

Preface

The diffusion of instrumental methodologies based on the information and communication technology (ICT) for the digitalization of cytology glasses, such as the digital cytology (D-CYT) is today an important challenge for the National Health Care System (NHCS). D-CYT could be very useful in several fields of interest, such as remote areas or emergency care, where both the time for patients transferring and costs are very critical. The difficulty to exchange large data through (not suitable) nets hampered in the past its use and diffusion. To date ICT innovation, such as network low cost wideband communication channels and the compression techniques, have the potential for the implementation of low cost and clinically effective D-CYT. The latter has thus the potential to promote changes in the health care organization and ultimately in the way citizens will benefit from the tele-service in their life. To date the D-CYT connections were designed during national and international discontinuous projects and funds. Issues related to technology innovation and research novelty are usually privileged in these projects. Other aspects such as the quality of the application/service itself or the interoperability with other existing ICT/hospital infrastructures are seldom approached in those projects. However these are basic issues for the introduction of an application in the NHCS. In particular, when a D-CYT application is going to be introduced in the NHCS it is mandatory to plan at least:

1. reliable methods for the assessment of the diagnostic accuracy of the transmitted exams to assure the clinical effectiveness of the D-CYT application;
2. designing of a complete D-CYT service around the manufacturer's application;
3. a study of health technology assessment (HTA) of the application itself; today widely considered for the whole acceptance (organizational, cost effectiveness etc.) of a new product/service in the NHCS.

The herein presented monography starts with a review, exploring some significant experiences in D-CYT considering all the above mentioned issues.

The first work entitled "Virtual microscopy and digital cytology: state of art" is a review on the progress of the D-CYT with particular attention to the last ten years experience, progress particularly accelerated by the wide development of the ICT, such as the availability of wide-band channels and new compression

algorithms for digitalization of exams. The analysis was arranged into two main parts:

1. the first one focused on the technological tools needed to carry out a successful service (client-server architectures, e-learning, quality assurance issues);
2. the second one focused on issues oriented to help the introduction and evaluation of the technology (specific training in D-CYT, health technology assessment on in-routine application, data format standards and picture archiving and communication systems, PACS implementation, image quality assessment, strategies of navigation, 3D-virtual-reality potentialities).

The second work entitled "How do young and senior cytologist interact with the digital cytology?" focuses on D-CYT application in the WAN/LAN. In particular a study is presented, conducted on two groups of senior and young investigators in the Master "Diagnostic cytopathology and screening of population" (at the Second Faculty of Medicine of University of Rome Sapienza) to evaluate the approach with the new technology of possible actors involved in the service. The work faces both the aspects of acceptance and performances of the new technology (clinical performances and diagnostic accuracy of the methodology). The two investigated aspects are important for the introduction of the new technology in routine applications within the hospitals. Special tools for technology assessment have been proposed to investigate these aspects and to collect information in a structured way. The work shows that the use of D-CYT applications is effective and feasible for tele-diagnosis even though the time spent for investigation still needs to be shortened for the routine applications. The investigation on younger and senior expert showed in details how they interacted with the novel technology.

The third work entitled "The picture archiving and communication systems in digital cytology" faces one of the basic problems relevant to the introduction of the digital cytology in the hospital: the electronic recording of the virtual glasses integrated in the hospital information system (HIS) through a PACS. Particular attention has been focused on the comparison with the digital-radiology. Results of the study shows that:

- there is not a standard format (from manufacturers) in the digital files relevant to virtual glasses;

- the PACS are not standardized and are manufacturer's dependent.

The study ends with a proposal of an innovative architecture software for D-CYT useful to improve the integration of D-CYT PACS in the hospital LAN.

The fourth work entitled "A pilot study for the integration of cytometry reports in digital cytology telemedicine applications" pioneers novel fields of investigation on the potentialities of the D-CYT in the tele-consulting based on the image-diagrams from the cytometer. In fact D-CYT does not comprehend only images from glasses (as for standard cytology and histology) but also from the image diagram outputs from diagnostic equipments such as the cytometer-diagrams and electrophoresis-diagrams. The paper initially shows how the cytometer integration in a tele-consulting service allows possible cooperative diagnosis and second opinion support. The paper ends describing a technical solution based on Adobe Acrobat writer for the integration of the cytometer report in telemedicine future scenario.

The fifth work entitled "The virtual slide in the promotion of cytologic and hystologic quality in the

oncological screening" presents a territorial experience in virtual microscopy and digital pathology comprehending the D-CYT. The project has been conducted in the Emilia-Romagna Region and has been planned for the promotion of wider service and also the quality assessment in cytology and histology supporting the screening in the prevention of tumors of uterine cervix, mammella and colon-rectum. During the project a dedicated PACS has been designed for cooperative diagnosis, didactics, training, tele-consulting, documentation of rare cases or significant experiences; furthermore case studies can be archived in the PACS with the aim of future check for diagnostic concordance in oncological screening.

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