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# Project 8: UI for Radiation Therapy Cohort Selection

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Mentors: Todd McNutt,Pranav Lakshminarayanan

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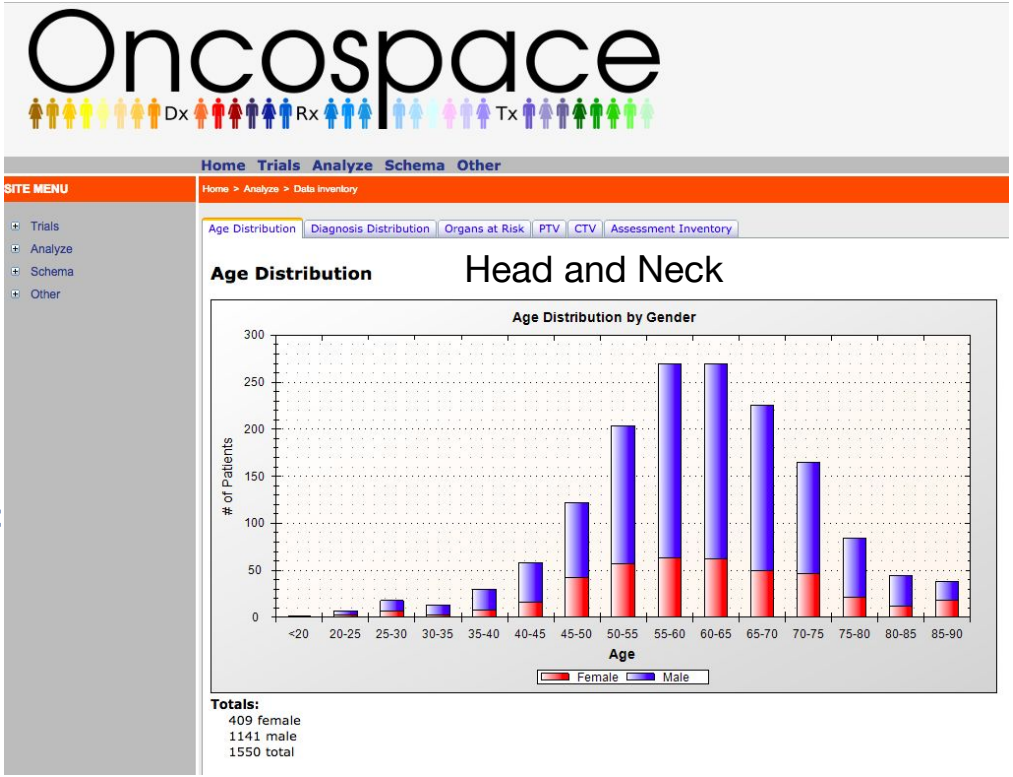
# Background

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

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

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# Motivation

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

- Quality Reporting
- Decision Support
- Toxicity Prediction
- Research

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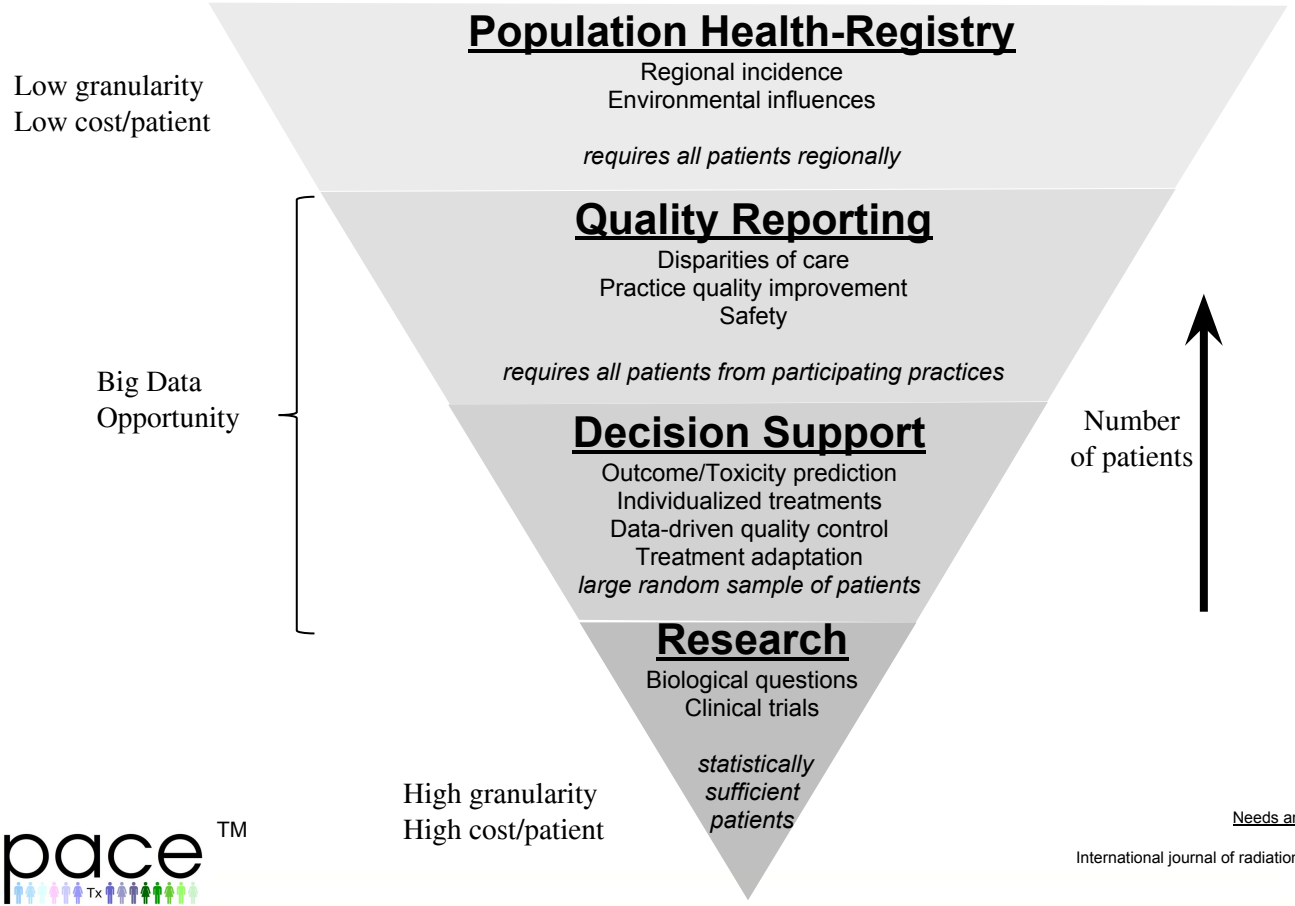
# Levels of Big Data

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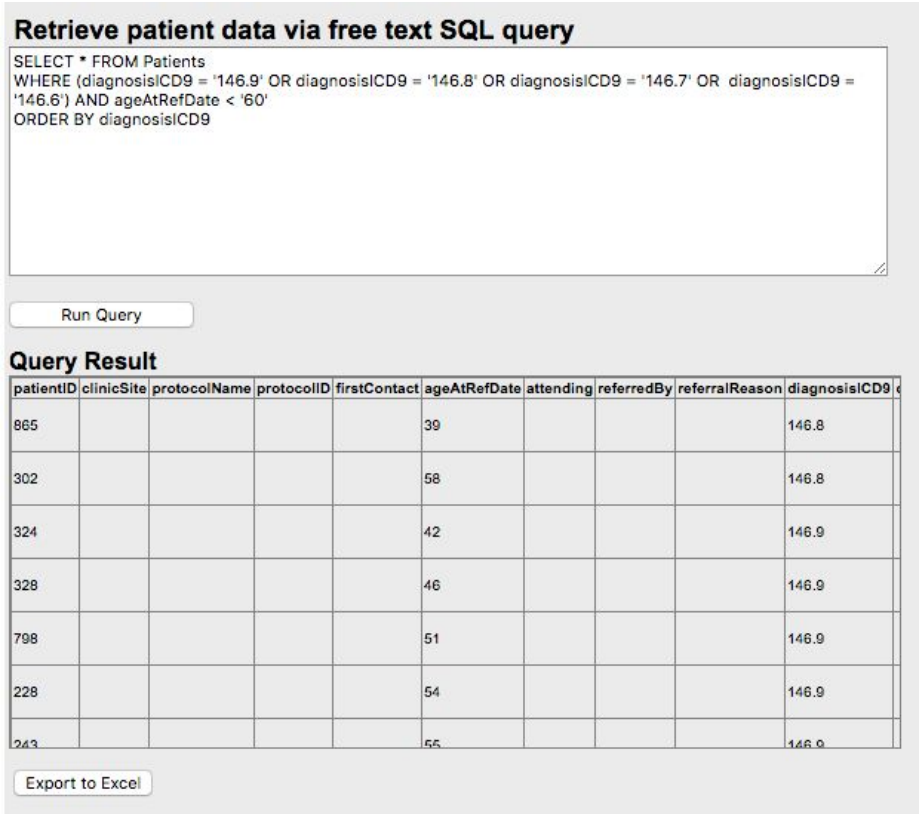
Needs and Challenges for Big Data in Radiation Oncology.
McNutt TR, Moore KL, Quon H.
International journal of radiation oncology, biology, physics. 2016; 95(3):909-915.

# 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.

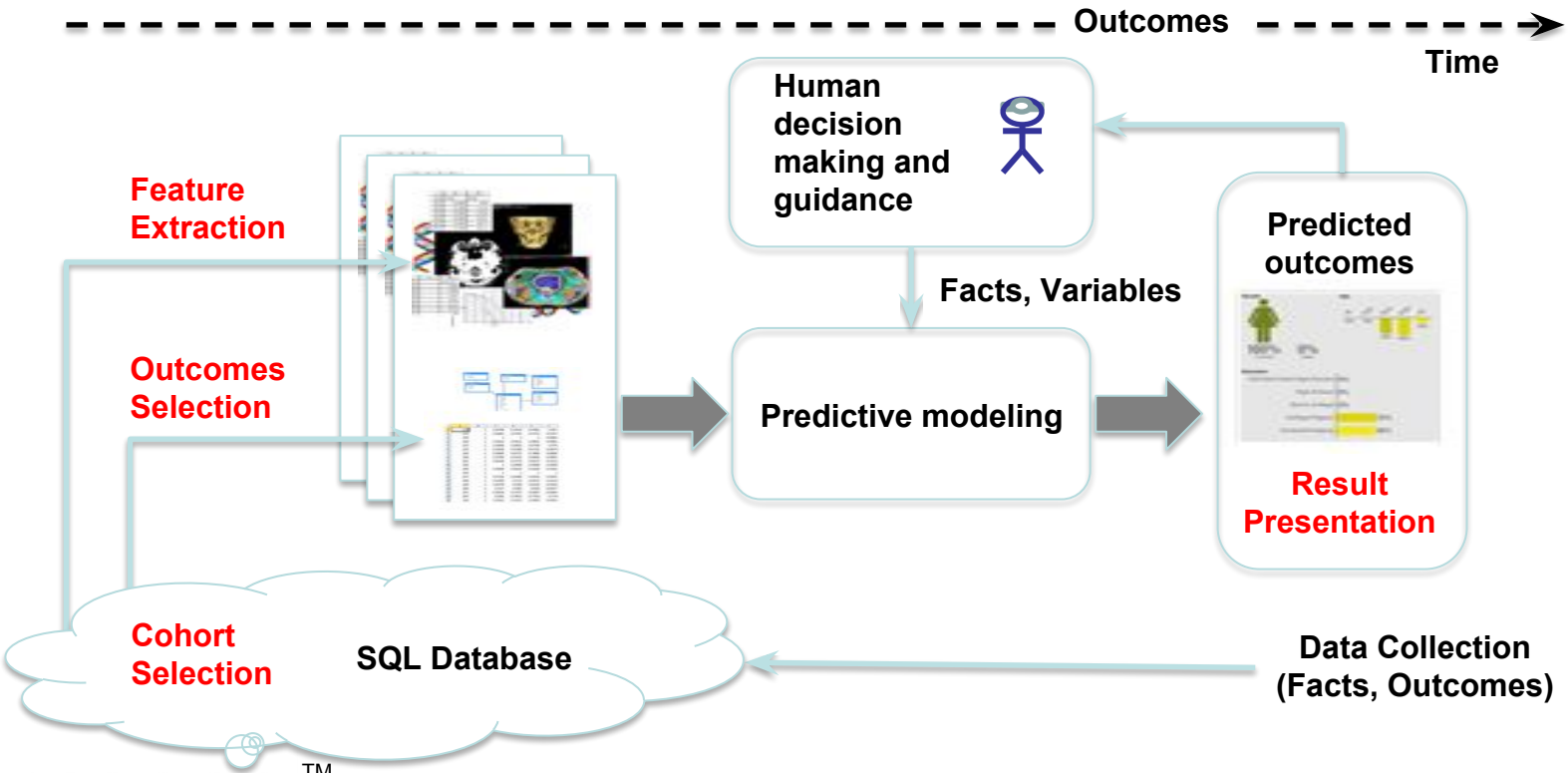


# Goal

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

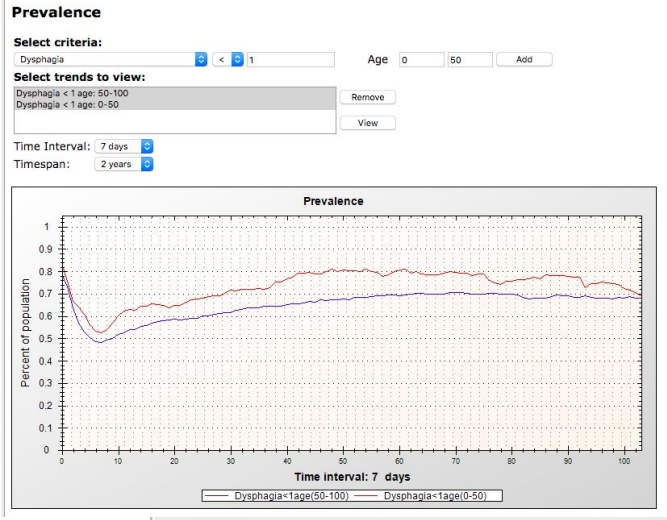


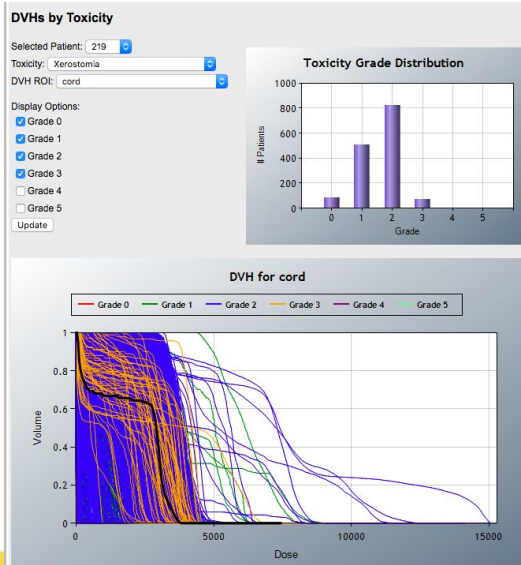
# Deliverables

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.

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# 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 |

# Timeline

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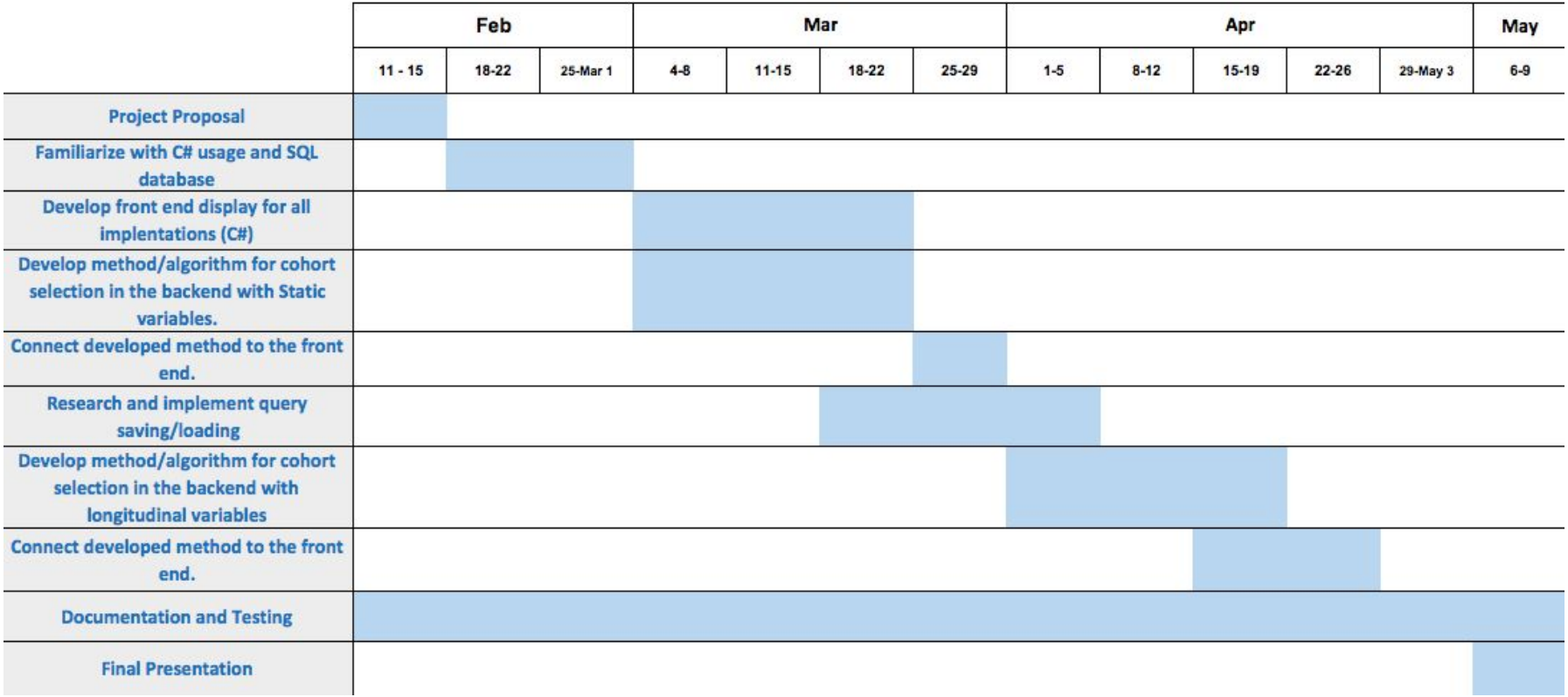


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# Dependencies

| 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. |

# 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

**Reading List:**


Benedict, S. “WE-H-BRB-01: Overview of the ASTRO-NIH-AAPM 2015 Workshop On Exploring Opportunities for Radiation Oncology in the Era of Big Data.” *Medical Physics*, vol. 43, no. 6Part42, 2016, pp. 3842–3842., doi:10.1118/1.4957989.

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.

Chen, Ronald C., et al. “How Will Big Data Impact Clinical Decision Making and Precision Medicine in Radiation Therapy?” *International Journal of Radiation Oncology*Biology*Physics*, vol. 95, no. 3, 2016, pp. 880–884., doi:10.1016/j.ijrobp.2015.10.052.

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.

Mcnutt, Todd R., et al. “Needs and Challenges for Big Data in Radiation Oncology.” *International Journal of Radiation Oncology*Biology*Physics*, vol. 95, no. 3, 2016, pp. 909–915., doi:10.1016/j.ijrobp.2015.11.032.

Mcnutt, Todd R., et al. “Using Big Data Analytics to Advance Precision Radiation Oncology.” *International Journal of Radiation Oncology*Biology*Physics*, vol. 101, no. 2, 2018, pp. 285–291., doi:10.1016/j.ijrobp.2018.02.028.

Potters, Louis, et al. “A Systems Approach Using Big Data to Improve Safety and Quality in Radiation Oncology.” *International Journal of Radiation Oncology*Biology*Physics*, vol. 95, no. 3, 2016, pp. 885–889., doi:10.1016/j.ijrobp.2015.10.024.

Skripcak, Tomas, et al. “Creating a Data Exchange Strategy for Radiotherapy Research: Towards Federated Databases and Anonymised Public Datasets.” *Radiotherapy and Oncology*, vol. 113, no. 3, 2014, pp. 303–309., doi:10.1016/j.radonc.2014.10.001.