A Fully Integrated QA and Data-Management Platform for Cyberknife stereotactic Treatments

Gregory Szalkowski[1], Xuejun Gu[1], Cynthia Chuang[1], Lianli Lu[1], Iris Gibbs[1], Erqi Pollom[1], Elham Rahimy[1], Scott Soltys[1], Lei Wang[1]

[1]Stanford University School of Medicine

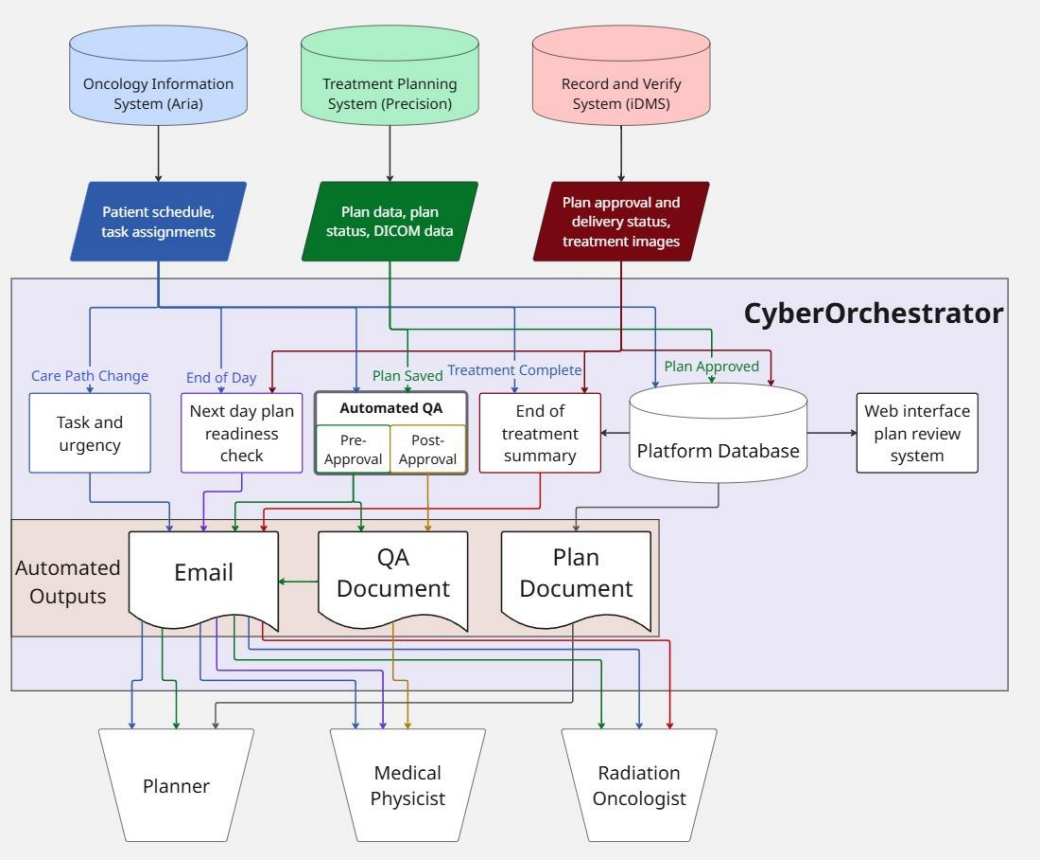
Introduction

- High-throughput stereotactic radiosurgery workflows require coordination across multiple clinical systems
- Treatments are often delivered within **2–3 days of simulation**
- Automated workflow coordination and verification support safe and consistent clinical operation

Methods

- The CyberOrchestrator platform is implemented in Python and interfaces with the Oncology Information System (Aria), treatment planning systems, and Record and Verify system (iDMS).
- Workflow events within these systems trigger automated processes that coordinate clinical communication, perform quality assurance checks, and generate treatment documentation.
- System performs **20-30 automated checks**, depending on the treatment site, for each treatment plan including
  - Target labeling accuracy
  - Appropriate collimator selection
  - Dose constraints met
- Plan data are automatically stored in a structured database and can be reviewed or edited through a browser-based interface

Automated Workflow Trigger and Response Architecture



Implementation

- The platform has been fully deployed in routine clinical operation at our institution, which treats approximately **1000 CyberKnife patients per year**.
- The system processes **100% of CyberKnife treatment plans** generated at our institution.
- During the first **8 months of operation**, the platform supported the quality assurance, documentation, and structured data storage of **753 treatment plans**.
- The system operates continuously within the clinical workflow and integrates directly with existing clinical infrastructure.

Discussion

- Automated quality assurance facilitated early detection and correction of imaging selection, plan deliverability, plan quality issues, and other problems prior to treatment
- Standardization and automation of workflow coordination and plan documentation has significantly streamlined the treatment process