Project Eleven (Intensity-Modulated Radiation Therapy Project)
Checkpoint Presentation

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Division of Health Science Informatics
Organ Nearer To Tumor  |  50% Volume Of Organ  |  Old Patients
---|---|---
Organ Further To Tumor  |  50% Volume Of Organ  |  New Patient

Search 50% Volume, <4cm

Dose 1 < Dose 2?

Dose 1 is more optimized than Dose 2
Organ Nearer To Tumor  Old Patients

Organ Further To Tumor  New Patient

Search 50% Volume, <4cm

Dose 1 < Dose 2 ?

No

Dose 1

Yes

Dose 1 is more optimized than Dose 2
# Deliverable (Goal) Updates

<table>
<thead>
<tr>
<th></th>
<th>Original</th>
<th>New</th>
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<tbody>
<tr>
<td><strong>Minimum</strong></td>
<td>Python Package That Can Pull Correct Optimized Plan From Database</td>
<td>Didn’t Change</td>
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<tr>
<td><strong>Expected</strong></td>
<td>Integrated SQL Search Method For Minimum Achievable Dose Into The Package Instead Of Using Linear Search</td>
<td><strong>Update:</strong> Enhance other functions using SQL as well (r function for calculating distance and d function for calculating dose)</td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td>Direct Clinical Use Features (Pinnacle 3 scripts generating; Effectiveness measures evaluated)</td>
<td><strong>Update:</strong> Pinnacle 3 script generating, hot and cold spot killing; possible in developing GUI; not feasible for full effectiveness measures evaluation, efficiency can be measured, effectiveness needs followup of clinicians and patients.</td>
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## Work Progress Updates

<table>
<thead>
<tr>
<th>Events</th>
<th>Weeks</th>
<th>1</th>
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### Proposed Dependencies

- **Milestone 1**
  - **Familiarity**
- **Milestone 2**
  - **Minimum Deliverable**
- **Milestone 3**
  - **Expected Deliverable**
- **Milestone 4**
  - **Maximum Deliverable**

### Actual Dependencies

- **Milestone 1**
  - **Familiarity**
- **Milestone 2**
  - **Minimum Deliverable**
- **Milestone 3**
  - **Expected Deliverable**
- **Milestone 4**
  - **Maximum Deliverable**
Work Progress Updates

Events

Milestone 1
- Dependencies
  - Proposed
    - Familiarity
  - Minimum Deliverable
  - Expected Deliverable
  - Maximum Deliverable

Milestone 2
- Dependencies

Milestone 3
- Dependencies

Milestone 4
- Dependencies

New Dependency

Actual

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- **Milestone 1**
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- **New Dependency**
Work Progress Updates

Events

Milestone 1
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Milestone 3
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Milestone 4
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Proposed

Dependences

Milestone 1
- Dependencies

Milestone 2
- Dependencies

Milestone 3

Milestone 4

Actual

Dependencies

Milestone 1
- Familiarity

Milestone 2
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New Dependency
Work Progress Updates

Events

Proposed Dependencies
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Actual Dependencies
- Milestone 1
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  - Maximum Deliverable

New Dependency
What Has Been Done

- Python Package that will correctly pull out data from head and neck database based on linear search methods (takes an hour to run) in test database

- SQL implementation for minimum achievable dose calculation, works well in test database (takes 5-8 minutes to run)
Results View

Patient ID: 185
Session ID: 177

Session of PTV 58.1
Organ, Dose Point, Dose Received (cGy), Est. Achievable (cGy)

rt_parotid
D(35), 3852.59, 3326.91
D(50), 2681.71, 2157.19
D(65), 1661.96, 1398.01
D(80), 1019.88, 945.14

lt_parotid
D(35), 2948.26, 3139.01
D(50), 2077.38, 2077.38
D(65), 1321.97, 1321.97
D(80), 944.26, 944.26

lt_brochial_plenum
D(0), 5929.97, 2490.42

larynx_for_Edeca
D(0), 7478.56, 5985.92
D(35), 6156.59, 3747.16
D(50), 4999.02, 3384.40
D(65), 4532.46, 3818.69
D(80), 3223.01, 2108.55

rt_liner_lar
D(35), 3361.58, 339.48
D(50), 2983.87, 339.48
D(65), 2597.25, 381.76

oral_nasoso
D(0), 3248.26, 1762.18
D(0), 7516.33, 6829.79

esophagus
D(0), 5749.16, 5160.33
### Session of PTV 58.1

<table>
<thead>
<tr>
<th>Organ</th>
<th>D(35) (cGy)</th>
<th>D(50) (cGy)</th>
<th>D(65) (cGy)</th>
<th>D(85) (cGy)</th>
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</thead>
<tbody>
<tr>
<td>rt_parotid</td>
<td>3852.59</td>
<td>2681.71</td>
<td>1661.90</td>
<td>1019.80</td>
</tr>
<tr>
<td></td>
<td>3326.91</td>
<td>2157.19</td>
<td>1398.81</td>
<td>945.14</td>
</tr>
</tbody>
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Means for right parotid, the dose can be at least 3326.91 instead of 3852.59 for 35% of the volume of organ at risk in this radiotherapy session, dose decreased 500cGy.

**Minimum Deliverable-- Takes An Hour To Calculate All 13 Organs**
Results(3)

Session of PTV 70
Organ, Dose Point, Dose Received (cGy), Est. Achievable (cGy)

rt_parotid
  D(35), 4388.48, 3859.43
  D(50), 2875.21, 2875.21
  D(65), 2421.23, 1992.51
  D(85), 2042.91, 1315.05

Expect Deliverable-- Takes 5-8 minutes To Calculate All Organs
What Will Be Done

• Actual database target and organ at risk identification (a lot of target and organ naming variability, needs large amount of name matching)

• Pinnacle 3 script generating code implemented

• Wrap up (GUI development) and put into pre-clinical use
Remaining Work Timeline

- Proposed Dependency
- Regular Expressions Matching
- Pinnacle 3 Generating Function
- GUI
- Preclinical Use And Evaluation

Events

<table>
<thead>
<tr>
<th>Weeks</th>
<th>8</th>
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Thank You!
Questions?