# Implementation and Impact of AI Decision Support Software on Treatment Planning Workflow


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## Introduction

UCSF has a high volume H&N service with high demand for CMD time. We are employing Artificial Intelligence (AI) Decision Support software to:

- **Improve communication** between the physician and dosimetrist.
- **Decrease optimization time / reduce iterations** in treatment planning
- **Standardize planning techniques**

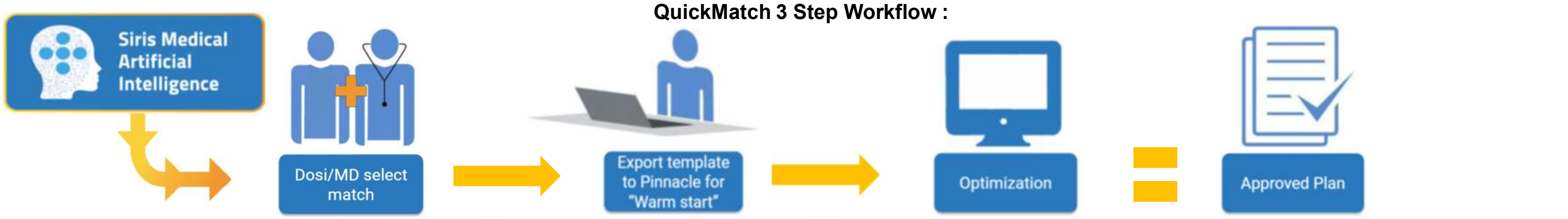
## Methods and Materials

QuickMatch, Siris Medical Inc., (QM) is a commercially available AI-powered decision support software that employs a classification scheme to identify previously approved/delivered historical matched cases. This:

- Enables instant analysis of tradeoffs between PTV coverage and OAR sparing. (Fig. 1)
- Encourages a single exchange between the Physician and Dosimetrist on the treatment plan directive prior to planning.
- Provides a template which is used to initiate the optimization (Fig.2)

The following workflow scheme, utilized QuickMatch, MiM, and Pinnacle was developed over the planning experience of eight oropharyngeal cancer patients.

**QuickMatch 3 Step Workflow :**




**Step 1: Select patient match in QuickMatch:**

- Import CT & structures from MIM into QuickMatch
- Open QuickMatch in web browser, select patient and confirm desired dose fractionation.
- Explore all potential matches to choose the best trade-off (Fig.1) between target coverage and OAR dose limits. (Red exceeds defined limit, blue is improved over other available options)

- **Step 2: Export Template:** The "export icon" (Red circle, Fig 1) sends an email (Fig.2) containing the objective template for the selected match. A Pinnacle script (Red circle, Fig. 2) enables the import of planning objectives into Pinnacle.

**Step 3: Optimization/Warm Start:** Construct plan in Pinnacle as normal for VMAT except for the optimization parameters.

- **Setup:** Set the max iterations to 85 and the convolution dose iteration to 25 with 2º arc spacing.
  **First run:** Weight all OAR objectives to 0.1 and all Target Objectives to 11.
- **Second run:** (identical to the first). This enables a "warm start" to ensure targets are met before "pushing" objectives to meet goals.
- **Third run**: Adjust the weight of OAR's to get closer to desired OAR planning directives.
- **Fourth run**: Continue adjusting the OAR's objective weights to generate optimal plan.

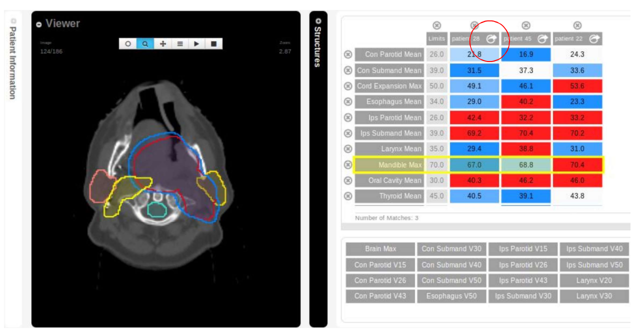
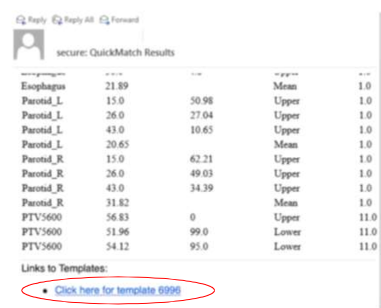



**Fig 1.** QuickMatch.



Reply Reply All Forward

secure: QuickMatch Results

| | | | | |
|---|---|---|---|---|
| Esophagus | 21.89 | | Mean | 1.0 |
| Parotid_L | 15.0 | 50.98 | Upper | 1.0 |
| Parotid_L | 26.0 | 27.04 | Upper | 1.0 |
| Parotid_L | 43.0 | 10.65 | Upper | 1.0 |
| Parotid_L | 20.65 | | Mean | 1.0 |
| Parotid_R | 15.0 | 62.21 | Upper | 1.0 |
| Parotid_R | 26.0 | 49.03 | Upper | 1.0 |
| Parotid_R | 43.0 | 34.39 | Upper | 1.0 |
| Parotid_R | 31.82 | | Mean | 1.0 |
| PTV5600 | 56.83 | 0 | Upper | 11.0 |
| PTV5600 | 51.96 | 99.0 | Lower | 11.0 |
| PTV5600 | 54.12 | 95.0 | Lower | 11.0 |

Links to Templates:

- Click here for template 6996

**Fig 2.** QM Export Template

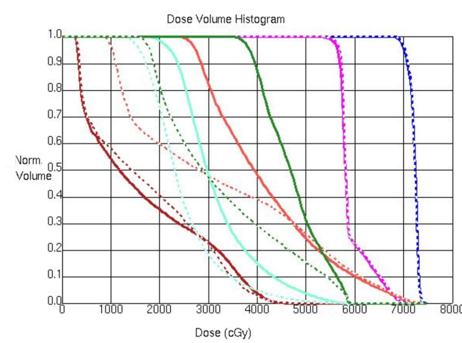



**Fig 3.** Superimposed DVH (QM dotted/Approved solid)

## Results

- All eight plans were achieved in 4 planning runs.
- The QuickMatch plans were dosimetrically comparable and in some cases superior to the eight approved plans. (fig.3 QM= dotted curves)
- Time savings was achieved in two ways: utilizing automatic import of objectives, and needing to only focus on OAR optimization priorities
- Estimated time savings =1day (vs 2 days).

## Conclusions

- Utilization of Artificial Intelligence decision support software in concert with a reproducible optimization process yields a more efficient planning workflow.
- Standardization of this workflow would be beneficial to overall departmental efficiency.
- Future work will quantify time savings afforded by reduction in planning iterations between the dosimetrist and physician