

Project 8: UI for Radiation Therapy Cohort Selection

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Background

There currently exists a SQL database which contains sizeable amounts of data of patients with various types of cancers undergoing radiation therapy.

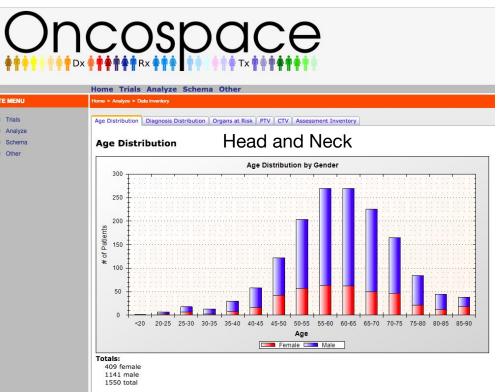
ITE MENU

Trials

Other

There is a website developed in C# that is connected with this database







Motivation



There is a desire for doctors and researchers to use this data for:

- Quality Reporting
- Decision Support
- Toxicity Prediction
- Research



Levels of Big Data

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Low granularity Low cost/patient	Population Health-Registry Regional incidence Environmental influences	
Low cost/patient	requires all patients regionally	
Big Data	Quality Reporting Disparities of care Practice quality improvement Safety requires all patients from participating practices	↑
Opportunity	Decision Support Outcome/Toxicity prediction Individualized treatments Data-driven quality control Treatment adaptation large random sample of patients	Decision Support Outcome/Toxicity prediction Individualized treatments Data-driven quality control Treatment adaptation
	Research Biological questions Clinical trials	
space™	High granularity High cost/patient High cost/patient	<u>Needs</u> International journal of radiation
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Needs and Challenges for Big Data in Radiation Oncology. McNutt TR, Moore KL, Quon H. urnal of radiation oncology, biology, physics. 2016; 95(3):909-915.

Problem



Currently there is no quick and intuitive way to select patient cohorts from this database other than through a command prompt.

- There is also no visuals of the outcomes of patients selected by these variables.
- No way to save and load variable parameters.

Retrieve patient data via free text SQL query

SELECT * FROM Patients WHERE (diagnosisICD9 = '146.9' OR diagnosisICD9 = '146.8' OR diagnosisICD9 = '146.7' OR diagnosisICD9 = '146.6') AND ageAtRefDate < '60' ORDER BY diagnosisICD9

Run Query

Query Result

patientID	clinicSite	protocolName	protocolID	firstContact	ageAtRefDate	attending	referredBy	referralReason	diagnosisICD9
865					39				146.8
302					58				146.8
324			0		42				146.9
328					46				146.9
798			6		51				146.9
228					54				146.9
243					55				146.0

Export to Excel

Goal

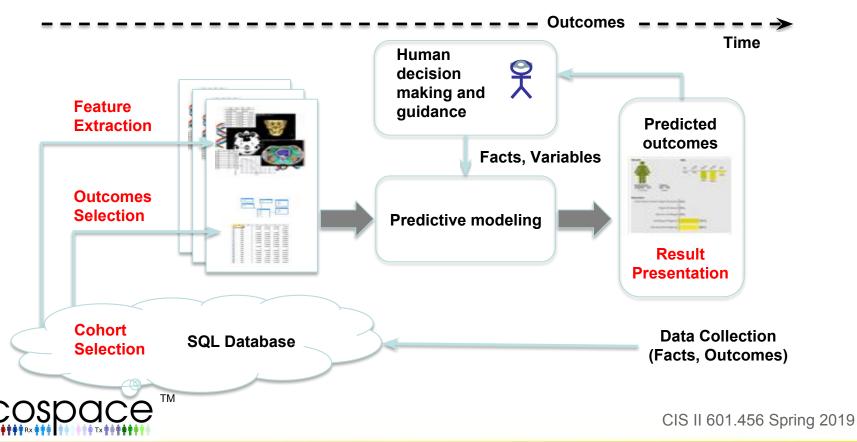


Develop a User Interface that would allow user the ability to:

- Select a patient cohort based upon any number of variables (SQL and Python)
- Perform statistical analysis on the extracted data (Python)
- Display the data in an easily comprehensible way (C# and JavaScript)
- Load and save parameters in a database query call (SQL)



Learning health system



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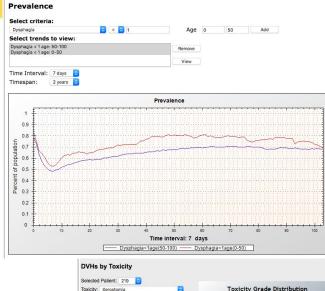
Deliverables

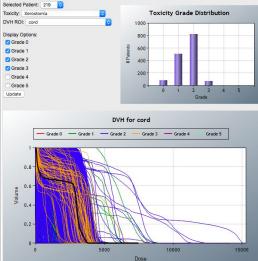
Minimum: UI and algorithm allowing for static variable(age, race, gender, diagnosis) selection of cohort with code and documentation.

Expected: Longitudinal variable (duration/onset of symptoms) selection of cohort with code and documentation. Query saving and loading implementation.

Maximum: Derived variable selection(Dose Volume Histogram comparison) of cohorts with code and documentation.







Milestones



Milestone	Date	Status	Measurable
Presentation And Proposal	2/14-2/28	In Process	Complete presentation and email proposal
Familiarize self with code and database		In Process	Be capable of editing website and understanding existing code
UI set up to allow for cohort selection with Static variables.	3/18	To Do	Perform a cohort selection, have report of code and documentation
UI set up to allow for cohort selection with Longitudinal variables	4/19	To Do	Perform a cohort selection, have report of code and documentation
Query Load and Save Parameters	4/5	To Do	Successfully save query and load independently on site
Parameters	4/5 M	To Do	

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Timeline



	Feb		Mar			Apr				May			
	11 - 15	18-22	25-Mar 1	4-8	11-15	18-22	25-29	1-5	8-12	<mark>15-19</mark>	22-26	29-May 3	6-9
Project Proposal								•	•	•			
Familiarize with C# usage and SQL database													
Develop front end display for all implentations (C#)													
Develop method/algorithm for cohort selection in the backend with Static variables.	2												
Connect developed method to the front end.	2												
Research and implement query saving/loading													
Develop method/algorithm for cohort selection in the backend with longitudinal variables													
Connect developed method to the front end.													
Documentation and Testing									1				
Final Presentation													
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Dependencies



Dependency	Plan to Resolve	Estimated Resolution Date	Resolved?
Access to Database and Website	Talk to Dr. McNutt	2/12/19	Yes
Access to Previous Code	Talk to Dr. McNutt/Pranav	2/14/19	No
Access to Clinicians or Researchers to Test Usability	Talk to Dr. McNutt or have Dr.McNutt as the Tester	2/15/19	No



Management Plan



Keefer	Domonique
Frontend(C# and JavaScript)	Backend(SQL, Python)
Parameter Management (Saving and Loading)	Data Manipulation
Developing the UI	Data Extraction
Data Visualization	Connection between C# and python
Statistical analysis and output	Communication between frontend and backend.
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Coordination:



Meetings:

Weekly meetings with Dr. McNutt and Pranav on Fridays Extra meetings with Pranav by appointment.

Team biweekly meetings on Monday and Wednesday

Communication:

Text Message(between team members)

Hopkins Email

Code Storage:

Github with private repository

Report/Documentation Storage:

JHBox





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Benedict, Stanley H., et al. "Introduction to Big Data in Radiation Oncology: Exploring Opportunities for Research, Quality Assessment, and Clinical Care." International Journal of Radiation

Oncology*Biology*Physics, vol. 95, no. 3, 2016, pp. 871-872., doi:10.1016/j.ijrobp.2015.12.358.

Bibault, Jean-Emmanuel, et al. "Big Data and Machine Learning in Radiation Oncology: State of the Art and Future Prospects." Cancer Letters, vol. 382, no. 1, 2016, pp. 110–117., doi:10.1016/j.canlet.2016.05.033.

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Mayo, Charles S., et al. "The Big Data Effort in Radiation Oncology: Data Mining or Data Farming?" Advances in Radiation Oncology, vol. 1, no. 4, 2016, pp. 260–271., doi:10.1016/j.adro.2016.10.001.

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