Implementation of an Electronic Patient Record System in a Venereological Outpatient Clinic

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Introduction

In recent years, there has been increased use of electronic-based patient records (EPRs) in several hospital departments in Denmark and abroad (1–7). In Denmark, focus has been drawn to the use of EPRs by both politicians and hospital administrators. None the less, EPRs have only been implemented locally in various departments and no decision has yet been made as to when a common model for data integration will be implemented. One of the major reasons for this lack of unity is that the hospital system in Denmark is not centrally managed. In Norway, where a greater effort has been made to introduce EPRs, its use is wider, but still no common solution has been chosen (8) and several different systems are implemented. Thus, problems with regard to information exchange exist.

While waiting for the implementation of a common information technology (IT)-based medical patient journal system, the establishment of local EPRs will give important information to potential benefits and problems. The field of venereology constitutes an isolated unit where the tight restriction on data flow out of the department makes it an ideal field for obtaining information with regard to implementation of a local EPR, since the problems related to patient information to be exchanged with external sources, such as other hospital units and referring doctors, are minimised. We have introduced an EPR to our venereological outpatient clinic in Bispebjerg Hospital, located in the periphery of Copenhagen. Our outpatient clinic covers the entire greater Copenhagen area and we have approximately 18 000 consultations per year. The EPR began to be used in May 2001 and is today fully functional (3). A description of this EPR system is the focus of this paper.

In general, there are several benefits to using an EPR as compared to standard paper-based medical records. We raised five major goals in connection with the introduction of an EPR:

1) Improvement of logistics. The medical records are stored in one place and access to all data is possible from different terminals. Furthermore, the growing problem of "missing" paper records is eliminated.
2) Data security. Only authorised personnel are capable of accessing the data and personal security codes are required. In addition, the results of all taken samples are available in the journal file and no loss of data is possible following registration.
3) Data quality. The structure of the EPR ensures that all major areas necessary for obtaining adequate venereological records are covered. This is an aid especially to young physicians.
4) Automation of procedures. The structure of the EPR makes it possible to generate statistics, e.g. in relation to the occurrence of various STD and the demographics of persons with venereological diseases. It is also possible to generate lists used for financial reimbursement to the clinic.
5) The implementation of IT-based solutions should yield immediate benefits to the users. In other words, the introduction of an EPR should support one's work, not generate more of it.

In addition to the above-mentioned items, we realised that the implementation of an EPR in our venereological outpatient clinic would yield valuable information regarding the use of IT-based medical records and prepare our medical staff for a later introduction of more complex systems.

Main structure of the EPR

The venerological outpatient clinic is a closed unit, with strict requirements regarding the security of patient data and a policy that allows patients anonymity if they wish. Thus, no information regarding the course of a disease or treatment is sent out to other medical personnel unless specific acceptance from the patient is obtained. In compliance

with these policies, our EPR is not connected to any central database containing personal information on the individual.

The EPR is programmed in Clarion, a fourth-generation tool that works under PC-Windows. The overall structure is fixed but can be modified by a specialist. The users can modify the different modules, and there is flexibility regarding questions, treatments and sample materials. In our case, it is the physicians in the clinic that have formulated the different modules contained within the EPR.

The program is based on a Windows platform and access to the EPR requires that the workstation be attached to the local IT-network. This network is covered by standard security measures including authorised passwords and private security codes. The EPR stores all registered data in a file located on a separate server in the hospital and access to this server is subject to special restrictions. Thus, only specifically authorised personnel can access the area on the server containing the EPR database. Furthermore, to open the EPR, a specific ID and password is required. This information is stored within the EPR system and new users can only be registered or information modified by two specially authorised users. Thus, two levels of security exist.

Table I. *List of modules available in the EPR*

Modules	Content/target patient group
A*	Primary patient record
B	Registration of diagnoses
C	Condyloma-control visits/ treatment registration
D	Chlamydia-control visits/ treatment registration
E	Gonorrhoea-control visits/ treatment registration
F	Syphilis control visits/screening module/treatment registration
G	HIV+ control visits/screening module
H	Module used by the counsellor
J	Area for "input data" obtained by scanning procedure
K	Hepatitis-control visits/ screening module

* Module A contains all information necessary to obtain a full venereological patient record.

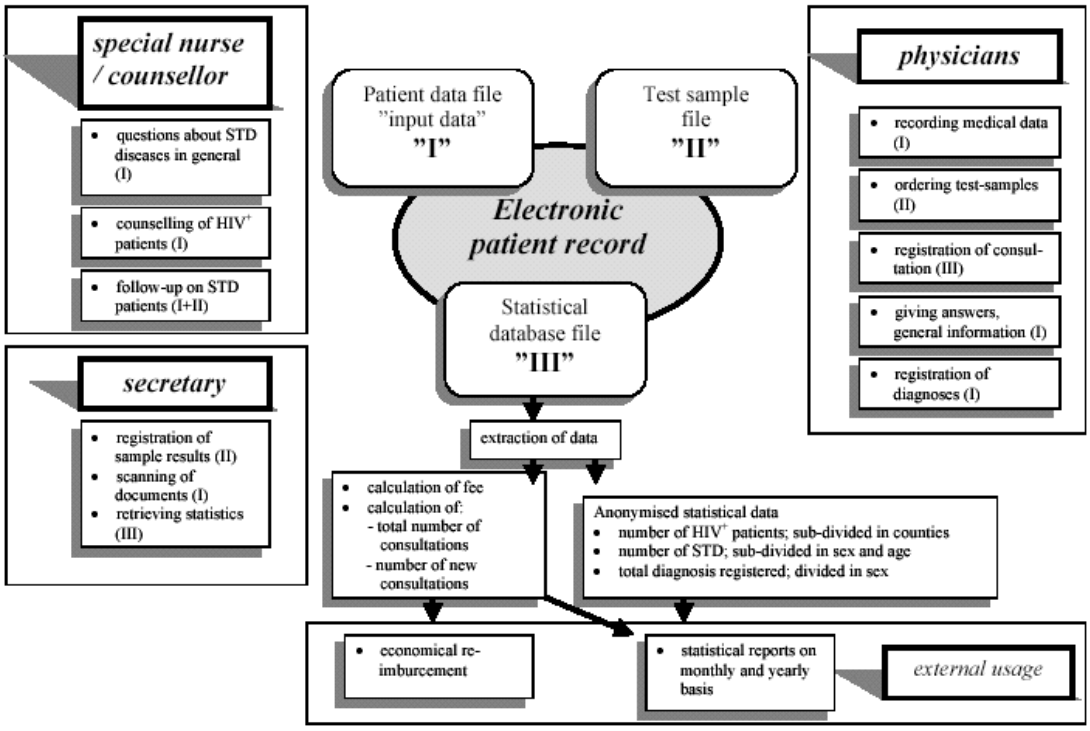

Fig. 1. Structure of the electronic patient record (EPR). The EPR contains information related to patient data, recorded test-sample results and data used for statistical analyses. The tasks of the different user groups are indicated.

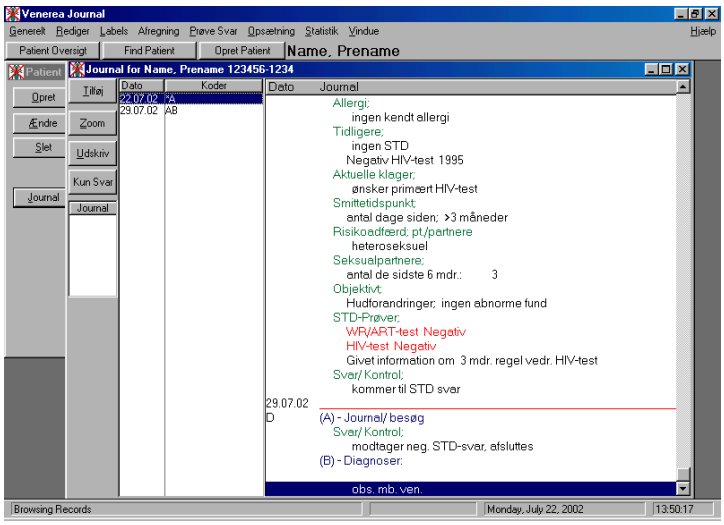

Fig. 2. Example of how the screen window in the EPR can look

In total, three groups of personnel have access to the database. These include physicians, a few nurses (performing counselling sessions) and secretaries (Fig. 1). All access to the database is registered in a separate file (LOG-file) where it is possible to see the identification of individuals that have opened specific patient files and to see any registrations or alterations performed. Finally, to secure the registered data, daily backup of the entire database is performed.

Description of the EPR

The EPR system is a medical record system containing anamnestic questions, clinical observations, treatments prescribed and diagnoses of the patients. It provides a longitudinal record of the individual patient, making it possible to provide optimal care and treatment. The EPR consists of three layers. The front layer (Fig. 2) contains all information registered during current and prior courses of treatment. This includes information regarding the date of previous appointments (marked "dato"), type of appointment (marked "koder") and finally all texts, including sample results. Most information can be put into the EPR by marking specific preformed questions/answers. However, if necessary, additional text can be included. The second layer contains sample results only, so that a quick overview of previously performed tests and their results is available. The third layer contains registered diagnoses of the patient.

The EPR is based on 10 different modules (Table I). When a new patient is registered or when a new course of treatment is initiated with respect to a patient previously known to the clinic, module A is used. This module contains all the questions necessary for obtaining a full venereological record. In addition, all standard tests can be registered in module A. When a specific diagnosis is made, this is registered under module B. This approach ensures that no cause of treatment is terminated without a diagnosis being registered. The other modules are used in follow-up consultations. These are small modules specifically targeted to selected patient groups. This can be e.g. patients with condyloma acuminatum who are attending control/treatment sessions or patients with previously diagnosed chlamydia who attend the 5-week follow-up test (Fig. 3). By choosing these modules, only relevant questions are available, thus reducing the time used to fill out the EPR.

Because a lot of information from external sources is available on paper only, a scanner is attached to the system. Through this approach, all information, including antibiotic sensitivity test results, specific HIV test results, results of blood samples and notes such as letters from referral doctors, is available in the EPR.

Registration of test samples

All samples taken are to be registered in the EPR. Each sample has to be ordered separately. Through this approach, the samples are automatically registered in the test sample folder and can be handled by the secretary when test results are received in the clinic. At the moment, all samples additionally need to be ordered using paper forms and the test results obtained from the different laboratories have to be entered manually in the EPR. This is partly due to lack of standardised

communication with the different external laboratories supporting our outpatient clinic and partly due to the necessity of registering positive test results. This is especially important regarding the HIV-test, where we prepare the delivery of a positive test result with great care and always make sure for instance that a counsellor is available. This is, however, a time-consuming part of the current system.

Database structure

To make the data secure, personal data (social security number/CPR) is stored separately from clinically related data. The only way to access data is through the EPR that combines the different information in the individual medical record. Thus, upon opening a patient record, all registered data are available on that person. For statistical use, registered data are collected in a single database that sums up the different individual data. For the moment, specific information can be retrieved regarding age, sex, and county of origin and this information can be combined with the different fields, e.g. positive test results. It is not possible, however, to retrieve other information, e.g. on patients with a positive chlamydia test for statistical evaluation, because the database only contains the total number of events from a given question.

Finally, specific information is stored combining the different types of fees and the patient address (county). This part is used to claim the charges for the consultations. All the above-mentioned options can be calculated at time intervals determined by the user, thereby automatically generating statistics, e.g. on a monthly or annual basis.

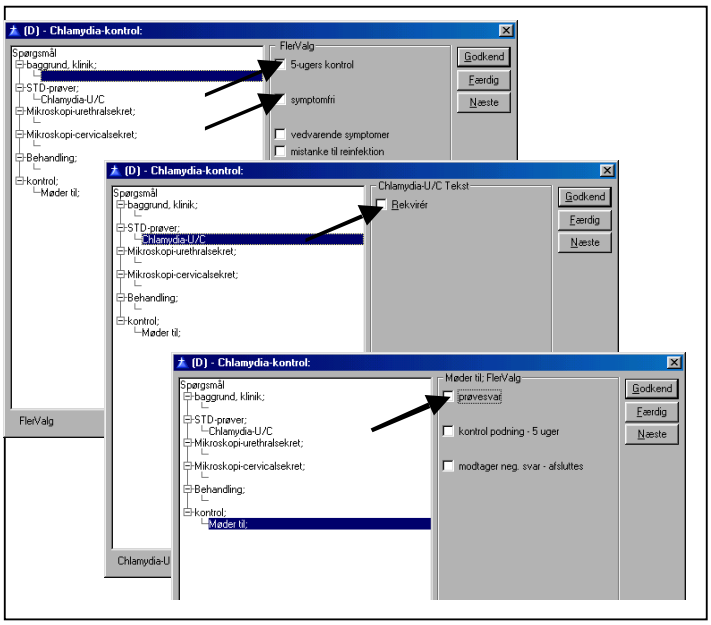

Fig. 3. Work schedule for a 5-week chlamydia follow-up session. The figure shows the registrations needed to fill in the special module (module D) in the case of a non-complicated chlamydia control consultation. The arrows indicate the necessary markings.

Implementation of the EPR

The EPR was introduced in April 2001 and within the first two months following implementation, all previous paper-based data were evaluated and transferred to the EPR system either by short notes or through scanning. In addition, we implemented both an electronic and a manual registration of the number and type of consultations performed through the first two-month period. Following this, no difference was apparent and subsequently all claims were made based on the EPR system. Initially, an increase in consultation time was anticipated, but within the above-mentioned period normal time schedules were re-introduced. In support of this, 16 889 consultations were performed during the period from May 1, 2001 to April 30, 2002. This figure is close to the expected number based on the results from the previous year.

To investigate a possible increased time consumption due to the implementation of the EPR, comparison was made between the same 1-month period in 2000 (before implementation of the EPR) and in 2001 (after implementation of the EPR). This comparison included the total number of consultations throughout the period and the maximal number of consultations per day. By this comparison, no decrease in efficacy could be registered (3).

When analysing 100 consecutive journals, 100 out of 100 had registered the address (county) of the patients. Furthermore, if a patient had attended twice or more or if a treatment was initiated, 92 out of 100 journals contained a diagnosis (3). Finally, to check the integrity of the recorded data, a comparison was made between the number of ordered HIV-tests and the charge for such a service. Using this set-up, no significant difference could be seen in the overall result. However, comparison of data obtained from individual records was not possible due to the structure of the database.

Discussion

Today, our EPR has been in use for more than one year. In general, the users are content with the system. There are, however, both benefits and drawbacks from the system in its current form. The benefits include improvement of the logistics. In addition, the automation of procedures reduces the workload for our secretaries in connection with finding paper records, transporting records from archive to consulting rooms, writing notes in the journal, manual registration of the consultations and finally with respect to the generation of the different statistical reports. For the physicians, the EPR seems to help especially younger colleagues going through the aspects of obtaining an adequate venereological record. Furthermore, most procedures can be registered simply by a "mark", thereby decreasing the time requirement.

However, some drawbacks are also evident in the current system. First, with regard to diagnosis registration, it is currently possible to register the same diagnosis more than once during the same course of treatment. Second, due to our security requirements, scientific analyses of data are very restricted. One cannot retrieve statistical analyses based on e.g. sexual activity or origin of infection in persons with verified STD, even though this information is put into the files. Specific programming through an external source, however, may solve these problems.

Furthermore, the physicians are now spending considerably more time typing notes into the EPR. Secretaries attached to our outpatient clinic previously carried out this function. Before implementation of the EPR, the secretaries went through the paper records once a year to register them, terminate inactive courses of treatments and "add" missing diagnoses. This service is now unavailable due to required savings. In order to find the "falsely active" medical records and to ensure that diagnoses have been recorded, active journals, grouped according to last attendance, may be located in the EPR system, but staff resources have not been allocated to perform this function.

Thus, implementation of an EPR system has now begun and in general users are content. Several benefits have been obtained, but the actual financial savings attributed to the implementation of an EPR are not entirely clear. One's major goal in introducing IT-based record systems should be to improve logistics and data security and the EPR should function as an aid to primary users by increasing the overview of the treatment course of the patients and by reducing the workload.

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