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Introduction of a new Hospital Information System at the Innsbruck University Hospital

Verena Callegari[*], Karl Peter Pfeiffer[*], Georg Lechleitner[**]
[*] *University of Innsbruck, Department of Biostatistics and Documentation*
[**] *TILAK Gmbh, Innsbruck*

Abstract. The aim of the introduction of an advanced hospital information system at the Innsbruck University Hospital is mainly to support the care process and to improve quality and efficiency of care. These requirements entail changes in the clinical processes and many obstacles with respect to the organization have to be considered. The article gives an overview of the goals, organization and problems of the introduction which is still in the planning phase.

1. Project Introduction

1.1. Goals

In the past few years complaints and new requirements showed that the existing IT-environment at the Innsbruck University Hospital is no longer sufficient. Single departments started to install proprietary systems. The result is a heterogeneity of systems which have to be integrated for a hospitalwide use of patient data. The new system should provide functions for documentation, communication, presentation, evaluation, quality assurance and decision support.

Further reasons for the introduction of a new system are listed below:
Accessibility and management of the paper-based medical record is problematic. The goal is an electronic patient record who allows immediate access and a clear view to all relevant patient data no matter where these data come from. An important step will be the integration of inpatient and outpatient data since these data are separated in the Innsbruck University Hospital for administrative reasons now.

The procedure of ordering and resulting at the moment takes a lot of time to wait for someone who picks up the orders and the results. Many phone calls are made to specify the orders and to find out the stage of the processing. In the new system it must be possible to enter an order directly into the computer where it will immediately show up at the ancillary site. The processing can be tracked by giving status reports like „specimen arrived", „in process", etc.

One of the high priority goals is a scheduling system where patients can be scheduled for more than one examinations at different sites at the hospital. This process should be supported automatically by the system.

Since the introduction of a new hospital financing system in Austria the importance of electronic capturing of patient data is growing. The inpatient encounters are no longer charged by length of stay, but by service and diagnosis. For this purpose a data set with the most important patient data, as patient demographic data, organizational data and medical data, has to be captured. Therefore flexible forms for structured electronic data entry will be necessary to facilitate this process.

Furthermore standardization and optimization of the care process should be managed by the new system.

1.2. Environment - TILAK Organization and Innsbruck University Hospital

TILAK is a holding company, responsible for the management of 4 hospitals. The biggest is the University Hospital in Innsbruck - around 1600 beds, compared with a total of around 2400. The new system will be introduced in all TILAK hospitals, the start will take place in Innsbruck. Innsbruck University Hospital delivers care for around 61.700 inpatients and 275.000 outpatients per year. The requirements of an University Hospital exceeds the ones for a „normal" hospital. Features like flexible medical documentation possibilities for clinical trials are necessary as well.

1.3. The existing IT-technology

The current central patient information system is a ASCII-format oriented system for patient registration and a few medical documentation possibilities. Viewing results from the laboratory system and entering diagnoses and services are examples of the functionality. All outpatient clinics and all wards are integrated in this system, with a total of 500 workstations and 2.200 users at the moment.
Furthermore some departmental systems and clinical support systems are integrated via the communication server „Cloverleaf". There are standardized HL-7 interfaces as well as proprietary interfaces.

2. Organization of the Implementation

2.1. The Decision-Making Process

Beside the requirements defined above the search for a suitable product was performed by the following criteria. The system was expected to be

- highly integrated
- Windows based
- clinical oriented
- suitable for science and research with tools for quality assurance, data analysis and presentation.

Further requirements were a well structured, flexible database with a modern database management and the expectation of a continuos development of the system.

After an international search for hospital information systems the decision for Cerner Corp., Kansas City, MO, was made. This company developed a system called HNA-Millenium which focuses on the care process rather than on the administrative and billing process.

Before starting the implementation a group of software specialists has been established in Austria. This group has been trained on the system to serve as consultants for the this project and further projects in Europe.

2.2. Where to start – Pilots and Rollout

four stages depending on the priority and complexity and to start the implementation at two pilot clinics which will be followed by the other departments during a rollout-phase. This means the implementation of stage 1 will be carried out at the pilots and then be extended on the other departments. Then stage 2 will start at the pilots etc.

The pilots were chosen because of the high motivation and a high level of structuring at these departments. It might be easier to implement the system and collect experiences there first before rolling out to more complex departments.

One of the pilots already uses a departmental system which is not ready for the Y2K problem. This means that there's a deadline for the basic functionality of the old system - December 1999.

2.3. Functionality

At the first stage the existing functions of the old system should be implemented in the new system to guarantee a continuous transition. These functions will mainly be administrative ones, e.g. patient management. It is necessary to implement interfaces to the old system, because this system will remain the registration system which assigns the unique patient and encounter identification numbers.

HL-7 interfaces to subsystems which are important for the department (e.g. radiology, laboratory) will be set up for the inbound of information. Thus results from these ancillary sites will be routed directly into the new system. At the first stage it will not yet be possible to set up an order via an HL-7 interface. A basic communication system will be introduced for the users of the system as well as scheduling functions for the outpatient clinics.

The coding of diagnoses and procedures is necessary for the billing process as described above and should therefore be integrated in the new system from the beginning.

The composition and storage of patient oriented clinical documents e.g. discharge summaries within the system will also be implemented at the first stage.

An important prerequisite for a continuous transition is the data transition from the old system to the new one.

Advanced functionality as ordering/resulting, additional interfaces to important subsystems, implementation of standards for treatment and nursing, proactive functions, decision support up to an integrated case management will be introduced at the following stages.

2.4. Prototype

Since there was no German demonstration material available the decision was made to develop an prototype of the Orthopedic Department which is one of the pilots. Real doctors' names, real patients, local facilities, German expressions, forms and user interfaces should be the environment of a real world scenario to give an impression how the system will look like and how processes could be carried out in the future. The design of the prototype was also a chance for the implementation team to get known to the system, its constraints and possibilities.

2.5. Process Redesign

The organizational changes which accompany the introduction of a new system have to be considered. Processes have to be redesigned to reach optimal support by the system.

The system itself is based on a workflow management where tasks can be defined. These tasks are listed in personal or common task-lists. Clinical documentation such as

forms for structured data entry are integrated in these tasks and can be accessed during the processing of the task. Thus the user is supported through integrated documentation in the task. The importance of the connection between process management and document management was shown also by [1].

The reengineering of processes is part of the implementation strategy suggested by the Cerner Corp. This implementation strategy is called "Designer's workbench". There tools for the implementation especially for the process reengineering can be found.

First step is a current state analysis to inquiry the clinical processes as they are carried out now and the constraints given by the organization. An example for a constraint in the described environment is the lack of mobile computers. There won't be any mobile computers available - at least at the beginning- , so data captured on the bedside will be written down on paper and afterwards transcribed into the system.

Processes are visualized by the use of flowcharts which makes it easier to find bottlenecks and possibilities for improvement.

The next step is to analyze these processes in view of these constraints and the system's possibilities and to reengineer them. An important consideration is to include clinicians in the planning of these processes. Accordance has to be reached to assure acceptance.

An example of a process which will change substantially is the ordering and resulting process. Changing this process to an order process in the system disturbance will be reduced, the communication will be faster and a tracking of the stage of the order can be done easily.

The reengineering will be necessary not only for the first stage but also for the next three phases which will entail even bigger changes.

3. Experiences and Considerations

3.1. Current status

The Current State Analysis is nearly finished for the pilots (May 1999). The main processes have been analyzed in detail with the help of physicians, nurses and secretaries. Teams have been formed who are familiar with these processes.

The next step is to analyze the processes in view of potential benefits which can be gained through the use of the new system. These teams will differ from the former teams, because in this team stakeholders will be included to make the conversion easier.

The aim is to define standard processes which will be the basis for all departments.

3.2. Expected problems and challenges

The step by step introduction of the system means there has to be a parallel execution of the old and the new system which will force the staff to do some of the work in one system and some in a different system. The desired benefits will not be obvious until overall integration is reached.

The users' acceptance of the system and the change management are challenges, but there are many obstacles. There are high expectations that have to be met which might end up in disillusion and demotivation, especially in the early phase where only a small part of

or data which might cause problems concerning the acceptance.

An other critical point is the scheduling of the training on the system, because of the large numbers of users. Therefore a training concept has to be developed.

The HNA-Millenium has been developed for the American health system mainly hence some effort will be necessary to adjust health system specific issues.

Today many documents consist of unstructured information mainly. To structure as much information as possible is a necessary prerequisite for analysis, scientific reasons, quality assurance and for the development of standards for treatment and nursing. A major part of the documentation considerations will be the design of forms for structured data entry.

Although the aim is the electronic capturing and storing of all patient data (see [2] for the requirements of an CPR) it will not be possible to integrate all documents in the system. Some of the remaining paper documents could be scanned, e.g. results from external sites. Still there are some documents that cannot be replaced via electronic documents because of legal reasons. The patient's compliance if he needs a surgical procedure e.g. has to be signed by hand and stored. There's no legal possibility to forego a handwritten signature yet.

There are lots of catalogues which have to be maintained and updated regularly. These catalogues are partly national catalogues partly local catalogues. A synchronizing concept has to be developed to synchronize these catalogues for the old and the new system.

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