

## Shared experience in 13 local Danish EPR projects The Danish EPR Observatory.

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### Abstract

*In 1996 a national strategy for the development of electronic patient records (EPR) for the Danish hospitals and primary care was launched. An element in the strategy was to support a number of regional EPR development projects. The EPR-Observatory has in the two recent years collected data from the regional projects, dealing with the expectations in four areas: 1) Impact on organisational issues, 2) Benefits of EPR, 3) Integration of EPR with other information systems and 4) security aspects of EPR.*

*Among the observations an increasing teamwork and improved knowledge about the patient was found. What was expected, but not found, was resistance to EPR, as a result of changes in skills and power. The most obvious benefits are increased data accessibility and improved decision making. The most considerable disadvantage is an enormous growth in discontent with the systems performance and the fact, that all the projects are delayed. Many different types of integration solutions are chosen, because of a lack of a common model for integration. Generally the projects find, that EPR yields increased security, but logistical problems arise in having the systems running 24 hours 7 days a week. Economical benefits cannot be documented. This relates to the fact, that the regional projects are stand-alone projects. The ongoing growth in discontent with the EPR-systems and the fact, that all the projects are delayed must be subject to further exploration.*

### Introduction

The Danish Ministry of Health launched in 1996 a national strategy for the development of EPR- in the Danish health care sector [1]. A key element in the strategy was to support a number of regional EPR development projects. In addition to this, the EPR Observatory [2] was launched as a horizontal activity to collect and disseminate experiences from the regional projects.

The Ministry of Health focused on four areas, both in the local projects and in the EPR Observatory. The four areas were 1) Benefits of EPR, 2) Impact on the organisational issues, 3) Integration of EPR with other information systems and 4) Safety and security aspects of EPR. The EPR Observatory has collected data for 1998 and 1999. In 1998

focus was on the expectations, related to the four areas of interest. In 1999 focus was on the experiences. The results are published in two Annual Reports [3,4]

This paper gives a presentation of the experiences related to the organisational issues.

### Methods and materials

The 13 local EPR projects are very different in size, patient category and stage of development. 1 project is in the pre-analysis stage, 8 projects are using EPR as a routine working tool. Two of the projects entered the observatory recently and were studied by the questionnaire, but did not participate in the interviews. Further two projects did not take part in the study in 1999 due to inactivity and lack of project resources.

Questionnaires were given to 7 persons in each project (a representative of the doctors, the nursing staff and the medical secretary, a representative for the managers of the department, a representative of the hospital managers, the project manager and the manager of the local department of information technology). As many as possible of the 7 persons who answered the questionnaires took part in the interviews as well. The interviews were carried out as group interviews. Data were collected with structured and semi-structured questionnaires and semi-structured follow-up interviews.

Related to the fact that the EPR Observatory primarily does observations, the questions were related to *how* things are done in contradiction to *why*.

*Benefits* of using the EPR were considered in 1998 and in 1999. In 1998 the project organisations were asked about their expectations to the EPR and in 1999 they were asked about their experienced benefits. Furthermore the experienced barriers were surveyed.

Two main *organisational issues* are to be considered:

1. The organisational change related to using the new technology (EPR) [5,6]  
Data concerning the following areas were collected:
  - a) The impact of EPR on the co-operation between healthcare professionals
  - b) The impact of EPR on the daily work procedures

- c) The education related to the application of EPR
  - d) The super user organisation
2. The organisational aspects to be managed during the technological change [7-9].  
Data concerning the following areas were collected:
- e) The project organisation
  - f) The EPR system developers
  - g) Analysis of working procedures and work processes
  - h) Local evaluation of the EPR development project

Integration between EPR and other health information systems has been observed with respect to data integration and technical integration.

Safety and security aspects of EPR have been a theme in the questionnaire, and four essential dimensions have been investigated, confidentiality, trackability, accessibility, and information quality. The theme has only been raised in the 1999 questionnaire where the respondents were asked to rate statements related to the four dimensions on a 4-range scale. In the interpretation it has been assumed that the answers were given on a ratio scale.

## Results

### Benefits of EPR

The participating projects were in the questionnaire asked what they expected to be the most important benefits reached by their projects in 1998, and in 1999 they were asked what they actually had achieved. The distribution of their answers is shown in fig. 1.

There were a total of 17 categories of benefits in the questionnaire, but the focus was on the 7 showed in the figure, hence the remaining 10 have been pooled in the "Misc." group. Only the projects that were in the state of daily use have been included in 1999, which explain the difference in participation.

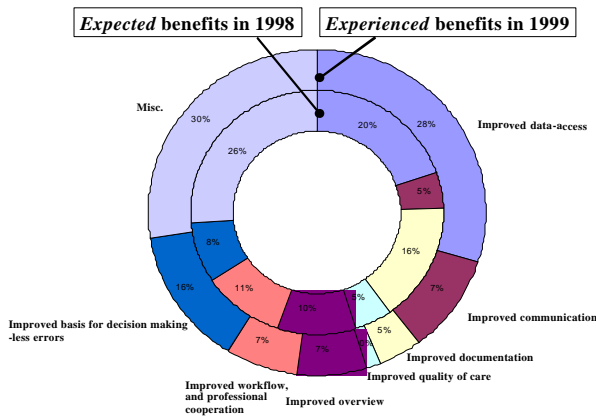


Figure 1. Expected benefits in 1998 (n=102) and experienced benefits in 1999 (n=57)

In the same two years the projects were asked for perception of barriers. The results are shown in figure 2.

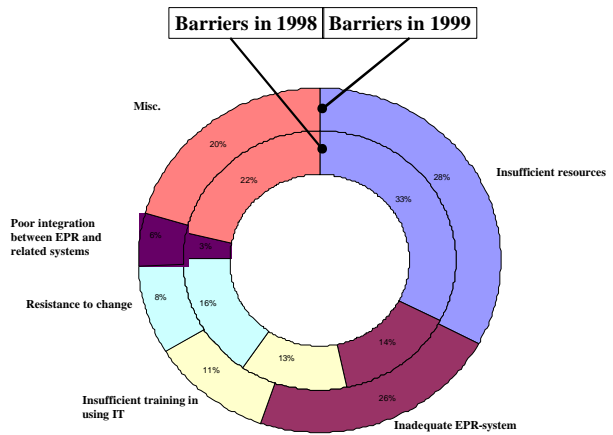


Figure 2. Barriers in the EPR projects in 1998 (n=101) and in 1999 (n=99)

In spite of a slightly reduction the dominating barrier is in both years insufficient resources. A similar tendency is observed in training and resistance to change is reduced 50%. The category of inadequate EPR-system has almost doubled from 1998 to 1999, as well as the category of poor integration between EPR-system and related systems, i.e. laboratory systems, patient administrative systems etc.

### Impact on the organisational issues

Surveying the organisational change related to using the new technology uncovered the following aspects.

- a) *The impact of EPR on the co-operation between healthcare professionals*  
Generally all the EPR projects have the goal to develop EPR to be used by all the healthcare professionals as a common tool. This refers to intentions like avoiding redundancy, multitude of professional view more consistency and a broader basis for decision-making. The projects indicate, that the interdisciplinary EPR affects the daily co-operative working processes as well as the more long termed professional development, thus moving away from a mono professional function towards a more interdisciplinary function. An example is the establishment of interdisciplinary care teams in several of the project organisations.
- b) *The impact of EPR on the daily work procedures*  
None of the project organisations have used EPR more than a few months in daily routine. That is why the organisations still are experimenting with different new ways to improve working procedures. Two of the most important working procedures EPR have influenced on are the ward rounds and drug administration.

Ward rounds are typically done without EPR. Instead the doctor and the nurse together prepare themselves thoroughly for doing the ward round. The healthcare professionals experience that they now have more focus on the patient than earlier.

The drug administration in EPR is typically tied to more restrictive working procedures, than ever was possible in earlier used paper based patient records. This to ensure, that the correct drugs are given to the correct patients on time. The changes introduced with the EPR in this regard are judged as the highest advantages so far. Also to mention is the movement from working with low structured data toward working with highly structured data.

At last it is worth to mention that the EPR projects expectations of resistance to implementation of EPR, due to loss of professional status or pressure to develop new skills as mentioned in the literature [9] were not experienced in the project organisations.

c) *The training related to the application of EPR*

In the 7 EPR projects where EPR are used routinely the time spent to education is shown in figure 3. An average of 2 days per user are spent on instructions in using the EPR. The time is spent on basic 'Windows' training and in basic EPR functions. The goal is to enable the user to make utilize the EPR system in the daily work procedures. In some of the EPR projects the type of instruction and the time spend are differentiated between the various professional groups.

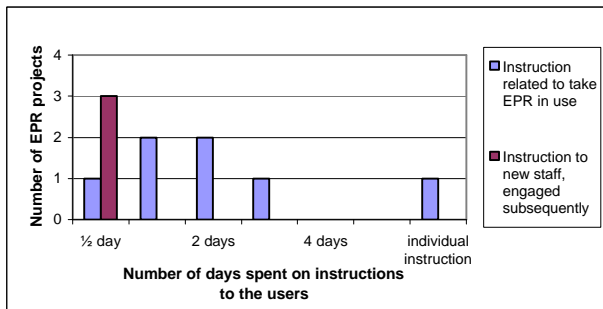


Figure 3. End user training

d) *The super user organisation*

The term 'super user' is used ambiguous. In most of the EPR projects the term 'super user' refers to a specific number of health care professionals who have had a little more training in the use of the specific EPR system than the average end user (figure 4).

Typically there are two different categories of super users. The first category performs various functions related to the daily work routines:

- 1) Helping the end users with daily use of the EPR
- 2) Solving uncomplicated software and hardware problems
- 3) Registration of errors
- 4) Networking the end users and the EPR project organisation and/or the managers of the organisation

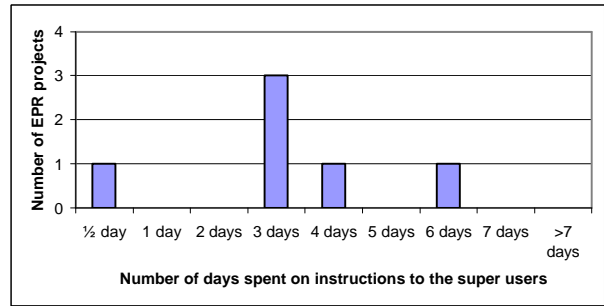


Figure 4. Super user training

The second category is the technical super users. They are responsible for the more advanced software problem solving and support, and hardware set-up and maintenance operations.

By common consent it is underlined by the advanced user organisations, that it is essential to establish and maintain super users on duty around the clock, especially on the technical side.

The organisational aspects that are to be managed, while the technological change is in progress:

e) *The project organisation*

Characteristics for the project organisations were that 1) There is a broad representation of health care professionals in the project organisation and management as well as floor staff are represented. 2) The project organisation is not anchored in the hospital management system or health care management system in all the projects. Anchoring the project in the management system results in an active support from the management system. 3) Highly motivated personnel manage most of the projects. A lot of energy is put into the projects on a voluntary basis to make a success of the EPR projects.

f) *The EPR systems developers*

5 different systems developers are present in the EPR projects. From the data collected in 1999 it is evident that the EPR project organisations often are not satisfied with the systems developers. The main problem is related to delivery of the software at the appointed time. Problems are also related to the accomplishment of integration between different systems and to achieve the required functionality of the EPR.

g) *Analysis of work procedures and -processes*

Analyses of work procedures and -processes take up a central position in most of the EPJ projects. First to mention is that the analysis of the process helps the project organisation to attain shared understanding of the applications of EPR. It also provides a solid basis for dialogue with the systems developer.

Different methods and tools are used in the analysis of the process. Common is the following three steps: a) Describe the existing work procedures and -processes and their advantages and disadvantages, b) describe the visions, and c) describe the realistic attainable.

*h) Local evaluation of the EPR development project*

At least 5 of the EPR projects are carrying out formal evaluation. The majority of these evaluations focus on the effect of EPR. Most of the EPR systems are in use only in one or a few departments. In addition to this it is clear, that the local evaluations complement the EPR Observatory observations very well.

**Integration between EPR and other health information systems**

Four main categories of technologies for implementation of integration has been observed: Common database, Electronic Data Interchange (EDI), middleware, and Internet technologies.

The closest integration is achieved where two systems have a *common database*. In this situation a real time communication can be achieved. This type is present in only 2 projects.

EDI is applied where two systems communicate structured messages. Copies of data are transferred between the systems, which can take from seconds to several minutes. Communication standards like EDIFACT and XML are used. In-house formats and screen scraping are referred to this category. EDI is present in 8 projects.

Middleware is a piece of software placed as a layer between the actual application and the database or network layer. It is often used in heterogeneous environments where many applications communicate with various databases. Middleware is seen in 6 projects.

	EDI		Middleware	Internet techn.	Common database
	Messages	Screen scraping			
Pro. # 1	X	X		X	
Pro. # 2	X		X		
Pro. # 3					
Pro. # 4	X				
Pro. # 5			X		
Pro. # 6	X		X	X	
Pro. # 7	X		X		
Pro. # 8			X		
Pro. # 9		X		X	X
Pro. # 10	X	X			
Pro. # 11	X		X		
Pro. # 12				X	X
Pro. # 13					

Table 1. Integration technologies applied in the EPR-projects.

Internet technology is applied in the open Internet as well as in closed intranets. This type of integration is mainly applied where data is communicated for viewing in a browser, and is applied in 4 projects.

The different types of integration are not completely exclusive, and often a combination of types is seen to achieve coherence in a hospital or in a region.

An overview of the different integration technologies applied is shown in table 1 below.

**Safety and security aspects of EPR**

The questionnaire to the different professional groups in the projects the respondents were asked to rate statements about safety and security aspects in paper patient records and electronic patient records. The aspects were related to four dimensions: confidentiality, track ability, accessibility, and information quality. The answers were ratings on a 4-range scale. The accumulated results are shown in figure 5.

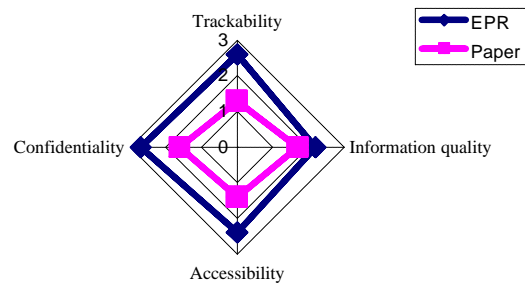


Figure 5. Accumulated result of assessment of safety and security issues

**Discussion**

In the survey of the benefits of using EPR the improved data accessibility had proven to be of big value, and especially the improved basis for decision-making had doubled in the ratings. These increases were seen at the expense on the improvement of documentation and quality of care. A likely explanation can be that the improvement in workflow and professional cooperation still has to develop.

Concerning the perceived barriers almost all project organisations experience a lack of resources, which hardly can be a surprise given such an open question. It is, however remarkable that the project organisations are facing inadequate EPR systems. This category has almost doubled in one year. One of the reasons that could be detected during the interviews is that many projects have started systematic workflow analysis. Hereby has the organisation been explicating former hidden work procedures and become aware of the real needs and demands for the EPR system. The workflow analysis has resulted in more specific and qualified user requirements – requirements which existing systems on the market have difficulties in fulfilling.

The emerging workflow analysis, which is involving end users in great numbers, may also encounter for the decrease of resistance to change and the small decrease in the need for training.

Observing the organisational issues showed a number of aspects, which are important to take into account in relation to future EPR projects.

The use of a common EPR lead to a more interdisciplinary co-operation. This challenges the traditional mono professional cultures.

To work with highly structured data is also a great challenge to the health care professionals because of the traditional culture, using mostly free texture formulations in (paper) patient records.

It is an interesting fact that the expectations of resistance to implementation of EPR due to loss of professional status or pressure to develop new skills [3,9], is not experienced in the project organisations. There might be coherence between this and the fact that the EPR projects studied can be characterised as bottom-up projects, with a heavy user influence in the implementation phase.

The training of the users is generally given as instructions in operation of the programme. This gives the users insight in the EPR for daily use on a very basic level. How the users act in the future to learn more about the EPR to be experts is still not visible. It might lead to other kinds of education/training.

The super user concept today refers primary to the special trained healthcare professionals, secondary to the technical supporters. There might be a third meaning of the super user concept that refers to the professionals who establish and develops the interaction between the developments in the society, the healthcare sector and the EPR systems – i.e. health informatics professionals [10]

The analysis of the different integration approaches in the projects showed that many different types of integration are in use. Although the many different types can be understood under the same framework they still vary considerably. A noticeably lack of knowledge about integration principles were detected in the projects and this might have led to leaving the integration problems to vendor solutions. If the requirements are limited to functional specifications the various vendors will suggest different integration solutions.

Although the ratings of safety and security issues showed that the electronic patient record had significant advantages compared to the paper record there are still potential hazards in the electronic version. Hardly any of the projects had considered the demand for having a full functioning system running 24 hours a day all week. These hazards have a technical side and an organisational side. It could be necessary with mirror databases and duplication of the hardware. And it will be necessary to have a plan B – and possibly C and D.

## Conclusion

At present the experiences with Danish EPR in routine use are limited and with that, experiences in relation to the four focus areas: 1) Benefits of EPR, 2) Impact on the organisational issues, 3) Integration of EPR with other information systems and 4) Safety and security aspects of EPR are

scarce. Therefore it is of course impossible to assess all the *actual* possible benefits caused by a widespread use of EPR, but it is very important to communicate and promote the sparse experience done so far for others to learn from and take advantage of.

The EPR-Observatory will continue to follow the most significant Danish EPR-projects and make the observations comprehensible and accessible via the Internet.

## Acknowledgement

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