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Evaluation of a Regional Electronic Health Care Network,
Consequences for General Practice

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Abstract. A technology assessment of the regional health care network, FYNCOM showed a.o. a time saving for an average general practice of 50 minutes per day, and a better service to patients as compared to traditional mail communication. A significant part of the time saving was rather due to less clerical work and to organizational changes than to reduction of the transmission time per se. There was no clear evidence for a better clinical outcome due to the electronic network.

1. Background

In the county of Funen, Denmark a wide spread telematic communication system called FYNCOM was established 1992-93. It interconnected at the time of evaluation (October 1994) 75 GPs´ offices with the county administration, 16 pharmacies, and 64 clinical departments and 10 laboratories in 8 hospitals. Except for a few clinical departments, all participants used computers prior to the implementation of FYNCOM.

As to the content of communication the starting point was frequent and resource demanding messages. The communication to the GPs´ offices included laboratory result and discharge letters from the hospitals, and general hospital information (e.g. waiting lists) from the county´s administration. From the GPs´ offices prescriptions was communicated to the pharmacies, and accounts to the county´s administration.

The means of communication was in general a value added network (VAN) in which every party had its own mailbox, and EDIFACT standards are used throughout. However, for communication to and from the county´s administration disks are used.

2. Objective

After the implementation, the Danish Hospital Institute has described FYNCOM´s development process, and the consequences for all parties concerned of applying FYNCOM [1]. This paper presents, however, the consequences for general practice only.

The objective of this paper is to evaluate a wide range of consequences for general practice of applying the regional health care network, FYNCOM in the county of Funen.

3. Material and method

Questionnaires were send to 22 general practice clinics in Funen County of which 18 responded, to 23 clinical departments of which 20 responded, and to 9 laboratories of which 6 responded. Also, 2 pharmacists and a number of key persons who initiated and implemented the system were interviewed. In addition, literature, statistical material, minutes of meetings etc. was studied. The general approach of the evaluation was that of technology assessment.

4. Results

A few technical aspects were evaluated by the users in 18 general practices. User-friendliness was assessed using an interval scale ranging from 0 (= extremely poor) to 10 (= extremely good). Generally, easy to operate was in average rated 8.7, data transmission to own system 8.5, easy access to FYNCOM 8.1, and well-arranged screen 7.3.
Safety was of great importance when developing FYNCOM. One of the main precautions was to built in an automatic acknowledgement of transmission and of receipt of the message. In general, users are used to handle confidential data, and have in connection with FYNCOM not taken any extra technical or organizational safety precautions of there own. However, 3 out of 18 practices use personal passwords which are often changed. There has been no violation of the safety of FYNCOM reported.
Reliability has been of great concern too. Half of the 18 practices could not recall any technical disturbances within 3 month prior to asking them whereas 6 had had break downs of some importance a.o. caused by lightning. Many of the practices have technical and organizational emergency procedures, in particular concerning transmission of prescriptions to the pharmacy.

Organizational changes was prerequisite as well as consequence of the introduction of FYNCOM. In 10 out of 18 practices the division of labour between the physician and his secretary has changed, usually with slightly more communication work to the physician, and much less to the secretary. Except for prescriptions, it is mainly the physicians who operate FYNCOM.

The time saving for an average general practice of 2.3 physicians with a daily administration of 26 prescriptions, 3 laboratory replies, 2 discharge letters, and the general hospital information was more than 50 minutes per day, or 22 minutes per physician. Table 1 illustrates the time saving.

Table 1. Time saving in general practice

ACTIVITY	TIME SAVING IN MINUTES			NUMBER OF RESPONSES
	Average	Min.	Max.	
Transfer of one prescription	1.2	-2	4	18
One use of general hospital information	2.1	0	5	11
Receive/journalize one lab. response	3.7	1	15	17
Receive/journalize one discharge letter	5.1	1	15	17

Note: 22 practices were asked, and 18 responded to the questionnaire.

The service to the patient was improved due to the faster response rate. On average the GP could present the discharge letter to the patient 8.2 days earlier than with traditional means of communication, and the laboratory reply was available 1.0 days earlier. To the patient this could mean a timely information and thus shorter time of uncertainty, and a prompt initiation of after-treatment and thus lover morbidity and less absent from work.

The clinical consequences of FYNCOM are, however, not clear. 22 general practices were asked: "What clinical consequences have you observed that the faster response rate of FYNCOM have had?" Of 18 responding practices 17 answered as shown in table 2.

Table 2. Important clinical consequences observed

NUMBER OF PRACTICES	OBSERVED CLINICAL CONSEQUENCES
4	NO practical importance observed
4	LITTLE importance, small or rarely observed consequences
2	SOME importance, consequences observed now and then
1	IMPORTANT, consequences observed more than twice a week
6	VITAL importance, consequences observed daily

Note: 22 practices were asked, 18 responded to the questionnaire, 17 answered this question.

The economic consequences of applying FYNCOM consist of cost (i.e. investment and running expenses), and of benefits (a.o. time and money saved).
The communication takes place to and from six different makes of systems for general practice, and each make is present in different models and system configuration. Consequently, the investment per practice varies within a broad range, our survey showed investments from 3,500 DKK to 20,000 DKK (500 to 3,000 ECU).
The running cost depends on the use made of the system, and therefore also varies within a broad range. Eleven practices reported monthly running cost between 250 and 2,500 DKK (35 to 350 ECU).
Based on the information gathered in our survey it was not possible to express the benefits in monetary terms. However, the costs can be viewed in the light of a monthly saving of time per practice (on average about 15 physician hours), of a better service to the patient (less morbidity and absent from work?), and of monetary saving to printed forms and postage.

5. Discussion

Prior to the development and implementation of FYNCOM the communication between general practice, and hospitals, pharmacies and the county administration in Funen County was assessed [2] showing a very extensive exchange of forms, and telephone conversations. For the county as a whole (about 0.50 mill. inhabitants), the daily communication in 1990 was estimated to: 8,800 prescriptions, 1,500 laboratory replies, and 800 discharge letters.

As confirmed by others, prescriptions to the pharmacies are the GPs´ most frequent external communication. Surveys in 1986 of prescription habits and errors [3, 4] showed that:
- 52 % of GPs´ prescription were written on traditional printed forms whereas 48% were communicated per telephone,
- 76 % of the prescriptions were presented to the pharmacy on the date of issue, indicating the need for a rapid communication, and
- 28 % of the prescriptions were vitiated by serious errors in relation to the National Board of Health´ regulations.

The first Danish computer-based communication of prescriptions took place in Copenhagen 1990 [5]. Based on the experience there, a handbook and EDIFACT-standard was issued and subsequently used in Funen County.
Our survey showed a drastic reduction in the use of traditional prescription forms. In many cases FYNCOM presents the prescription to the pharmacy before the patient shows up, but sometimes it is faster for the patient to take the prescription to the pharmacy by hand.
Most computer-systems for general practice in Funen County do contain a prescription

module with drug information. We have not studied the error-rate of prescriptions as it is assumed not to be influenced by the mean of communication, at least as long as it is written.

Clinical chemical laboratories and GPs in Funen County was early aware of the need for good cooperation and fast communication, actually the first computer-based communication between a hospital and a few practices in Funen County concerned laboratory results and took place in 1989. The reason why computer-based communication was introduced in this field was presumably that the laboratory information consists of few standardized figures which were already available on the laboratory computers.

For several years, one of the most general problems of communication between hospitals and general practice concerned the delay of discharge letters [6]. An early survey [7] showed a.o. that 45 % of the letters arrived in the GP´s office more than 14 days after discharge, and that 27 % of the discharged patients showed-up in the GP´s office before he has received the discharge letter. Another survey [8] showed that 41 % of discharged patients show-up in the GP´s office before the discharge letter has been received. Also the content of the discharge letters has ben criticized.
Prior to the implementation of FYNCOM, the health services in the Funen County encountered the same type of delay and frustrations. The average reduction of the transmission delay of more than 8 days means a lot to the service, and is mainly due to standardization of the discharge letters and organizational changes in the clinical departments. The standardization did, apparently not mean any loss of important information to the GPs, some say even that the discharge letters have been clearer and more to the point.

Organizational changes is a common prerequisite for and/or consequence of introducing medical informatics. Some organizational changes were well planned (e.g. the clinical departments' procedures concerning discharge letters), others came more or less as a surprise. Fifty per cent of the general practices asked had not considered organizational questions prior to the introduction of FYNCOM, and those who had had mainly discussed a new potential division of labour and where to place the work station.

6. Conclusion and perspective

The regional health care network, FYNCOM is now in normal daily use and more than 30.000 messages are sent each month.
The work has started to fine-tune the implemented messages. One example of this is the establishment of a classifications for dosage information in electronic prescriptions. Pharmacies can already use information for stock control, and new functionality can be added. When structured dosage information is included, the pharmacy system can make intelligent controls of all parts of the prescriptions, and labels for pill bottles etc. can be printed automatically and error free.
Projects are also being established to implement new types of messages. The referral is being implemented as a part of the national project (MedCom). The need for exchange of basic information (waiting times etc.) have required a brand new EDIFACT. This was developed during 1995, and the experience will be fed back to the European standardization process.
Since January 1996 FYNCOM is no longer merely a time restricted project, is has become a permanent County activity. The politicians, health care administrations and health care professional users are convinced about FYNCOM's viability.

The results from the project in the County of Funen has been a major input to the national strategy for a health care network. The project - MedCom - started in 1995 and will establish a national health care network based on European standards within two years. The aim is to create a market for health care telematics which can survive on commercial conditions.
The first wave of 12 pilot projects are finished in the beginning of 1996. The second wave of 15 pilot projects will finish by the end of 1996. The dissemination process in Denmark seems promising. By the end of 1995 the network included more than 2400 "users": over 1200 doctors in 690 practices, 980 departments in 50 hospitals, and 260 pharmacies. The annual savings are estimated to at least 200 mil. DKK (30 MECU).

MedCom is the coordinator of the European project CoCo - Coordination and Continuity in primary health care. This is the largest research and development project within the Telematics Applications for Health programme under the European Union´s 4th Framework Programme.
CoCo is an attempt to contribute with the FYNCOM/MedCom strategies at a European level. CoCo will establish Regional Health Care Network in 10 regions. The aim is partly to improve the coordination and continuity of health and social services, partly to stimulate the development of a European market for health care telematics. CoCo includes both structured text-messages (EDIFACT) and multi-media communication to achieve these objectives.

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