

For MIE 2003, Saint Malo, May 4-7, 2003

Deliverable of the Workshop 3
Monday 5 May 2003, 16.00-17:30, Room C

Integration of Medical Image Processing into Clinical Workflow and the Electronic Patient Record

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1 Participant

Approximately 20 participants attended the workshop.

2 Topic summary

The field of Medical Image Processing (MIP) and the applications in Computer Assisted Diagnoses (CAD) and therapy (e.g. Computer Assisted Surgery – CAS) which strongly depend on MIP methods is of increasing importance in modern medicine. Due to its proximity to medical imaging devices, the field is widely considered as an engineering discipline rather than a core part of medical informatics. Integration of MIP applications therefore has mainly been carried out by vendors of medical imaging devices as integration into their imaging and post-processing systems in the overall framework of RIS/PACS environments. On the other hand, the discussion about the Electronic Patient Record (EPR) as well as the basic need for integration of components in the healthcare systems have recently more and more addressed also the non-textual information like medical images, audio and video data. So far, there are no comprehensive models and solutions for a seamless and complete integration of such data in the daily clinical workflow. Therefore, the EFMI Working Group on Medical Image Processing (WG MIP) has chosen as one of its objectives to foster the discussion of how to integrate decision support by means of medical image processing into clinical practice, i.e. the clinical workflow and the EPR.

3 Presentations

Presentations were given according to the [workshop program](#) (in slightly different order) on

- Basic Considerations on Requirements for Integration of Computer Aided Diagnosis Applications in eHealth Environments
- Morpho-functional Visualization of Image Information as Integration Tool of Medical Image Processing
- DICOM-Based Approach for Clinical Integration and the Problem of the Great Variety of Image Acquisition Parameters
- Integrating Content-Based Image Retrieval into Clinical Practice
- Considerations on Integration of Medical Research Data and Patient Care Data from Distinct Sources
- Images: Bridging the Gap between PACS and Clinicians
- Evaluating Information Retrieval Systems – Parallels with Evaluating Image Processing Techniques in Medicine

4 Goal of the workshop

During the workshop, invited speeches on the topic will be presented. The goal is to give an overview of the state of the art of the MIP field and its specialties, and to define the requirements that have to be met by MIP applications, the clinical workflows and the EPR, if integration shall be successful. A discussion with the audience shall give the opportunity to gather ideas and to exchange experiences. The result will be documented and published on

the WG Website. Last not least, interested colleagues can get into contact and also join the efforts of EFMI WG MIP.

5 Result of the workshop

The presentations and the discussion clearly showed that, depending on the context of the author, integration of MIP applications into eHealth environments are considered in very different ways. The following statements which arose during either the presentations or the subsequent discussion may illustrate this finding:

- A broad exploitation of Computer Assisted Diagnoses requires the incorporation of appropriate decision support applications as an integrated part of the professional's routine workstation, accessible via a simple click on a button.
- The CAD applications need to be seamlessly coupled with the EPR, i.e. on one side necessary medical data about the patient has to be handled to the CAD application for analytic purposes (e.g. parameterization of algorithms) and CAD results such as visualizations of diagnostic criteria (e.g. image overlays) as well as calculated numerical features have to be stored in the EPR.
- A feasible integration requires highly sophisticated interactive human-machine interfaces that utilize all available techniques (including virtual reality) in a user-centred and problem-adaptive manner. Especially the fundamental segmentation task that often cannot be carried out fully automatically must be supported by such efficient and comfortable interfaces.
- As to technical standards required for to implement integrated solutions the DICOM-SR (Structured Reporting), combined with HL7 CDA Level 3 seems the right way to go. Up to now it just lacks a tracking of image manipulation history, the possibility of labelling the (most) relevant images for further clinical process (especially important for large series) and the support of access to reference image datasets (which hopefully can be included in later versions of the standards).
- The great variety of image acquisition parameters have been identified to be on one side a challenge for MIP applications, on the other hand MIP applications should make use of these parameters in order to adapt their algorithms and make the application more robust.
- An especially interesting and helpful variant of MIP integration into the clinical workflow is seen in reference image/case databases which can be retrieved by appropriate methods (via indexing and content-based methods) in order to show similar cases for comparison with an actual case.
- A step-by-step integration policy seems promising.
- Decision support in general, and decision support by means of MIP in particular, need to be offered as an inherent function of the clinical day-to-day work whenever order entry is performed, because usually at these points in time decisions are fixed and then have – more or less immediately – diagnostic and therapeutic consequences.
- Integration does not only require technical solutions, but also personal communication among the professionals, as well as a continuing education and training in order to achieve the necessary degree of acceptance and usefulness.
- As to the way in which diagnostic images are allowed to be modified by MIP methods, there must be a clear policy. One policy is to allow basic image manipulations (e.g. level-windowing, zooming, contrast and brightness modifications), only. In any case, if images are processed (i.e. 'manipulated') more deeply (as e.g. in all CAD applications), this must be clearly displayed to the physician, and the original images should be displayed for comparison.
- Systematic evaluation of integrated solutions is considered important. Such evaluations must include e.g. benchmarking and "friendly meetings" to compare different technologies.