

The Role of Health Informatics Research: A Case of a Large-Scale Implementation in Norway

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Abstract. Many see the role of health informatics research as informing the development and implementation of information technology in clinical practice. The aim of this study is to see if this role is realized in the ongoing implementation of a large-scale health information system in central Norway. By doing a document analysis of the planning documents for the implementation, we assess to what extent evidence from the scientific community is explicitly referenced and used in the implementation planning. We found that evidence available is not explicitly used, and that evidence required is not widely available.

Keywords. Implementation, Implementation science, Health informatics research

1. Introduction

Several authors have reflected upon the role of research within health informatics. In the book *evidence-based health informatics* [1] the authors formulate the role of research within health informatics as “*systematically looking for evidence ... for the practice of health informatics – for the sake of patients, of health care organizations, and for high-quality and efficient health care*” [1] (p. vi). Coiera [2] defines the role of health informatics research, as: “*the study of information and communication systems in healthcare*” in order to “*develop interventions to improve these systems [and] evaluate the impact of these interventions on health care.*” To use the title of [1], we could say that the ambition to realize evidence-based health informatics implies that the research results produced and published by the health informatics research community, inform the development and implementation of health information technology (HIT). In this paper we want to challenge whether this ambition is realized in the ongoing implementation of a large-scale HIT in the region of Central Norway.

Generally, there are three phases in the implementation of large information systems: *preparations*, *going live*, and *continuing design during use* [3]. *Preparations* include activities related to planning the implementation. Examples are involving users,

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specifying expected effects, training users, and configuring the system. In this paper we will focus on the preparations phase by analyzing planning documents that detail the activities to be performed before go-live.

1.1. Background

We looked for review papers on the implementation of HIT, to get an overview of the insights available. Several studies we found presented lists of promoting and inhibiting factors, based on a review of empirical studies of HIT implementations. For example, Sligo et al. [4] present an unstructured list of promoting and inhibiting factors. Other studies have tried to organize the factors more systematically. Damschroter et al. [5] present a framework (CFIR) that distinguishes between five domains to which factors influencing the implementation success can be allocated. Boonstra et al. [6] take as their starting point the observation that implementing a HIT is a process of organizational change, and use Pettigrew's framework [7] to distinguish between three categories of factors: content, context and process. What all these frameworks have in common, is that they are based on a check list approach. They focus on *what* should be realized or avoided in an implementation process, such as *user involvement* or *training in using the system*. Two other frameworks take a more process-oriented view, by discussing what kind activities should be conducted.

The first is the Normalization Process Theory (NPT) as presented in [8] and other publications. It focusses on the social activities that need to be in place for a successful implementation, such as cognitive participation, collective action, and reflexive monitoring. The other framework is NASSS, as presented in [9]. It identifies 7 domains that should be taken into consideration when planning and evaluating an implementation process. In the case of implementing a HIT, the complexity for each of these domains must be assessed, and if the complexity is considered high, measures should be taken to reduce it. Neither NPT nor NASSS have concrete recommendations on either how to implement the required social practices (NPT) or how to reduce identified complexity (NASSS). So, for all the reviews consulted, the focus seems to be more on what to include in an implementation process than on how to do things.

2. Materials and Methods

The implementation of the so-called Health Platform began in May 2022 in the middle health region of Norway (Helse-midt), which has approximately 720 000 citizens. Health Platform is an electronic health record for all healthcare services, based on the system developed by the American vendor Epic. The community health services in Trondheim were first out to take the new system into use. The largest hospital in the region started using the system in November 2022. Other hospitals and communities in the region will follow in 2024 and 2025. Fully implemented, the system will have approximately 40 000 users.

For this study we analyzed documents describing the planning of the implementation process, focusing on whether there was explicit reference to scientific research, and, if so, how this research was used. The documents analyzed were the following planning documents (titles here in English, but originally in Norwegian):

1. Introduction to preparations for managers
2. Introduction to preparations for municipalities

3. Plan for the preparation of end users
4. Plan for super users
5. Principles for training
6. Plan for training

Though this is only a small set of documents they were provided to us by people from within the implementation project as a representative sample of the implementation plans, covering the most important areas in focus. Besides these documents we also viewed the video material that was made to support the preparation of end users. This material illustrated system functionality and how to integrate the use of the system in daily clinical practice.

3. Results

In this section we will summarize the content of the six planning documents. Three main themes emerged from the planning documents we received: Super Users, Awareness of benefits, and Training.

3.1. Super Users

The document 'Plan for super users' distinguishes two types: super users and leading super users. Super users contribute to training and are responsible for supervising end users in using the system correctly, as well as helping them with changing their work practices. Leading super users have two extra responsibilities on top of this: coordinate the work of other super users and collaborate with the implementation project to solve identified implementation problems. The document specifies the characteristics of (leading) super users, both in terms of required competence and personal characteristics. In total, 15 characteristics are listed, including respected by their colleagues, extravert and enthusiastic, domain expert, eager to learn, interest in ICT, etc. Recruitment of (leading) super users is the responsibility of the health organization (e.g., hospital or community) where the implementation takes place. It is not specified how the recruitment should be done. Do (leading) super users apply for the role or are they elected by management? They are bought free from their normal work. The time used for the role of (leading) super user is 58 hours before go-live and 120 hours after go-live. There is no explicit reference to implementation research. Only in the case of the specified hours it is stated that these are based on experiences from Epic.

3.2. Awareness of benefits

It is important to have a clear answer to the question of why the system is implemented. In the Health Platform implementation, a first version of this answer was given by formulating eleven so-called effect goals, early in the requirements specification and tendering process. These effect goals included goals like increasing treatment quality, decreasing patient injuries and improving the use of resources. These effect goals were later refined into so-called benefits. Benefits were formulated for both hospital care and community care in eight different areas, such as patient involvement, user friendliness, medication management and patient logistics. If we take user friendliness as an example, the benefit for the hospital is described as: 'Health workers will experience a better quality and easier access to documented health information, measured by an increased

score on a user friendliness scale compared to a score from 2020'. For this overall benefit, three sub-benefits are formulated that focus on secure access, better support for planning, examination and treatment and better quality of health information. The document *Plan for the preparation of end users* gives a detailed description of the information material (texts and information videos) that has been developed to inform end users in a period starting 18 months before go-live.

There are no explicit references to implementation research.

3.3. Training

The plan for training distinguishes between three phases in the learning process. The first phase is referred to as 'the maturing phase'. In this phase, future users will be introduced to the main concepts behind the system and get insights into how work processes will change. This phase runs roughly from 18-4 months before go-live. Learning channels are both digital and non-digital. The digital channels comprise websites and video material. The second phase is called 'system learning'. It runs from 4 months before go-live till go-live. Its main goal is to learn to use the system. There are three parts of the phase that all users must complete. The first consists of learning some preliminary skills, like logging in and getting familiar with the user interface. This part is mainly supported by digital learning channels. The second part consists of classroom teaching, often one full day. The third part consists of individual training using a test environment, to increase the skills in using the system. For all the parts, it is critical that the employees are allocated time to participate in the learning activities. The third phase is called 'skills training from go-live and after'. This training is to be done at the workplace in a test environment. The total hours required for obligatory (i.e., excluding the third phase) training are estimated to be 18 hours for physicians, 16-24 hours for nurses, 24 hours for administrative personnel, and 16 hours for others.

There is no explicit reference to implementation research, but it is stated that the training plan is influenced by experiences from similar implementations in Denmark and Finland, as well as by training practices developed by Epic.

4. Discussion

Even though no explicit reference is made to implementation research in the documents we studied, the three themes listed promote factors that are emphasized in the literature we consulted. However, many of the other factors mentioned in literature are not in focus, including organizational change, leadership, culture, and (user) testing. Again, we only looked at a small set of documents and it could well be the case that these factors are dealt with in different ways, for example in meetings or working groups. Or it could be the case that, even though there is scientific evidence that a factor is important, it is deliberately left out of the implementation planning.

When we look at the frameworks presented in the background section and the planning documents, we also see a difference in terms of the epistemological level they are on. Where the literature discussed in our background section focusses mostly on **what** should be focused on in an implementation, is the focus in the planning documents more on **how** to do things in an implementation. We can take users' awareness of the system's benefits as an example. In [4] this is listed as a promoting factor for implementation success, without operationalizing this. In the documents we analyzed a rather detailed

description is presented of how end users can be made aware of the benefits of the implemented HIT.

The situation is the same for the two other themes we discussed in the results section. So, where the literature we reviewed seems to focus on evidence for **what** should be done in an implementation project, the planning documents focus on **how** this should be done. The literature seems to lack evidence for this **how**, for example in the form of published best practices.

5. Conclusions

We have seen that the ambition of evidence-based health informatics was not realized in the case we studied. Evidence available on **what** drives successful implementation of HIT was not (explicitly) used. And evidence on **how** to best do the things that are important in an implementation, was not available. If our case study is representative, we can conclude that we have a way to go before we have realized evidence-based health informatics. First, we should, as researchers in health informatics, practitioners more aware of the scientific evidence we have collected in our studies of HIT implementations. Second, we should conduct more case studies of concrete implementation projects and publish validated best practices that can inform, and shape implementation plans and processes for health information systems.

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