



Origin and evolution of Hospital Information Systems

The Dutch Breast Cancer Screening goes digital

Ab Bakker, Addabit B.V.

abakker@addabit.demon.nl



Let me introduce myself

- **Trained as mathematician**
- **Active in ICT since 1956**
 - **Aeronautics**
 - **Shipbuilding**
 - **Computer industry (Philips)**
- **In health care since 1971**
- **(retired) Professor in Medical Informatics at Leiden University**
- **Now consultant, free electron**



Use of computers in health care

- **Began in the second half of the sixties**
- **Early applications**
 - **Clinical laboratories**
 - **Registration of diagnoses (ICD)**
 - **Registration of findings of clinical pathology (SNOPcode)**
 - **ECG analysis**
 - **Finance and administration**



Pioneers of ICT in health care

- *In de sixties: so > 40 years ago*
- **UK, John Anderson**
- **Sweden, Hans Peterson**
- **Germany, Peter Reichertz, Karl Theo Ehlers, Gerd Griesser**
- **Francois Gremy (FR)**
- **USA, Morris Collen**
- **Russia ??**



The concept integrated or total hospital information system

- **Emerged at the end of the sixties**
- **It was recognised that:**
 - **Hospitals were dealing with huge quantities of data**
 - **Many activities/processes were interrelated**
 - **The patient was the pivotal point in the care process**
 - **The communication/coordination in the hospital had to be improved**



Several HIS projects

- **El Camino, mountain view hospital (USA)**
- **Danderyd hospital Stockholm (SW)**
- **London Hospital (UK)**
- **Hannover (DE)**
- **Leiden (NL)**
- **Geneva (CH)**
- **Russia ?**



HIS concept (Morris Collen)

The goal of a hospital information system (HIS) is to use computers and communications equipment to collect, store, process, retrieve, and communicate patient care and administrative information for all hospital affiliated activities, and satisfy the functional requirements of all authorized users



Characteristics of early HIS

- **Central databank**
- **Unique patient identifier**
- **Variety of applications**
- **Applications cooperate through databank**
- **Variety of interactive users**
- **Simple end-to-end data communication**



Early HISprojects

- **Pioneering spirit**
- **Mostly initiated by hospitals or the government, seldom by the computer industry**
- **Aiming at support of the primary process**
- **All confronted by limitations in technology**
- **All underestimated the huge number of transactions in a hospital**



HIS projects in The Netherlands

- **Stimulated by the government**
- **In general cooperatives of a small number of hospitals**
- **Each project on its own**
- **To-day special attention for HIS at Leiden University Hospital**



The HIS at Leiden

- **Started in 1972 as a government sponsored project to:**
 - Gain knowledge and experience by means of a real-life HIS experiment in a large teaching hospital**
- **Security, performance and user satisfaction were recognised as critical success factors from the start on**



About the financing

- **Government sponsoring through (NOBIN: a foundation supporting improvement of information management with money from ministry of science and education and ministry of economic affairs)**
- **No sponsoring of the ministry of health**
- **As soon as the system was (partially) in use the hospital paid for the operational costs**



About the policy of NOBIN

- **Don't spread the money over several hospitals**
- **Choose one as the pilot site**
- **A university hospital because:**
 - **The ministry of science and education supplied a significant proportion of the money**
 - **In university hospitals there were already some applications running/under development**
- **Install a national guiding committee**



Technical characteristics of the HIS at Leiden

- **Central database with 2 foci:**
 - **patient data, linked to patient master index**
 - **data on resources and their utilization**
- **Based on minicomputers (novel in 1972),**
- **Dedicated system software (OS, DBMS, data communication)**
- **Dumb terminals**



Critical success factors

- **Commitment of the top management**
- **Involvement of the users**
- **Performance**
- **Security**
 - **Confidentiality**
 - **Integrity**
 - **Availability**
- **User acceptance**

HIS variety of applications

- **Patient registration**
- **Admission/discharge/transfer**
- **Diagnosis reg.** **Pharmacy/medication**
- **Clinical laboratories** **Radiology**
- **Appointments** **Meal supply**
- **Invoicing** **Stock control**
- **Discharge letters**
- **Personnel system** **Operation theatres**
- **Bookkeeping, Pay-roll, Accounts, etc**



Phase I at Leiden

- **Patient Master Index**
- **Support of processes in:**
 - **Chemistry laboratory, radiology, pharmacy**
- **Storage of results in central databank**
- **Reporting decentrally**
- **Diagnosis registration**
- **Registration of events/acts**



Next step

- **Extension of support:**
 - **Discharge letters**
 - **Scheduling**
 - **Meal supply**
 - **More laboratories**
- **Retrieval of data through terminals**
- **Finance and administration**
- **Personnel system**



Clinical workstations

- **Makes only sense when useful functionality and patient data are available**
- **So a condition is that the set of patient data in the databank is rather complete**
- **Now present in all most all doctors offices and in the wards**



Formal evaluation of the HIS at Leiden (1977-1978)

- **National steering committee**
- **Independent consultancy company (Van der Bunt)**
- **Spent 3 man-years**
- **Considered various aspects (project mgt, technology used, user satisfaction, cost/benefit)**
- **Questionnaires, interviews, study of documentation**
- **No statistics**



About effects

- **Communication in the hospital has improved**
- **Strong improvement of the care process**
- **Service to the patient has improved**
- **The system is user friendly**
- **Relatively little saving of staff, shifting of tasks**
- **Inconceivable to remove the HIS from the hospital**
- **Benefits do exceed the costs**



No continuous evaluation

In the Netherlands that is the most recent formal evaluation of an HIS



Evolution in the organisational structure

- **Initially government sponsored experiment in one hospital (1972-1976)**
- **Next cooperative of hospitals, cost sharing (1977-1984)**
- **Cooperative with fee for service system (1985-1994)**
- **Company with hospitals as shareholders (1994-1998)**