Abstract

Currently, in radiotherapy (RT) departments, there are different proprietary and stand-alone Information Systems (IS) for single-purpose applications, having most of the data distributed through multiple systems with limited interface between them. The IS are focused on the system instead of being patient-centered, limiting the data availability due to incompatibles formats between the equipment workstations and the IS. The need to integrate all the scattered information from different IS of RT department is steadily recognizable because of its imaging intensive nature and ever increasing demands for better treatment equipment and complete information. Besides transfer of RT data between IS there is the problem of clinical data exchange, between departments and hospitals impeding the research collaboration between institutions. This lack of interoperability in IS, causes discontinuity in health care leading to redundant clinical evaluations and clinical decisions based on incomplete information limiting clinical trials and scientific investigations.

The digital imaging and communications in medicine - radiation therapy (DICOM-RT) extensions consists of various DICOM-RT objects that provide a standardized mean of transferring much of the information circulating in the RT workflow. DICOM-RT plays an important task in enabling application interoperability (“plug and play”), however its implementation has some problems, the “communication” part works but the “interoperation” part is difficult at the RT workflow.

This thesis aims to investigate the relevance of DICOM-RT in the RT workflow, integration profiles of integrating the healthcare enterprise – radiation oncology (IHE-RO) task force, and in the data model of DICOM-RT based electronic patient record (ePR). To accomplish this aim, the work was divided in different phases: a comprehensive review of the state of the art focusing this issues, a bivalent study with: a survey of Portuguese RT departments characterizing facilities in terms of treatment equipments, imaging modalities and IS, and its compliance standards; and a study about DICOM-RT expert’s opinion about interoperability in RT context and the relevance of DICOM-RT.

This study is cross-sectional representing the reality found in RT departments and the opinion given by the DICOM-RT experts from the participating departments, and results presented in this master thesis are relative to the period May-September 2011. It was created a questionnaire online that was sent by email for one expert of each department.

The response rate of the target population (all RT departments from Portugal) was 70% (n=14) and results show that RT departments have IS and equipments from different manufacturers, but there are few departments with multiple-treatment units from different vendors. This fact reveals that departments have the tendency of purchasing treatment machines from the same manufacturer to not have to resolve integration problems between them and other equipments and IS. Regarding expert’s opinion about interoperability and DICOM-RT, results shows that they trust in the benefits of integration between the IS and equipments provided by DICOM-RT but with lack of specific information about this pertinent issue.

According to the results, a list of recommendations was established to advise RT professionals regarding interoperability issues. Recommendations for a good policy in RT department are listed for definition of IS specifications, new equipments/IS purchasing, problems occurrence, etc. Compliance with DICOM-RT is recommended, when buying new RT equipments preferably with all DICOM-RT
objects available, and compliance with DICOM v3.0 is suggested, when acquiring new imaging equipments. It is important to adapt the existing RT workflows to IHE-RO integration profiles for optimization of the RT interoperability in Portuguese departments.

**Keywords:** DICOM-RT, radiotherapy, information systems, interoperability.