INFORMATION SYSTEMS FOR MEDICAL IMAGING LABS: THE EXPERIENCE OF THE CNR CLINICAL PHYSIOLOGY INSTITUTE

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In the late 1990s the CNR Clinical Physiology Institute was entrusted with the "SPERIGEST" project, granted by the Italian Health Ministry. Among the technical challenges of the project, the following issues were faced: 1) the definition of a system architecture able to conjugate a centric view, as required by data integration needs, with flexibility and modularity in order to satisfy the different healthcare environments; 2) the creation of local information systems devoted to the management of each single laboratory activity; 3) the creation of a suitable network to exchange information both inside and outside the hospital; 4) the overcoming of safety and security issues in the treatment of healthcare data; 5) the data processing for extracting knowledge from the archived data and for supporting the diagnostic/treatment process; 6) the education of healthcare personnel; 7) the adoption of standards for both storage and distribution of data. An hospital information system was developed according to a three layers model (Fig. 1). The first layer is the central database, the second layer is associated to software applications, and the third layer represents the consultation level of data, which are stored in the central database. The central database is the core of the system; it is the reference repository of all the patient data and it is continuously updated by the external applications through a suitable middleware channel. These applications are devoted to the management of peripheral activities or specific functions; for instance, subsystems oriented to personnel/instrumental organization inside a specific laboratory, or subsystems for the management of the ward nurse activities. Each of these subsystems is generally named "functional island", to identify its main specificity given by its function. The third level is made by web applications for consultation of all the collected patient data which are made available on any workstations of the intranet hospital network. Each local system is autonomous as much as possible, so improving the security and efficiency of the whole system. Different models have been studied and applied in order to harmonize different clinical practices, instrumental resources and human expertise.

At present, the Clinical Physiology Institute provides, as image data sources: two gamma cameras serving the cardiology, pneumology, endocrinology and hypertension groups, together with a Positron Emission Tomography (PET) laboratory, enabled for the cardiologic, neurologic and oncologic studies; a digital radiology unit; the PET/CT laboratory which, due to its hybrid instrumentation and polymodality output, is accessed by both the PET as well as the Digital Radiology functional islands, respectively; the Magnetic Resonance Imaging Lab for cardiologic and neurologic activities.

Figura 1 - Information System model

The electronic Information System is contributing to solve daily data management problems, overcoming the maintenance and management of paper reports as well as image archives. In facts, multimedial digital reports guarantee unaltered data of medical interest, such as images, as time goes by; optical disks keep, in a reduced space, a large quantity of data, at least for the time limits imposed by the Law; moreover the digital archives represent the consultation basis for clinical, research, or administrative purposes; safe access and user-friendly management guarantee data integrity; secure and real-time access to the local databases from remote workstations makes all the necessary diagnostic information safely available to the authorized personnel only.
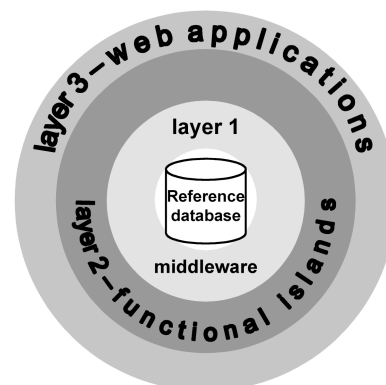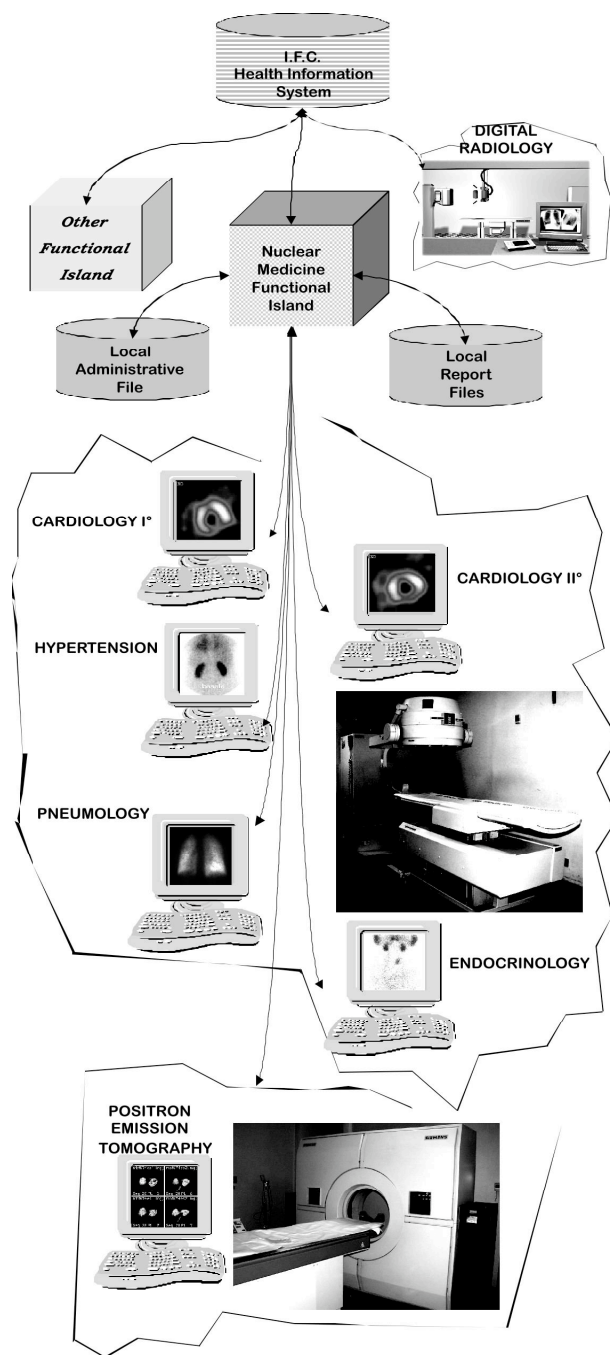
Figura 2 - Imaging Lab structure

Moreover, the shortening of the total duration of the examination is achieved by improving both the administrative and clinical procedures, in particular: patient identification is simplified and speeded up by the availability of an Hospital Information System; patient identification data can be associated to images and other clinical outputs by using worklists, fed once at the admission of the patient at the laboratory; complete report layout includes examination findings and multimedia documents; real time report storage into local and central databases, allows an immediate access to all the physicians. The success of the adopted approach allowed to export the system, or some selected functional islands, to other hospitals, with grants from the Italian Health Ministry.

Together with the technological improvement, new problems need to be faced. In fact we have to consider that: information management requires new rules to cover all the problems of safety and security of the clinical data; data should be easily distributed and accessed; data should be properly synthesized and presented to any physician.

Anyway, we believe that the improvement of ICT paired to the suitable integration and enhancement of the available consolidated clinical and healthcare standards, will allow the easy and immediate access to clinical and healthcare history and data of any potential patient, to provide to him the best care services everywhere, as at its home.

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