

## **A Peer Review System (PRS) for Prospective Registry, Peer Review, Quality Assurance and Clinical Outcome Studies in Proton Therapy**

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### **Purpose:**

To implement a web-based PRS for prospective registry, peer review, quality assurance and clinical outcome studies in proton therapy. The system is designed to store not only treatment plans but also information on planning strategies employed to get an optimal plan for each patient. There is a dire need to provide such a complete system in proton therapy because some information regarding an approved plan is implicit instead of being fully explicit. "What you see on paper or computer screen is not what the patient gets." Furthermore, laboratory results, diagnostic images, and radiotherapy data are located in disparate locations and are not readily accessible. Since data is frequently unavailable, patients are at risk for repeat diagnostic procedures or suboptimal therapeutic intervention due to a lack of knowledge regarding their medical disposition. A central repository of patient records can minimize repeat diagnostic testing while enabling the highest quality and safety of patient care at a reduced cost.

### **Method and Materials:**

We have designed and deployed a web-based clinical data submission and retrieval system to implement a successful peer review and clinical QA paradigm for proton therapy treatment plans. Our proprietary local DICOM server automates the communication between the TPS and our web-based secure client application. The TPS outputs the clinical treatment plan as DICOM-RT objects, which are then uploaded to the central server via a secure web-based link. The data sets are automatically anonymized based on one-to-one mapping that is known only to the submitter of a patient plan. It is often necessary to supplement this data set with additional information in order to appraise the plan reviewers of clinical rationale used in the plan evaluation and selection. The information that is not part of the DICOM Ion Plan includes; proximal and distal margins used to account for range uncertainty, smearing and smoothing margins for compensator design, distal blocking to spare organs at risk, etc. The submitter may generate screen captured views of a plan and add comments, instructions, and provide planning criteria by adding multimedia data. This information is converted to DICOM objects and is submitted to the server as a part of a plan. The reviewers can use our web-based client application to retrieve part or all of the submitted data set and use their own TPS for more comprehensive plan evaluation.

### **Web-based Peer Review System:**

Figs. 1-5 shows the Peer Review System, the case submission, retrieval and review processes. Also illustrated is our unique One-to-One mapping scheme for anonymization.

### **Results and Conclusion:**

The treatment plans for several proton therapy patients have been successfully

submitted to and retrieved from the prototype system at UFPTI. In all cases, the restored plans maintained the integrity of all clinical information as submitted. We found that the supplemental information uploaded with each plan was extremely important and useful for the plan reviewers. We believe that a Web-based electronic peer review system will dramatically improve the quality of care of proton therapy patients while providing opportunities for comparative effectiveness research.

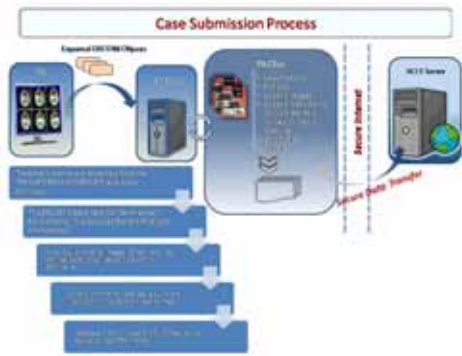


Fig. 1 The Peer Review System.

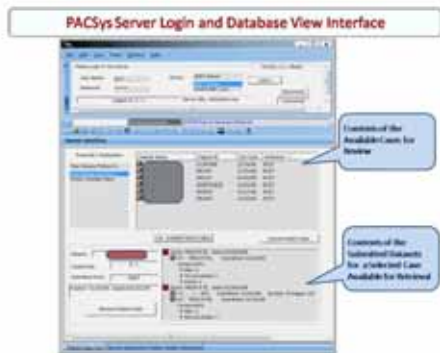


Fig. 2 The PACSys GUI.

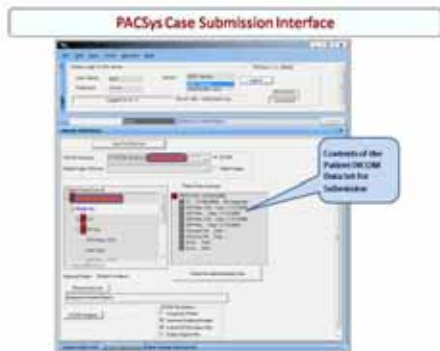


Fig. 3 Alternative DICOM import. Directory is scanned and available objects are listed.



Fig. 4 Mechanism of generating a Global Unique Case Code.



Fig. 5 One-to-One mapping scheme.

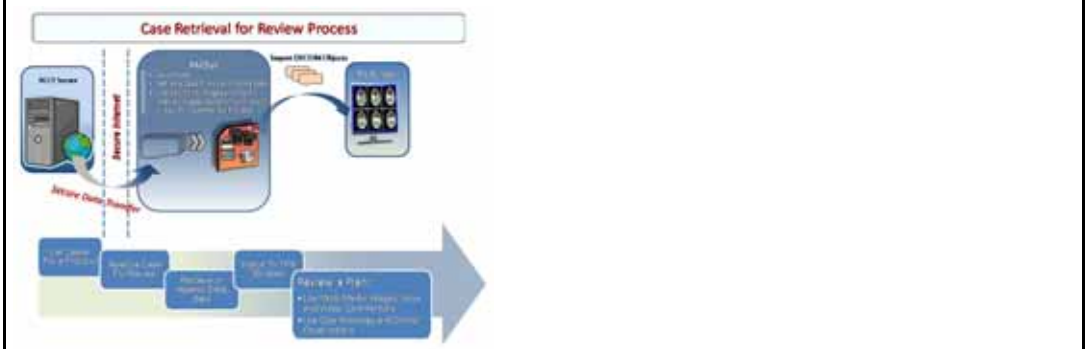


Fig. 6 Case retrieval and review process.