimally. Healthcare organizations and, increasingly, individual clinicians are evaluated according to metrics that assess care delivery, such as: Are patients diagnosed with cancer treated within the stipulated time? Are levels of medication errors below the acceptable
threshold? Are rates of central line infection higher than would be expected? Are surgical procedures such as cesarean section utilized appropriately, or are they over-utilized? Which ward or hospital is most cost- and resource-effective?

Performance measurements linked with such topics not only must be reported in greater volume and in more detail than in the past, but the results are tied to increasingly heavy sanctions. For example, a new model of healthcare reimbursement from both private insurance and public entities called "pay for performance" links payments for healthcare services to the performance of healthcare organizations on general measures of quality. The stakes are further raised by the fact that healthcare performance measurements are being made publicly available on websites, where individual consumers can look up data easily — while at present this is limited to organizations, it is expected in the future that individual clinicians may have their performance data published.

Amidst these high stakes come large concerns about the situated practices of making, managing, and using data. The creation, maintenance, aggregation, transport, and re-purposing of data does not happen without work effort to collect and transform data. ‘Raw Data is an Oxymoron’ a bad idea and should be cooked with care, as Bowker succinctly stated (2008: p183-4).

With the emergence of IIH and the increasing demand for data-driven management, accountability and increased performance, the importance and character of such ‘cooking’ work changes. Not only are managerial perspectives becoming more influential on health care practices, but professions have to learn new skills and include new job functions such as ‘health data scientist’ (Davenport & Patil 2012) and ‘healthcare data manager’ (Pine & Liboiron 2015; Bossen 2012). Thus a new kind of cooperative work arises to support and enable the emerging infrastructures of accountability, clinical decision support and policy making. In particular, external accountability raises complex and very timely questions for researchers, such as: how do we design and build sociotechnical infrastructure for accountability? What are the human and technological capacities needed to successfully engage in large-scale measurement? What new forms of data work are emerging, and how are they impacting the organization of healthcare? What are the potential unintended consequences for individuals and organizations — i.e. are low-resource organizations inadvertently penalized?

In addition to the attention to questions about new forms of data work, the design/use of infrastructure for healthcare data, and impacts for the organization of healthcare work, the workshop also addresses more profound questions about data. How data are created, shaped and acquire legitimacy is often closely intertwined with normative statements of what should become visible and granted importance. “Like events imagined and enunciated against the continuity of time, data are imagined and enunciated against the seamlessness of phenomena” (Gitelman 2013; p3) the categories and systems of classification embedded in the databases from which data are aggregated are inherently normative, and hence, political. Against the three precepts of data as being abstract, aggregative and mobilized graphically (Gitelman 2013), we want to look at the concrete work of how such abstractions are produced and ordered to become data that can be stored in specifically ordered databases: What are the
politics of what counts as quality, process and outcome measures? We may further investigate the practices and logics in and through which data are computed and transformed into aggregations: How does the formula or algorithm weigh quality, process and outcome measures into a ranking of healthcare work? In the new systems of accountability being constructed in IIH, what is being attended to and what remains invisible (i.e. the experiences of patients)? Finally, we may investigate the graphics through which aggregated data are mobilized, i.e., rendered, displayed, paraded, dramatized, in one word “told” (Tufte 2006; Gitelman 2013) for reflection, management and representation of work for accountability purposes, as well as the ways humans can interact with these visual and graphical representations to get valuable and usable insights (Liere et al, 2009; Crabtree & Mortier, 2015).

**Themes of the workshop**

The workshop will address the following themes, although the list should not be seen as exclusionary:

*The new work of healthcare data*: What are the new competences, tasks, and functions that the emergence of data-driven healthcare entails? How are existing occupations and professions changing in the wake of the push for data-driven healthcare? What are the emerging healthcare data occupations?

*The politics of creating and using healthcare data*: How do categories, classifications and algorithms shape what counts as data, and what do these schemes make visible and invisible?

*Artefacts and infrastructures as knowledge production*: Artefacts enter and shape the processes of knowledge production according to their own characteristics. Characters, tables, and databases each entail their own epistemological implications and shape knowledge forms. How does this look within the emerging healthcare information infrastructures?

*Reflection, management and accountability*: What instances of reflection, management and accountability are created with specific healthcare IT systems? What are the challenges, conflicts, and opportunities?

*Systems design*: How do the agendas of data for accountability and secondary uses influence and become integrated into systems design and development? Is this a simple add-on, or a dominant concern? What can the role of CSCW be?

**Workshop activities and goals**

Each participant will submit a short position paper (2-4 pages) presenting a brief overview of their work, along with a specific empirical case from their research. The case and its implications will be presented to add detail during the first part of the day. Presenting empirical cases will provide fodder for discussion among the group. Each presentation will be followed by questions.

At the end of the presentations, we will have a group discussion about emergent themes among the presenters as well as an outline of key open research questions in this space going forward.

In the afternoon we will break people into groups and have small group discussion where people reflect on the presentations and themes of the morning and share more about their own research interests.
In the final part of the workshop we will reconvene as a large group to talk about a future agenda for research, and include a short section on funding—how are people getting funding for this work, what are opportunities to collaborate across disciplines, and so on. We will move on to optional dinner. The outputs of the workshop will be: 1) a workshop poster to presented at CSCW on healthcare data research, including key research themes and an agenda for future research in this area; 2) a proposal for a special issue of Journal of CSCW on healthcare data, with presenters having the opportunity to join in organizing the issue as well as develop their position papers into submissions for the special issue; 3) a compendium of funding resources and knowledge sharing about how to create fundable research projects in this area including multidisciplinary research.

**Duration of the workshop**
One day

**Background of the organizer(s)**
*Claus Bossen* is associate professor at Information Studies, Aarhus University, Denmark. Based on ethnographic fieldwork, his research focused on design, implementation and use of healthcare IT, and he has published on these issues at conferences such as CSCW and PDC, as well as in journals such as CSCW and International Journal of Medical Informatics.

*Kathleen H. Pine* is Assistant Project Scientist at University of California, Irvine. Her work focuses on data practices, the situated social, technical, and organizational practices through which data are created, managed, and deployed, in the domains of healthcare and public health. She has published at conferences such as iConference, CSCW, COOP, and CHI, and in American Journal of Preventive Medicine.

*Gunnar Ellingsen* is professor at UIT – the Arctic University of Norway. His research interests revolve around design, implementation and use of information systems in health care, particularly Electronic Patient Records in hospitals. He has published at CSCW conference as well as journals such as CSCW, British Medical Journal, Methods of Information in Medicine, Information Society, and others.

*Federico Cabitza* is assistant professor at Department of Informatics, University of Milano-Bicocca. His research concerns the study and development of Information Systems and CSCW systems with a specific interest on Health Care and Hospital Ward contexts. He has published at CSCW, GROUP and COOP, and various journals such as International journal of human-computer studies, Journal of CSCW, and Journal of Shoulder and Elbow Surgery.

**Maximum number of participants**
Maximum 20

**Means of recruiting and selecting participants**
Participants will be recruited through mailing-lists of CSCW-Sig; EUSSET; COOP, and PDC, and targeted recruiting to attract scholars with interest in the theme will be pursued.

**Equipment and supplies.**
Projector for presentations; poster-size paper and markers for producing posters
References