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Development of functional requirements for electronic health communication: preliminary results from the ELIN project

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ABSTRACT

Background User participation is important for developing a functional requirements specification for electronic communication. General practitioners and practising specialists, however, often work in small practices without the resources to develop and present their requirements. It was necessary to find a method that could engage practising doctors in order to promote their needs related to electronic communication.

Materials and methods Qualitative research methods were used, starting a process to develop and study documents and collect data from meetings in project groups. Triangulation was used, in that the participants were organised into a panel of experts, a user group, a supplier group and an editorial committee.

Results The panel of experts created a list of functional requirements for electronic communication

in health care, consisting of 197 requirements, in addition to 67 requirements selected from an existing Norwegian standard for electronic patient records (EPRs). Elimination of paper copies sent in parallel with electronic messages, optimal workflow, a common electronic 'envelope' with directory services for units and end-users, and defined requirements for content with the possibility of decision support were the most important requirements.

Conclusions The results indicate that we have found a method of developing functional requirements which provides valid results both for practising doctors and for suppliers of EPR systems.

Keywords: communication, electronic patient record, general practice

Introduction

Is it possible to develop functional requirements for establishing one or more complete 'plug-and-play packages' for secure electronic healthcare communication for practising doctors? Further, will there be interest among suppliers, general practitioners (GPs) and specialists in developing such solutions? These were the most important questions to be answered in a feasibility study initiated in 2002.

Exchange of information in the health service is extensive, as demonstrated in Table 1.¹ Laboratory results have been sent electronically to GPs since the mid-1990s in Norway. A growing number of discharge letters are now sent electronically, and several other types of electronic messages are on the way. So far, progress in these systems has been driven more by developments in technology than by clinical requirements. The

objective of starting this project was to strengthen the influence of health professionals, and manage the development process so that a solution for many-to-many communication would be functional and user-friendly in the clinical setting.

Table 1 Summary of different types of communication GPs have with others in Norway, specified in millions per year

Type	Number
Laboratory requisitions	7.0
Physiotherapy requisitions	1.0
Imaging requisitions	1.3
Referrals	1.9
Discharge letters	3.8
Sick notes and medical certificates	3.7
Prescriptions	17.0

The theory underpinning the project design was that, organisationally, GPs are maximally decentralised in small autonomous offices, with the result that as a group they are in a weak position to influence developments in information technology (IT). Unlike hospitals, they have no administrative and mercantile infrastructure combined with dedicated IT departments that together can study regulations, investigate different solutions and conduct their own projects. Another principle of the project was that the distance between technology and health disciplines is too great.² The link between users and developers is based on a translation process where professional health information and knowledge must be operationalised and adapted to machine processing. However, tacit knowledge that is difficult to codify plays an important role in the health disciplines, and there is a risk that technology experts will go too far in their quest to make things specific and tangible.³ Third, the introduction of new technology has social and cultural aspects to which little attention has been paid in the development and implementation of electronic patient record (EPR) systems.⁴

Materials and methods

The 'Business-oriented IT' (BIT) project model was chosen for implementation of the project. This is a

concept developed by the Norwegian Industrial and Regional Development Fund (SND), now *Innovation Norway*. The BIT programme has been used successfully in the development of industry- or sector-specific IT solutions in a co-operative effort between users and suppliers of IT systems. In our project, doctors in general and specialist practices represented a sector for which the Norwegian Medical Association (Den Norske Lægeforening, DNLF) is the professional organisation. ELIN (Electronic health information interchange) was the first project in the public health service based on experience from the BIT programme.

Material

The material was produced through the creation of four groups – a panel of experts, a supplier group, a user group with practising doctors, and an editorial committee. The panel of experts comprised ten experienced GPs with long-term experience of and interest in EPRs with respect to functionality and content. They had ten to 20 years' experience as GPs and had taken part in user groups, conducted research and been included in several types of health IT projects. Several GPs had also held key honorary offices. The selection represented experience of all of the three largest EPR systems in the primary health service.

A survey of suppliers' interest was conducted by first searching for references to all appropriate suppliers in the Norwegian market by making enquiries to the authorities, universities, centres of expertise and selected hospitals, as well as by asking the suppliers themselves. Only suppliers of software for electronic medical records were considered, since the project aimed for standardised solutions from application to application. In this way we arrived at a list of 24 appropriate suppliers in the area. An information meeting was then held for these suppliers. They were invited to apply to participate. Ten of them were then selected by the project management according to given criteria and comprised the supplier group.

Interest among practising doctors was investigated through a discussion and invitation on DNLF's home page, as well as through announcement in *Eyr*, a Norwegian mailing list for GPs. The project was also mentioned in the DNLF journal, *Tidsskriftet for den norske lægeforening*. The user group, subsequently termed the pilot practices, was selected by the project management after submission of applications, and based on given criteria.

To form the editorial committee, the project manager included two doctors with special competence from the Norwegian Centre for Medical Informatics (KITH) and the Norwegian University of Science and

Technology (NTNU), respectively. The project manager is also a doctor specialising in general practice with many years of experience from collaborative health projects within the primary health service.

Method and design

The BIT programme does not provide direct guidance about how an industry or sector should develop a user requirements specification. The panel of experts therefore had to establish a method for this. We used document analysis combined with methods from action research.⁵ Literature and experience material was searched and data were collected continuously through observation and minutes of meetings as well as documents submitted.

A standard for EPRs was presented to the expert group. It has been developed in Norway by KITH, but is based on international standards. The user requirements of the panel of experts were also to be compared with messaging standards from the State *Standardiserings- og samordningsprogrammet* [Standardisation and Co-ordination Programme].

After meetings in plenary sessions, the doctors divided up into groups of two. As their point of departure, the groups used the requirements from the journal standard that they found relevant to their part, and developed the necessary additional requirements for the part for which they were responsible. A form of observer triangulation was used to evaluate the results, as the proposals for solutions were discussed in plenary sessions followed by new discussions with resulting changes in the groups. The proposals were then swapped and evaluated between the groups. The editorial committee provided quality assurance of the requirements before they were given final approval by the groups.

These requirements were then validated by presenting them to the supplier group and the user group to investigate how willing they were to continue with these requirements in a major project for developing and piloting new solutions. The researcher took part in the process as project manager and as a participant in the editorial committee.

Results

The EPR standard includes 518 requirements divided into ten sections. The panel of experts analysed the requirements and concluded that in some areas the standard was inadequate. They decided to develop their own additional requirements based on a standardised and common method.

Quotations from the panel of experts reflect some of their views on standards:

‘Norway is obliged to follow the international standard for records.’

‘It is difficult to interpret some of the requirements in the EPR standard.’

‘As our basis, we must use an analysis of what we need and do not need.’

‘We must develop the requirements at an unambiguous but practical level in co-ordination with the suppliers.’

In total 69 requirements from the EPR standard were selected. A further 197 additional requirements were drawn up and presented in the same way as the requirements in the standard. The requirements from the EPR standard that the panel found appropriate were primarily associated with general functions and with workflow. The highest proportion of additional requirements was associated with workflow, but there were also many additional requirements relating to the medical content in the light of professional health care. Many-to-many communication accounted for the fewest requirements, since this is covered by common requirements for use of the same messaging standards and framework for all players. The breakdown of requirements and how the requirements from the standard and additional requirements were divided into the areas of workflow, healthcare content and many-to-many communication are shown in Table 2.

There was satisfactory interest in the project. A total of 52 GP practices and 20 suppliers applied to participate. Four of the GP practices also had specialists in disciplines other than general practice. Applications were received from GP practices in all of Norway’s five health regions. The suppliers that had applied covered all the sub-areas and included both application and messaging suppliers as well as a few specialised suppliers.

Getting rid of paper

In the experience of the expert panel members, although laboratory results had been sent electronically for nearly ten years, the results were still sent on paper as well. The same applied to the electronic discharge letters that had started to appear. Panel participants felt that no adequate security around electronic communication had been developed. The panel agreed that a primary objective had to be to make it unnecessary to send paper in parallel with the electronic messages. The group felt that development of a scheme with acknowledgement of receipt could be a good solution. An acknowledgement should come automatically from the patient record system itself

Table 2 Summary of the number of functional requirements extracted from the EPR standard, called K requirements, and the number of functional requirements developed in the ELIN project, called T requirements. The breakdown of the requirements reflects the six parts in the ELIN project considered in relation to the primary criteria of content, workflow and many-to-many communication

Breakdown of functional requirements	Content		Workflow		Many-to-many	
	K requirements	T requirements	K requirements	T requirements	K requirements	T requirements
Part 1: General function requirements	3	1	14	3	7	19
Part 2: Requisitions and results	1	6	3	9	3	4
Part 3: Referrals and discharge letters	0	25	3	10	3	1
Part 4: Sick notes and other medical certificates in connection with disability	0	3	2	12	0	1
Part 5: Prescriptions	3	7	3	7	1	3
Part 6: Exchange of information and internet	0	6	0	20	0	6
Total	7	48	25	61	14	34

(the application), and not create a disturbance or additional work. As a result of this, both requirements from the standard and additional requirements developed in relation to an acknowledgement scheme for healthcare information were included.

Electronic 'envelope'

The panel of experts confirmed that the GP has a need for extensive electronic communication with many parties, and with widely varying content. There is, however, a plethora of electronic systems and solutions in use in the health service. Several participants felt that it was difficult for GPs to have an overview of these and relate to them. The group emphasised that electronic communication must become as simple and standardised as putting paper requisitions, referrals, etc., in an envelope.

The panel found that this could be taken care of through requirements for using messaging standards,

requirements for the same 'packaging' of the messages, and requirements for a shared address directory service. The group concluded that the planned health service unit register (HER) and 'framework for electronic messaging in the public health service' could fulfil these requirements.⁶ An additional requirement was that an electronic message envelope must be able to handle several types of attachments such as images and biosignals.

Helpful requisition forms

In the expert panel's experience, many requisition (order) forms were extensive and complicated because an attempt had been made to include all information that might be relevant. If explanatory text was available, it was often in a completely different place in the form to the field being filled in. The panel therefore felt that requisitions should take advantage of the potential of IT to enable dynamic adaptation to the problem

formulation (diagnosis) and the examination ordered. The panel was of the opinion that the quality of requisitions could be improved with interactive guidance and non-intrusive clinical decision support available for filling in requisitions. The group formulated additional requirements that placed greater emphasis on the professional healthcare content than previous requirements specifications and standards.

The good case summary and the good referral

The panel studied previous work from the KITH under the concepts 'the good referral' and 'the good discharge letter'. The basis for this investigation was a series of meetings between GPs and specialists at Orkdal Hospital in Central Norway as well as corresponding work from Denmark. On the whole, the group's view supported the requirements specification developed by KITH. Several panel members were concerned about opportunities to reuse information. There was a unanimous desire for concise referrals and discharge letters. The purpose of a referral must be clear, and a case summary must have a conclusion covering requirements for follow-up and further treatment.

The panel supplemented previous requirements by specifying which elements were necessary in the first development phase, and which could wait. The panel differentiated between discharge letters from departments, outpatient clinics, specialists in private practice and doctors on duty for accident and emergency services. The group formulated requirements for more structured content and data in both referral and discharge letters. A further requirement was that some information should be mandatory.

Discussion

The study shows how one can effectively develop user requirements for electronic health communication that meet the needs of a professional group in a context characterised by many small and scattered units. This has been shown earlier in the development of EPR systems, but few studies have been done on electronic communication specifically. Acceptance of the requirements in user groups and industry indicates that the method presented is valid. The project has created a forum where users and software suppliers work in closer and more binding co-operation.

We chose a qualitative approach. Methods from qualitative research are recommended in studies of the

development of user requirements in international literature.^{7,8} Involving people with in-depth theoretical and practical expertise in the area provided a sound professional foundation and was effective; however, one must be cautious about generalising the results before they have been further tested with a representative sample.⁹ The cross-evaluation between different parts of the expert group, the plenary assessment and new approval in the panel of experts may not have provided optimal observer triangulation. The participants in the groups had fairly similar backgrounds. Implementation of the project model was demanding, but in our opinion it increased precision and relevance. We discovered that not all requirements were completely unambiguous and suitable for subsequent programming and testing, although several of the experts had previously worked in close co-operation with programmers.

Publications about the development of requirements specifications for EPR in general show that many procedures have been used.^{10,11} Very little has been published about developing user requirements for electronic communication in the health service in particular. This has made it difficult to find comparison material for our results. We know, however, that there is considerable activity in the field in many countries. This may indicate that there is no strong tradition of publication and research in the area.¹²

If analysis is confined to issues of primary concern to GPs, several studies support the conclusions of our panel of experts regarding important requirements.¹³ The majority emphasised improved functionality as most important.¹⁴ User-friendliness is of greater concern for end-users in hospitals and GPs than for hospital administration and management staff.^{15,16} It is vital that use of any system provides immediate gains for those who use them, and that the systems provide great flexibility, adaptability and communication with other systems to achieve optimal workflow.^{17,18} Studies also support the user panel's conviction that integration of decision support may be very important to the use of services.¹⁹ There is also support for a positive response to the use of electronic signatures when these are in place.²⁰

We have not found any investigations that conflict with the proposals put forward by the user panel.

Conclusion

The project has developed a number of functional requirements for electronic health communication by using method triangulation. Elimination of paper in parallel with electronic messages, optimal workflow, unhindered secure health communication, and de-

finned requirements for content with scope for decision support are the most important requirements that have become operationalised. Further research should clarify the extent to which the requirements can be implemented in EPR systems and provide the results expected with regard to practical and professional benefits.

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CONFLICTS OF INTEREST

None.

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