Information Technology and Psycho-Oncology: When will we have electronic patient files?

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Introduction

Our culture is moving from the nuclear to the information age. Computers are common tools in many work fields, although they are not yet commonly used in hospitals outside the purely administrative area. Clinical work includes complex tasks and the interaction of many people with shared responsibility who have to share information. This article gives examples of advantages of computer use in this setting over paper based patient files, describes some requirements for a clinical information system and finally, highlights some of the systems which are already available.

Where are computers already used?

Computers are already used in areas where administrative tasks or billing are involved and regularly used in preparing discharge letters and other reports. However within a single hospital, it is not uncommon to find that different specialists write reports on independent computer systems - and pass on the printouts. The integration of electronic data is often suboptimal, e.g. administrative information collected on admission might not be available in an electronic format to the person who writes the discharge letter. Traditionally, information gathered during the stay of the patient is collected in a paper based file.

Disadvantages of conventional patient data management

Information is commonly passed between hospital ward and specialists on paper. This method infers the following disadvantages:

Inefficient data entry: At least in Germany, a lot of normal findings have to be documented. A typical physical examination report may include 90% of normal findings. Writing down 9 normal and 1 pathological findings takes 10-fold the time of writing 1 pathological result into an electronic form, leaving 9 default entries unchanged.

Inefficient data handling: lt takes time to arrange sheets of paper in the patient's file. Getting a synopsis of selected data is difficult: lt requires more time and concentration to review 10 laboratory printouts from different days containing different investigations, than to look at one cumulative table with all investigations automatically sorted by time and type.

Time consuming communication of data: Every time a piece of information has to be passed on, it has to be written down again. E.g., to schedule a chest x-ray, a physician will write an order; a nurse will copy it; an assistant in the x-ray facility will write down the patient's name and the required investigation in a diary - the nurse on the ward will do the same. The radiologist will dictate the data again for his report, which his secretary copies. Finally, the initial physician will dictate the same data for the discharge letter which his secretary types. Data - which don't carry much information - have consumed time for dictation or writing about 8 times.

Poor data availability: Results of an investigation are usually not available immediately to the requesting physician but only after they have been dictated, printed, and distributed into patient files. Understandably, some results remain unavailable forever. The availability of data depends on the physical availability of the patient file. Paper based files do not allow simultaneous accessibility for different people. Even with the best tracer systems much time is lost searching for missing files.

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Poor data availability for scientific purposes: The most time-consuming part in many scientific studies is to identify relevant data from patient files and to enter them into a computer system. This problem makes any evaluation of medical work extremely difficult. In the conventional patient file system files are classified by: name, date of birth and year of admission. lt is diffcult to identify files with common clinical parameters.

Uncomfortable physical data format: A typical patient file archive occupies a large room in any hospital. The same is true for x-ray archives. Text or numeric data contained in a typical patient file will be far below 1 MB. Together with results from examinations generating low resolution data streams like ECG, EMG, EEG or low resolution images like ultrasound or nuclear medicine, they might reach a few megabytes. Only high resolution reproductions of photos, roentgenologic films or movies require more storage space. Nowadays, certainly all non-image data produced or collected in a typical ward in one year can be stored on a single inexpensive harddisk. The same harddisk might also have enough space left to store some 10,000 ultrasound printouts.

Limited access to external medical knowledge: Numerous medical databases and journals are available either on CD-ROM or through the Internet. An electronic database can produce results faster, and results from a database might be more up-to-date than those found in books, making it quick and easy to extend the physician's knowledge base e.g. concerning rare diseases.

A Good Clinical Information System

A good clinical computer system can be expected to inerease the effectiveness of a ward or a hospital. After the installation of some of the systems mentioned below, annual savings of up to $ 1 million have been reported.

A good clinical information system should offer easy and intuitive handling, even for people who cannot write quickly on an alphanumeric keyboard. There are different technical solutions available. Some (like touch-screens or voice-recognition facilities) may be suitable only for special areas. Modern systems have special features to enable physically handicapped people to use them.

A clinical information system might provide an electronic patient file, in which to store and process different kinds of data: text information including administrative data, nurses' and physicians' notes, numeric data including clinical parameters, test results including quality-of-life data and image data. Multimedia computers and networking technology have become so cheap, that it is no technical or financial problem to create a virtual radiology library, accessible from anywhere in the world.

Communication is a key element so the system should be able to distribute and share data either through networks or telephone lines. For some tasks portable media like floppy disks or CD-ROMs will be required. Exchange of data between Systems is required, so data should be stored in standardised or well documented formats. In Germany, there is at least one major standardised format for data exchange among practice management systems. Data can be stored centrally in a network system. Thus, an electronic patient file can be read or modified by several users from several locations without any delay.

An electronic patient file can offer advantages in standardisation of procedures and documentation, e.g. prompting for results ensuring that tests have been completed. Reports concerning similar questions can be standardised but additional space should be reserved for individual remarks. Default answers in report forms (which only have to be confirmed or selected from a list) assist the reporting physician by reducing the number of words he has to write to those which really bear information. The system can compose main parts of a discharge letter leaving the clinician only to remove unnecessary data and add individual points, e.g. therapeutic suggestions. Conceivably, the patient could hold his whole data set on a portable storage medium to pass on to the next health care provider.

Effective computerisation of records allows the imme-

diate availability of data for audit, stock control (e.g. of ward supplies) and statistical information, e.g. total patient number per time or cost analyses can be retrieved more easily. From the scientific point of view, these data-bases, especially those including outcome data like patients' quality-of-life-reports, can be used for therapeutic evaluation. Electronic patient files are suitable for multivariate analysis with almost no additional preparation.

The major components of a clinical information system are: in most cases, a number of computers, linked through a (partially wireless) network. There will be a database server software with image processing, word processing and calculating software elements. The system should offer interfaces to other systems or modules which accomplish special additional tasks. Of course, (secure) links to tbe Internet might be advantageous to access external medical data bases or to exchange data for medical or scientific purposes. Because such a system must comply with local legal and billing standards, continuous updating of relevant parts of the system will be required.

As far as hardware is concerned, different system architectures like UNIX, MS-Windows, Apple Macintosh can work together today. There are some solutions available using the Apple Newton as client computer - with limited computing and display capabilities, but with competitive size and price. Because most platforms can offer similar features, the kind of hardware chosen is of secondary importance. However, PCs have by far the biggest market share and might offer greatest versatility and value for money.

An important point of critisism might be data protection. A clinical information system should offer limited access to members of the medical team according to their requirements. The electronic patient file must be protected against unwanted modification or deletion and against any unauthorised access. Reliable methods to achieve these goals are available employing password identification in a networking system and data encryption methods for data storage. There must also be some means of data protection against malfunction of the computer system itself or impact from fire or other disasters.

What is already available?

In Germany, there have been systems for the management of medical practices for about 10 years. Recent changes in medical law will result in increased computer use in German hospitals.

The systems already available include many of the features mentioned above. Some can be scaled up from practice to hospital level just by adding more workstations. However, multimedia support is not yet common.

Years ago, the development of any computer system was a specialist's task. With improvements in user friendliness of modern graphical operating systems, the use of commercially available database or office management software might be a feasible approach.

The list appended to this article is not comprehensive. Further information is available from the author.

What should be done?

Those who are in charge of planning the implementation of an electronic system in their clinical setting should consider the following points:

- Review currently available electronic solutions.
- Consider, how well different available solutions might fit the given setting.
- Try to find comparable sites where electronic systems have been implemented.
- Look at different sites to see different systems working. Because there is already a variety of systems available, one of them should fit a potential user's needs very well. So there will be no need to spend exorbitant financial resources on the development of a new system.

Conclusion

It is no problem to have an electronic patient file with wireless access from anywbere in the hospital. Numerous complete solutions are available or under development. Many have proved they can increase effectiveness and save costs. Most clinical environments still work in a paper based manner. Even standard hardware and software can be used effectively to reduce the paper in clinical work. lt is essential to increase awareness of the potential of electronic support for clinical work. The electronic patient file can be available as soon as you want it!

Appendix

- Quincy PCnet: An older practice management system with an electronic patient file, billing, communication, interfaces to several hardware add-ons. Using a PC network, running in several hundred practices in Germany.
- Clinisys: A modular patient management System using pen-computers and an Oracle database server. Currently used in over 50 clinics.

- DocuMed: Automated medical records and outcome management, also using pen-computers.
- NextGen: Patient management system, client-server architecture, including image and drawing management.
- Medos-X: A system with special capabilities in processing and archiving image data resulting from radiologic investigations, integrated with text and document archiving.
- ISTec KIS: A cinical information system under development in the Department of Urology of the University of Ulm.
- Medical Digital Assistant and Patient Record Server: Automation of all aspects of clinical encounters, authorisation, procedure billing and documentation, access to complete medical information at the point of care.[3]
- The Strang Cancer Prevention Center (N.Y.) developed a client-server solution based on Microsoft Windows NT and Microsoft SQL Server database, thereby saving the cost of a third party developer estimated at $200.000. [3]
- The Intensive Care Unit at the Clinic Robert-Weixler-Straße in Kempten. Germany, uses forms prepared with the standard software Ragtime on an Apple Macintosh for comprehensive patient management.
- An integrated system in the Intensive Care Unit St. Vincent's Hospital, Melbourne, supports the complete multimedia electronic patient file with live data capture through a computer at each patient's bed and in each consultant's room.
- The Quality-of-Life-Recorder, developed at the University of Ulm: This is a specialised tool optimised to allow patients completely untrained in computer use to fill in electronic questionnaires. Resulting data can be imported into clinical information systems. A new version runs on every Windows PC and is available as shareware.[1, 2]

References

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