Title
Implementation and User Experience Analysis of RayStation Radiation Treatment Planning System in an Academic Setting

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Implementation and User Experience Analysis of RayStation Radiation Treatment Planning System in an Academic Setting

By

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THESIS

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Contributors and Acknowledgements

I could not have accomplished this goal without enormous support from my family, the UCD MHI Graduate Studies faculty and staff, and my wonderful colleagues at UC Davis Health.

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ABSTRACT

Background

Radiation treatment planning is a core function within the Radiation Oncology practice utilizing integrated software to develop executable radiation treatment plans to target a tumor and spare surrounding tissues and organs at risk (OAR). In 2018 the University of California, Davis, Health (UCDH) Radiation Oncology department embarked on an effort to replace a legacy treatment planning system with a state of the art, integrated treatment planning system (TPS).

RayStation® by RaySearch Laboratories was known to have a longstanding history of innovation within the industry, enhanced clinical features, and cross-platform planning capabilities. In 2019 an interdisciplinary team comprised of radiation oncology (RO) and information technology (IT) representatives convened to conduct extensive evaluation of the RayStation® system security, data flow, infrastructure requirements, and interoperability and subsequently approved this system for purchase in 2019, at which time a project team convened to build the infrastructure including updated computing hardware, enhanced network capabilities, and increased interoperability with the departmental clinical system and devices. The system was turned over to the radiation oncology team for use in 2020.

Objectives

The objective of this study was to describe the framework for selection and implementation of an integrated treatment planning software within an academic RO department, and to subsequently assess users' feedback regarding the implementation process, the clinical tools, system availability and support, and to document any lessons learned applicable to similar implementation efforts in the future.

Methods

A combination of literature review, stakeholder interviews, and direct observation were used to examine and describe the details of project initiation, planning, execution, and transition to support including the clinical feature requirements and cybersecurity considerations.

Qualitative interviews were conducted Nov-Dec 2022 to assess user experience with the implementation, training, system performance, and support. Interviews were conducted using Microsoft Teams to record and transcribe the interviews. Interview transcripts were uploaded to Dedooce statistical analysis software and encoded to identify core themes in the user response. Encoded transcript excerpts were exported to Microsoft Excel and analyzed using pivot tables.

Results

The results of the user experience assessment indicate a high level of satisfaction with the RayStation® system overall. The users expressed positive opinions regarding the look and feel, system layout, system performance, and available clinical tools. There were mixed results regarding the experience with training, and some indication that additional training may be helpful to increase efficiency. Additionally, there were several participants who felt that the clinic would benefit from an overarching strategy to evaluate system features and future upgrades and to develop best practices across the department.

There are known issues with the systems interconnectivity, which warrant further assessment and mitigation. These issues are specific to file type compatibility, interface protocols, and firewall rule complexity between interconnected departmental systems.

Radiation Oncology Background

Advances in Radiation Treatment and the Emergence of Computing Technologies

The objective of radiation treatment is to deliver ionizing radiation to cells within cancerous tumors, while minimizing the dose delivered to surrounding tissues, organs, and structures. The concept of using radiation to cure cancer began in the early 20^{th} century shortly after the discovery of X-Rays (American Cancer Society, 2014). Early practitioners of radiation treatment quickly realized that side effects of radiation treatments outweighed the benefits and started new studies for a better understanding of the treatments (Gianfaldoni et al., 2017).

Since the early years of radiation therapy, many technical advances in hardware and software have enabled more complex treatment methods to be achieved and have resulted in significant advances in the precision of radiation treatment. Suit et al. listed some of these advances in the article titled "The Gray Lecture 2001: coming technical advances in radiation oncology" (Suit et al., 2002).

Table 1: Technical advances in radiation oncology in the recent 50 years **(Suit et al., 2002)**

1.	Portal Films	2.	Gantries
3.	Simulators	4.	60Co Units and Linear Accelerators
5.	Electron Beams	6.	CT, MRI, PET and US
7.	Computerized Treatment Planning	8.	Intra-operative Electron Beam Therapy
9.	Stereotactic Radiosurgery and Radiation Therapy	10.	IMRT [IMXT]
11.	Image Guided Brachytherapy	12.	Proton Beams

Present Day

The practice of RO is supported by many integrated clinical devices and information systems including linear accelerators (LINAC), imaging modalities, electronic health records (EHR), treatment planning systems (TPS), oncology information systems (OIS), treatment delivery systems (TDS), record and verify (RVS) systems, quality assurance (QA) systems, and often integration with an enterprise picture archival and communication system (PACS) using diagnostic imaging communication (DICOM) protocol.

Workflows within the department are time sensitive, critical to patient and staff safety, and often require extensive collaboration between the subgroups of RO, physics, dosimetry, nursing, radiation therapy, clinical engineering, IT, and administration, and transfer of data between numerous systems for the purpose of consultation, treatment, quality assurance, business operations, and research.

Figure 1 describes the workflow steps that occur from the time a patient is referred to radiation oncology through final treatment and follow-up. A vast amount of information is collected, generated, and transmitted throughout these steps, and careful attention must be given to the handoffs between the functional groups, and the information systems throughout the process.

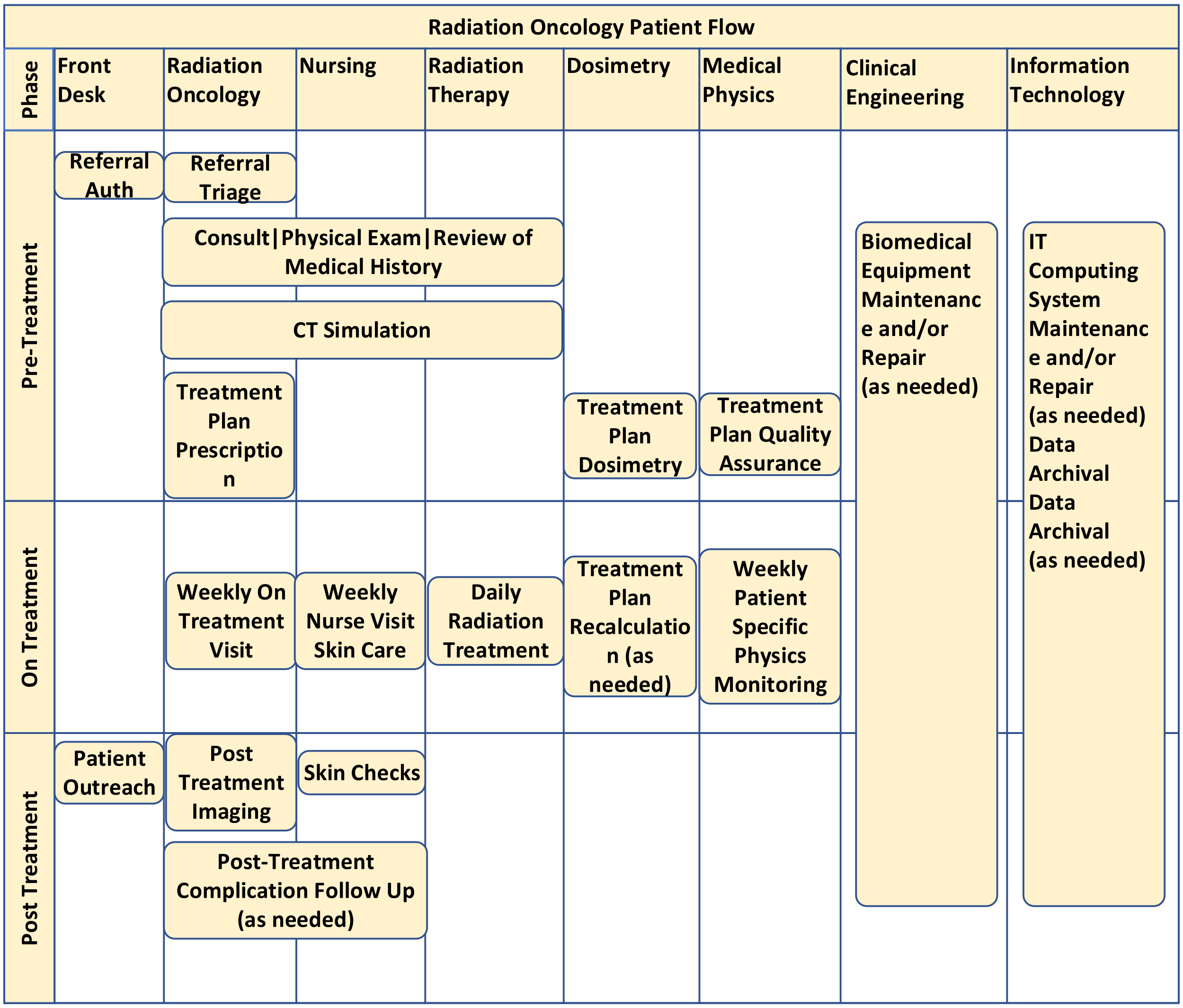

Figure 1: Radiation Oncology Patient flow

Table 2 describes information systems utilized throughout the patient treatment cycle in a typical radiation oncology department.

Table 2: Information Systems used in RO patient treatment cycle

Information System	Description
Electronic Health Record (EHR)	The EHR is a comprehensive record containing all inpatient and outpatient healthcare information. Pertinent information from ancillary systems is often linked into the primary EHR.
Lab/Pathology Information System (LIS)/ (PIS)	Numerous independent systems support the laboratory and pathology environments, including analyzers, slide scanners, software, and middleware. In most cases, all lab/path systems will integrate into a central LIS or PIS.
Radiology Information System (RIS) Picture Archival and Communication System(PACS)	An RIS is used to process imaging orders and summary notes and is usually backed up by a PACS system for storage and retrieval of large volume imaging data. This data is stored in Digital Imaging and Communications in Medicine (DICOM) format.
Oncology Information System (OIS)	An OIS contains detailed records of a patients' "on-treatment" status and historical radiation treatment information. RO informatics is challenged with integrating pertinent details of a patients' "on-treatment" status into the primary EHR for accessibility across an organization.
Radiation Therapy Treatment Planning System (TPS)	Dosimetrists apply contouring processes to DICOM images to develop a treatment plan targeted to the applicable site, sparing surrounding organs and tissue. The TPS must be able to communicate with numerous systems and devices within the RO department.
Intermediary systems for processing external data	RO informatics involves constant transmission and manipulation of information in various standard and/or proprietary formats. Intermediary systems are often used to move information between systems.
Treatment Planning quality assurance (QA)	QA systems are a combination of sensors and computing systems which support rigorous quality assurance testing by the medical physicists. This involves delivering the treatment to phantom objects and measuring the dose and distribution. Treatment plan QA is conducted before any treatment is delivered to a patient. Weekly machine QA is also conducted for each treatment device.
Patient Alignment Systems	Keeping a patient in a fixed position is critical during many RO treatments. Real time patient positioning systems, consisting of cameras and computing equipment, give radiation therapists real time view of a patient position in relation to ideal treatment position. Automatic feedback loops can pause the treatment beam if indicated.
Record and Verify (R&V)	During patient treatment sessions, "record and verify" systems record the actual dose and distribution delivered to the patient.

Radiation Treatment Methods

There are several methods used to deliver radiation treatment, and each has unique benefits depending on the size and location of the tumor to be treated. Each method, and associated treatment device, will have unique capabilities for beam types, angles, modulation, and board imaging capabilities.

Table 3: Types of Radiation Treatment

External Beam – 3D Conformal	Multiple radiation beams are directed to conform to the shape of a tumor and spare surrounding tissue (Mayo Clinic, 2022)
External Beam – IMRT	Intensity modulated radiotherapy (IMRT) is an advanced form of 3D conformal which uses more beams, and varies the intensity at specific locations within the tumor (National Cancer Institute, 2022)
External Beam – IGRT	Image guided radiotherapy (IGRT) includes use of real time imaging during radiation therapy sessions (National Cancer Institute, 2022)
Tomotherapy®	Tomotherapy® is a method of treatment in which the radiation source rotates around the patient in a spiral pattern, to direct radiation beams from all directions (National Cancer Institute, 2022)
GammaKnife	GammaKnife radiosurgery is a treatment using high energy gamma rays tightly focused on small tumors or other lesions in the head or neck, so very little normal tissue receives radiation (National Cancer Institute, 2022)
Brachytherapy	Brachytherapy is a method of implantable radiation in which radioactive material are placed directly into or near a tumor (National Cancer Institute, 2022)

Framework for Clinical Features Evaluation

RO treatment processes rely on a complex system of integrated hardware and software from various proprietary vendors. The clinical features within the core planning system are critical to departmental workflow efficiency, quality of care, and ability to deliver state of the art treatment. The clinical features required to meet the needs within the UCDH RO department are discussed below.

Cross - platform planning

The UCDH Radiation Oncology department employs several treatment devices including Versa HD external beam LINACs, Radixact TomoTherapy, GammaKnife Icon, and OnCentra Brachytherapy. Prior to the RayStation® implementation, numerous treatment planning systems were used to plan for the various devices. Each planning system required staff training, IT infrastructure, and physical space in the department. Having fewer planning systems in use presents many benefits throughout the department. RayStation®is designed to facilitate cross platform planning and includes a specific module for Tomotherapy planning with no post-processing required, making it particularly beneficial to a the UCDH RO department (RaySearch Product Overview, 2017).

Several years prior to the UC Davis Health evaluation, the University of California, San Francisco (UCSF) Radiation Oncology department adopted RayStation® as a replacement for multiple planning systems that were previously in use. During a 2016 interview, Tim Solberg, Ph.D., Director of Medical Physics at UCSF commented on the importance of consolidating planning for multiple modalities (RaySearch Press Release, 2016).

Multi-criteria optimization tools

Clinical goals, defined by the radiation oncologist, impose criteria on the amount of dose that is allowable at the target tumor, and surrounding OARs for each patient. A dosimetrist will calculate the optimal treatment plan by adjusting the priority to each criterion until a plan is developed which maximizes adherence to the overall clinical goals. RayStation® includes multi-criteria optimization tools which allow the dosimetrist to continuously adjust criteria and generate possible treatment options in real time with an easy-to-use interface. (RayStation® , 2022)

Plan evaluation tools

Radiation treatment plans have a significant amount of human input, which inevitably leads to variability. An additional mechanism to ensure selection of the optimal plan, and minimize variation, is to conduct comparative evaluation of several plans. Plan evaluation tools allow multiple plans to be evaluated at once, using predefined comparative criteria. RayStation® offers plan evaluation tools which enable up to three different plans to be simultaneously compared (RayStation® , 2022).

IMRT planning tools

IMRT is a form of radiation therapy in which the radiation beam intensity is modulated using an multi-leaf collimator (MLC) with dozens of sliding metal leaves to shape the beam to fit the specific shape of the tumor or treatment site (UC Regents, 2022). "The UCDH Department of Radiation Oncology is among the first facilities to use this sophisticated, 3-D conformal radiation therapy and has been successfully providing treatment for many years" (UC Regents, 2022, , Intensity Modulated Radiation Therapy). Robust planning algorithms to support this treatment method is an essential feature of the core TPS.

Deformable image registration (DIR)

Radiation oncology processes rely on images collected from a variety of imaging modalities, and different times throughout the patient treatment cycle. Variations in patient position, or field size of the modality, result in variations of the spatial layout of the images. There are 2 categories of image registration, rigid and non-rigid (also known as deformable) (Oh & Kim, 2017). Rigid image registration keeps the pixel-to-pixel relationship the same, whereas in DIR pixel-to-pixel relationships change. The additional flexibility available through DIR enables registration of images when anatomical changes are present (Oh & Kim, 2017). Radiation treatment patients often undergo anatomical changes due to weight loss and/or tumor shrinkage. RayStation® includes DIR capabilities which enhances the ability to develop adaptive treatment plans for these patients.

Physician remote review & contour

Prior to patient treatment planning by a dosimetrist, a radiation oncologist reviews the CT SIM images, and applies contours to the target tumor volume and the OARs. RayStation® offers a physician's toolkit which enables each physician to have a license, resulting in the ability to see only the tools relevant to the oncologist functions, and to conduct the review and contour from their office (RaySearch Product Overview, 2017).

Adaptive Radiation Therapy

Adaptive Radiation Therapy (ART) refers to the need to recalculate a plan intra-treatment cycle, due to changes in anatomy, tumor size, or location of OARs. Historically this was very difficult to predict accurately, and would require acquisition of new images, and development of a completely new plan. With the advances in treatment devices with embedded imaging modalities, and robust adaptive planning algorithms, candidates for adaptive planning can be identified easily, and the plan recalculated with fewer repetitive steps by applying previous contours to new images. RayStation® offers "a wide range of adaptive re-planning tools that consider the accumulated dose and observed deviations of the patient's geometry. Plans can then be re-optimized and adjusted to compensate for dose coverage problems or to adapt to adjusted clinical goals. Optimization objectives can be set to assure dose levels on future fractions only or to include already delivered dose to meet total dose constraints on organs at risk (RayStation® , 2022)." The UCDH Radiation Oncology department recently installed two Elekta Versa

HD LINACs which have onboard imaging modalities capable of 4D imaging, furthering the adaptive replanning capabilities.

Graphical User interface and System Useability

It is broadly recognized that high quality useability design in health information systems can increase morale and productivity.   Repetitive motion injuries, eyestrain, and migraine are common ailments among professionals who work predominantly at a computer, and overall frustration with health information systems is a known issue. Every aspect of the system user interface design, from the location of the tools to the color of the font has a great impact on the individuals using the system.

Framework for Cyber Security Considerations System Requirement Analysis and Design

Advances in computing, networking, and system interoperability have led to a complex integrated environments within the health care setting.   Clinical information systems often consist of legacy hardware, software, or clinical devices integrated within the hospital network, leading to increased vulnerability and risk of cyber-attacks.

Industry standards for cybersecurity are rapidly evolving and focus on many facets of the technology environment.   The critical nature of the systems and information used in healthcare make it especially important for health care organizations to place a high priority on cyber security programs.   The current standard for information security strategy is defense-in-depth which is defined by the National Institute for Secure Technology (NIST) as “the application of multiple countermeasures in a layered or stepwise manner to achieve security objectives” (National Institute of Standards and Technology, 2022). Figure 2 illustrates many of the attack vectors that must be considered when deploying any health information system.

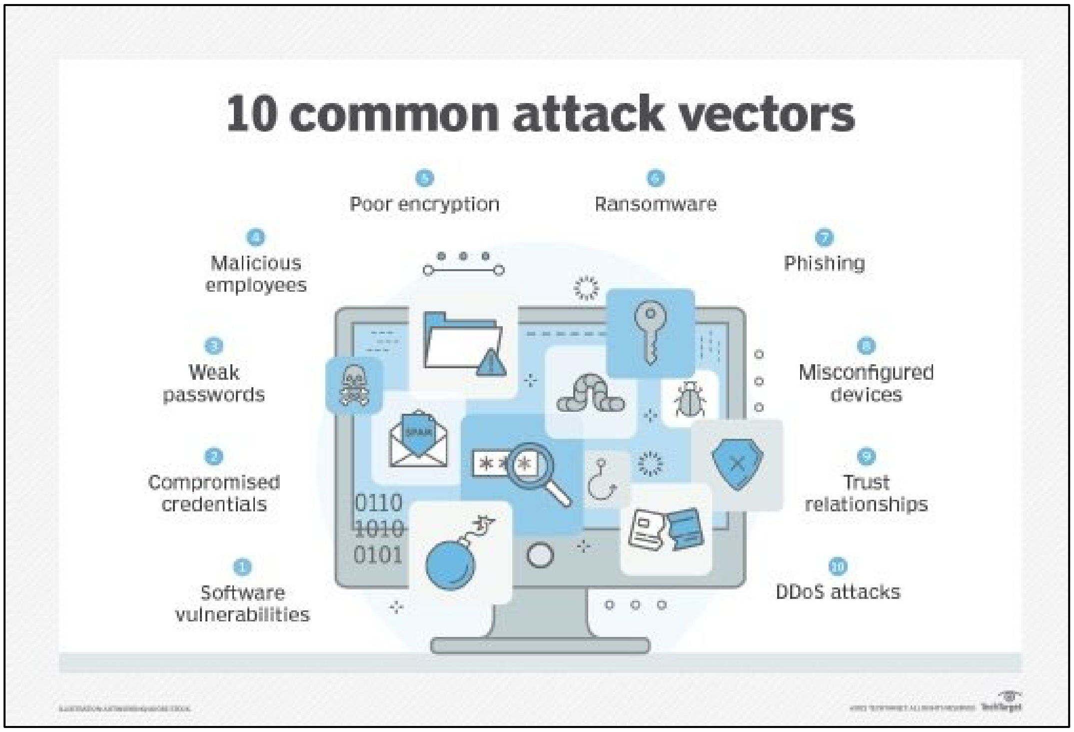

Figure 2: Common attack vectors (Schacklett, 2021)

Additionally, rules and regulations govern the retention of health care data, and organizations are responsible for ensuring that data is available, and accessible, in accordance with these regulations. A 2017 study conducted by Lockhart et al concluded that the radiotherapy plan objects should be kept for the lifetime of the patient + 5 years (Lockhart et al., 2017).

Specialty departments, such as radiation oncology, rely on specialized proprietary systems resulting in large archives of data in proprietary file types, dependent upon the proprietary software which created them. This creates significant barriers when transitioning to a new system and becomes especially problematic if a vendor decommissions a particular software or system.

Extensive technical specification and security review was conducted on the RayStation® system by a committee comprised of representation from key IT groups. This review addressed data classifications, retention requirements, encryption protocols, vendor remote access requirements, user access management, software design standards, and overall system design.

Communication protocols at each layer of the OSI stack were considered in the evaluation, design, and implementation of RayStation®.

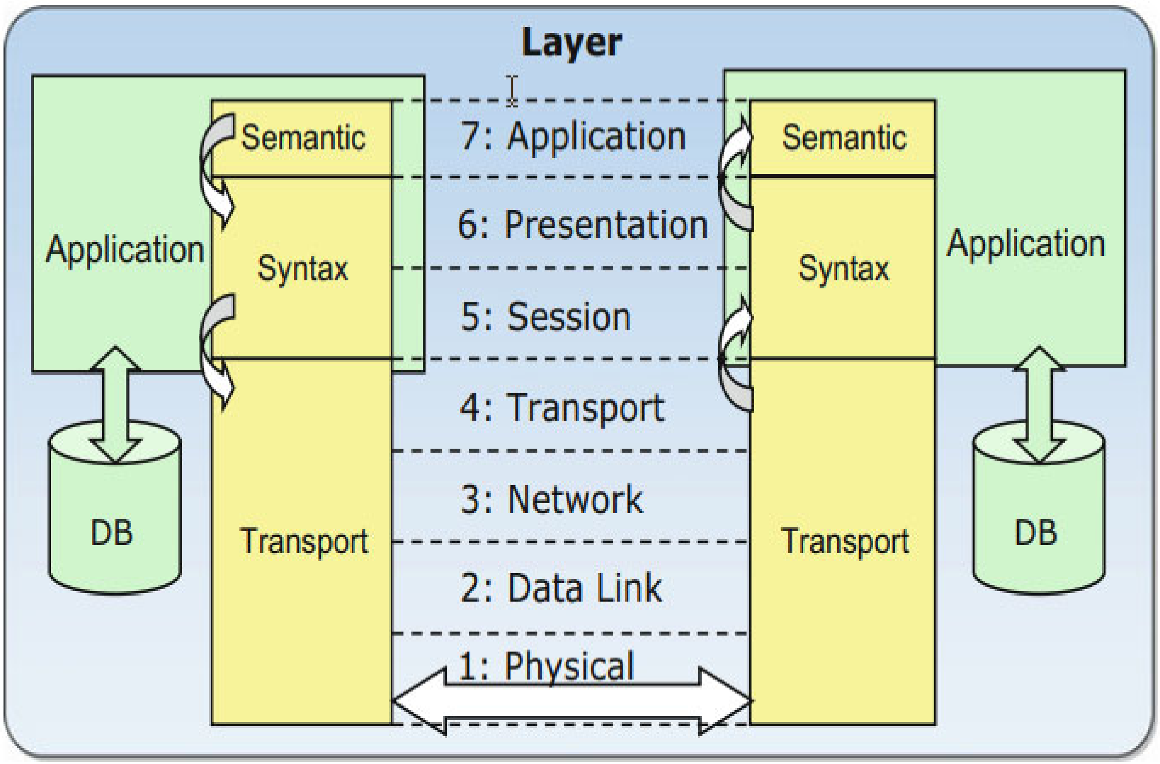

Figure 3 (Oemig & Snelick, 2022)

User Experience Assessment

Methods

This user experience analysis aimed to study the users' satisfaction with various aspects of the RayStation® training, system features, and performance. Participants were invited from the IT, Physics, and Dosimetry teams to participate in structured qualitative interviews. Interview questions were drafted for each group consisting of questions related to user role and background, project initiation processes, specific tools within the RayStation® module, intra-departmental workflows, general look and feel, and overall satisfaction. The questions were designed to be open-ended to elicit maximum feedback.

The interview process was piloted on one IT team member to assess the relevance of the questions, test the Microsoft Teams Record and Transcribe feature, and test the Dedooce encoding functionality. Several interview questions did not elicit detailed responses and were reworded to be more open-ended. Several questions elicited repetitive response and were consolidated. The Microsoft Teams record and transcribe feature misinterpreted a few words, resulting in the need for manual correction.

After conclusion of the pilot, and revision of the interview questions, participants were contacted via email to request participation in the interviews. Invitations were sent to 2 IT analysts, 6 dosimetrists and 6 physicists.

Interviews were conducted with 2 IT analysts, 2 dosimetrists and 4 physicists. Transcripts were generated using the Microsoft Teams record and transcribe feature and manual correction was conducted on transcripts as needed. Corrections were made immediately after interview, based on interviewer recollection of the answers.

The corrected transcripts were uploaded, as media files, to the Dedooce software program. Codes were developed both inductively and deductively. Some codes were anticipated based on prior knowledge of common issues, and some were deduced based on the responses received.

Responses were coded by theme, subtheme, and categorized as negative, positive, or neutral as appropriate. The excerpts and codes were exported to Excel and analyzed using Pivot tables and Pivot charts.

A total of 188 encoded comments were extracted and categorized into 1 of 7 categories: Positive, Negative, Neutral, Use Cases, Desired Features, Underutilized features, and Generals Comments.

Table 4 Dedooce coding

Code	Categories
Compared to other TPS	Negative/Neutral/Positive
Data Interoperability	Negative/Neutral/Positive
Desire for more specific training	Desired Features
Desired Feature - File Archiving Process	Desired Features
Desired Feature - Simultaneous Plan Accessibility by Multiple Users	Desired Features
Desired Feature - RS-Mosaiq Connectivity	Desired Features
Follow Up Training	Negative/Neutral/Positive
General Comment	Neutral/Positive
High Hard Disk Space Usage	Neg
Initial Training	Negative/Neutral/Positive
Licenses	Negative/Neutral/Positive
Look and Feel	Negative/Neutral/Positive
Outcomes	General comments
Performance Issues with IT root cause	General comments
Prior TPS Experience	General comments
Self-Reported Proficiency	General comments
System Performance & Accessibility	Negative/Neutral/Positive
Time spent in system	General comments
Underutilized Features	Underutilized Features
Underutilized Feature - Scripting	Underutilized Features
Use Cases	Use Cases
Vendor Support	Negative/Neutral/Positive

Results by Category

24% of all comments were positive comments about the system, 18% were neutral, 7% were references to desired features or enhancements, 16% were descriptions of use cases or features typically utilized by the respondent, 16% were general comments, 7% were regarding desired features, and 5% were regarding underutilized features that may benefit the clinic.

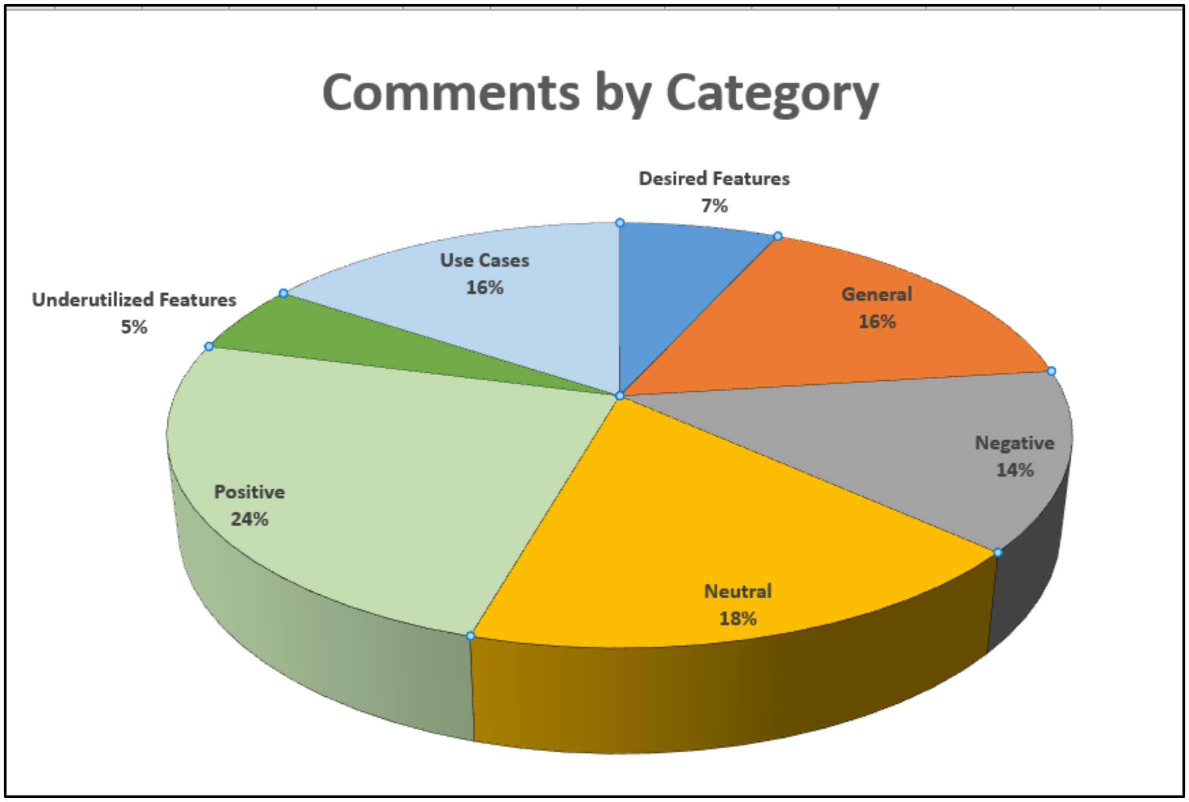

Figure 4 – Overall breakdown of positive and negative comments from all questions

Previous TPS Experience

Respondents were asked to describe their previous experience with other TPS. 38% of respondents have experience with 5 or more TPS, 62% have experience with between 1 and 4 prior TPS.

When asked to compare RayStation® to other TPS in regard to available features, look and feel, and overall system performance, 64% of comments were positive, 27% were neutral and 9% were negative.

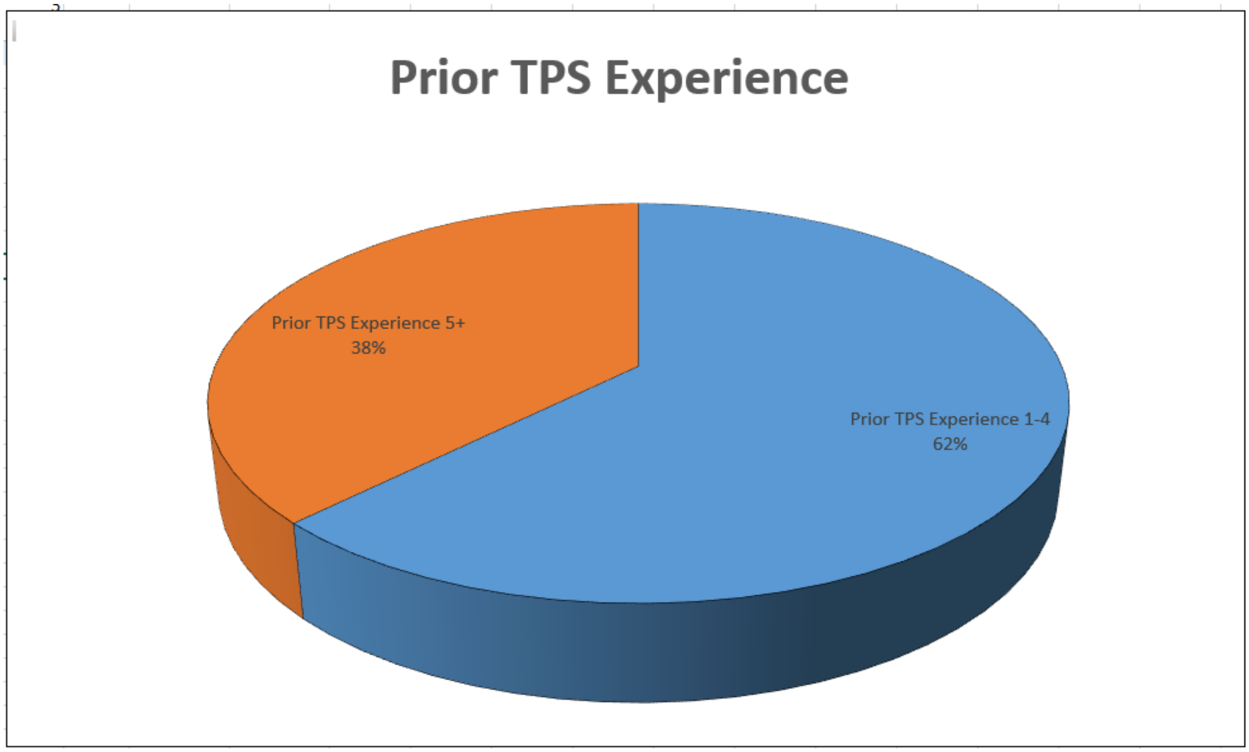

Figure 5 -Prior TPS Experience

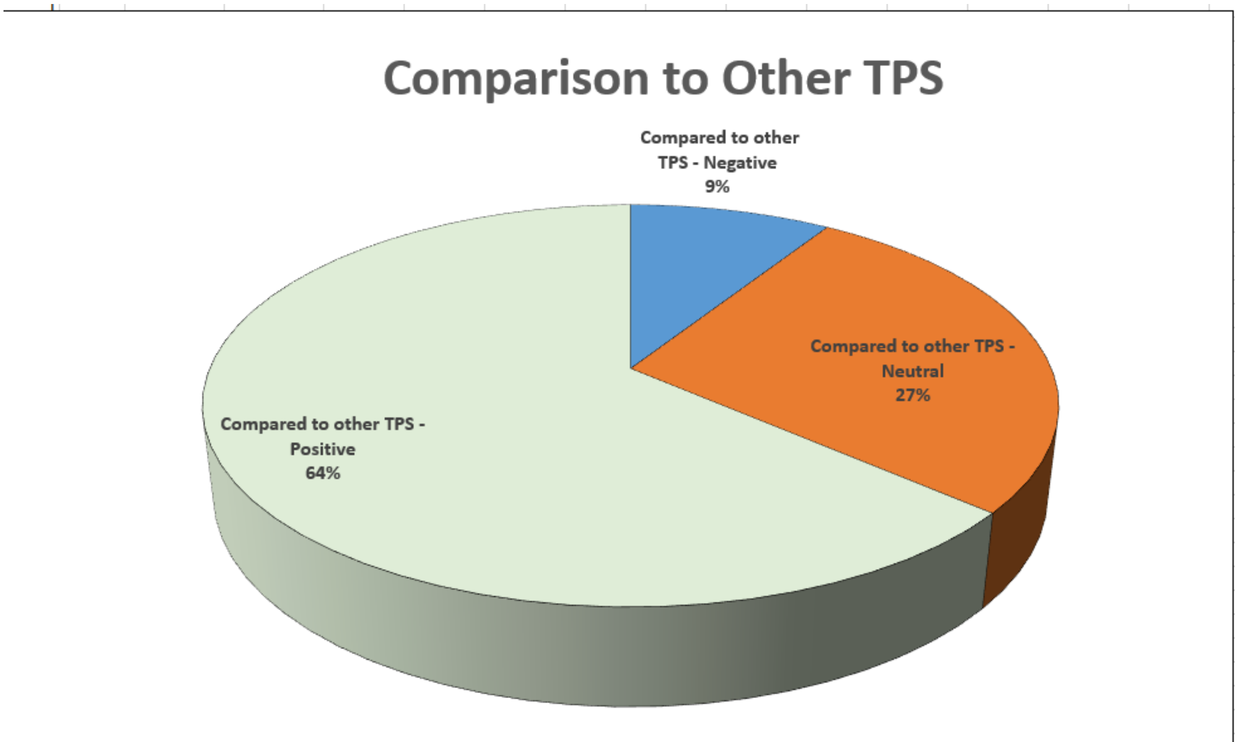

Figure 6 - Comparison to Other TPS

Features

Participants were asked a series of questions to determine their utilization of system features, features that they believe are underutilized, and any features that are not available that would be beneficial to the clinic workflows.

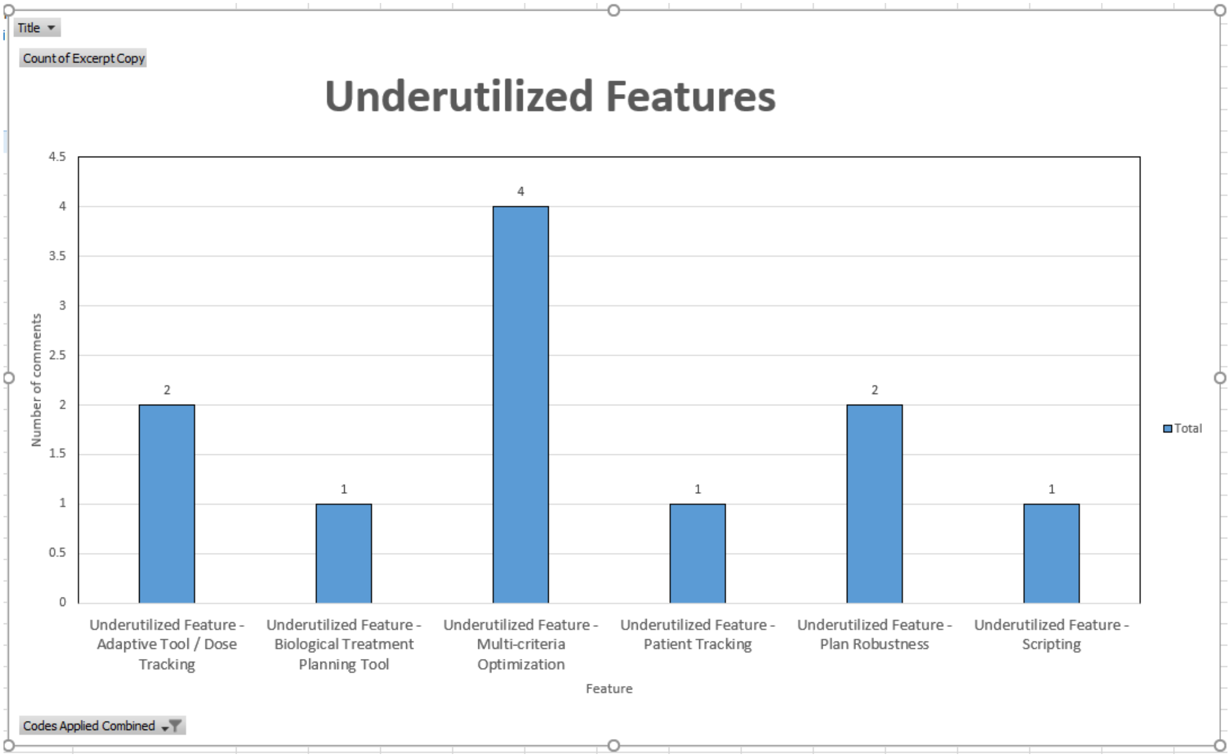

Figure 7 - Underutilized Features

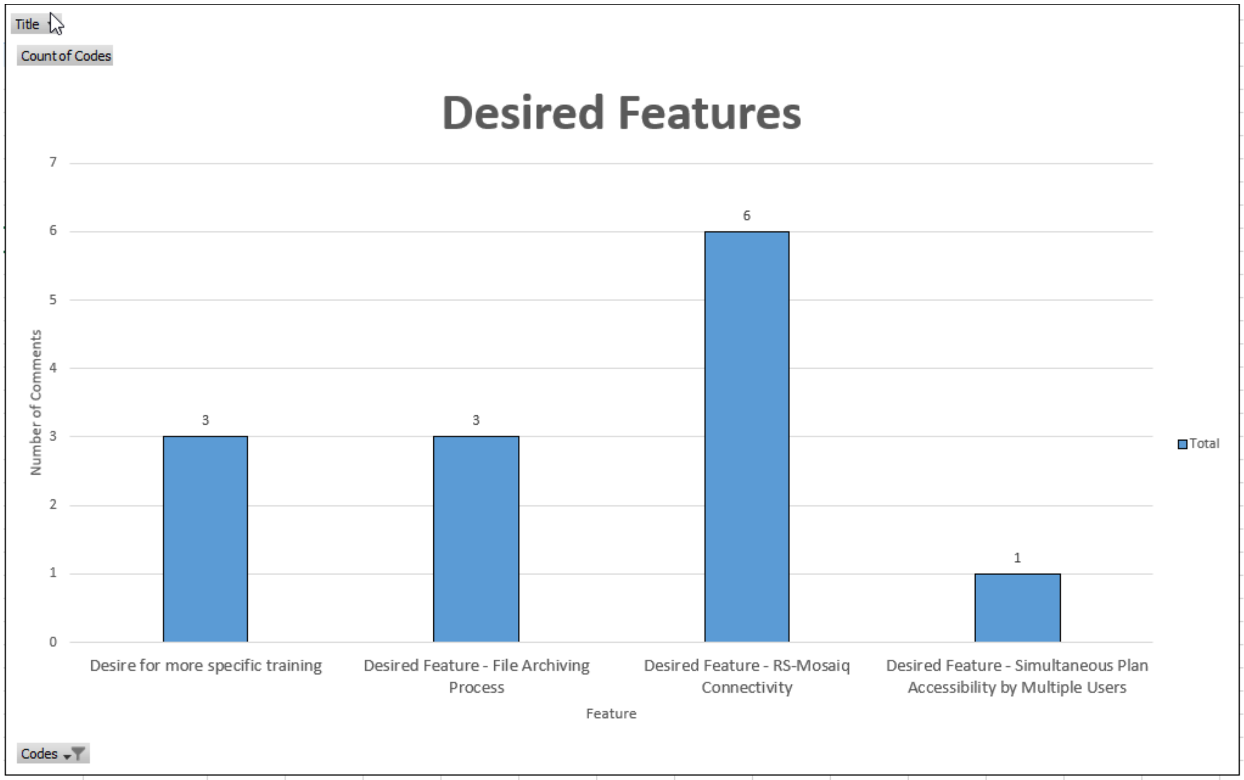

Figure 8 - Desired Features

Data Interoperability

Comments, both solicited and unsolicited, regarding data interoperability were 57% negative, 39% neutral, and 4% positive. Further qualitative review of the comments revealed the following core issues:

1. The process for transmitting between RayStation® and Tomotherapy requires manual input into separate systems and may require physically walking to another location to access systems. Additionally, when there are version upgrades to either system, there is a configuration change required to ensure continuity of connection. This has been missed in previous upgrades resulting in downtime.
2. The legacy data conversion tool presents significant challenges for IT team members and requires a significant amount of time to run conversions. Some of the converted files have been corrupted and resulted in need for reconversion and/or manual recovery of data from other systems.
3. There is not an HL7 interface between RayStation® and Mosaiq, and this results in need for manual steps to push data between systems.
4. There are firewalls between RayStation® and other department systems. If firewall rules are not appropriately updated when new systems are introduced this will result in failed data exports.

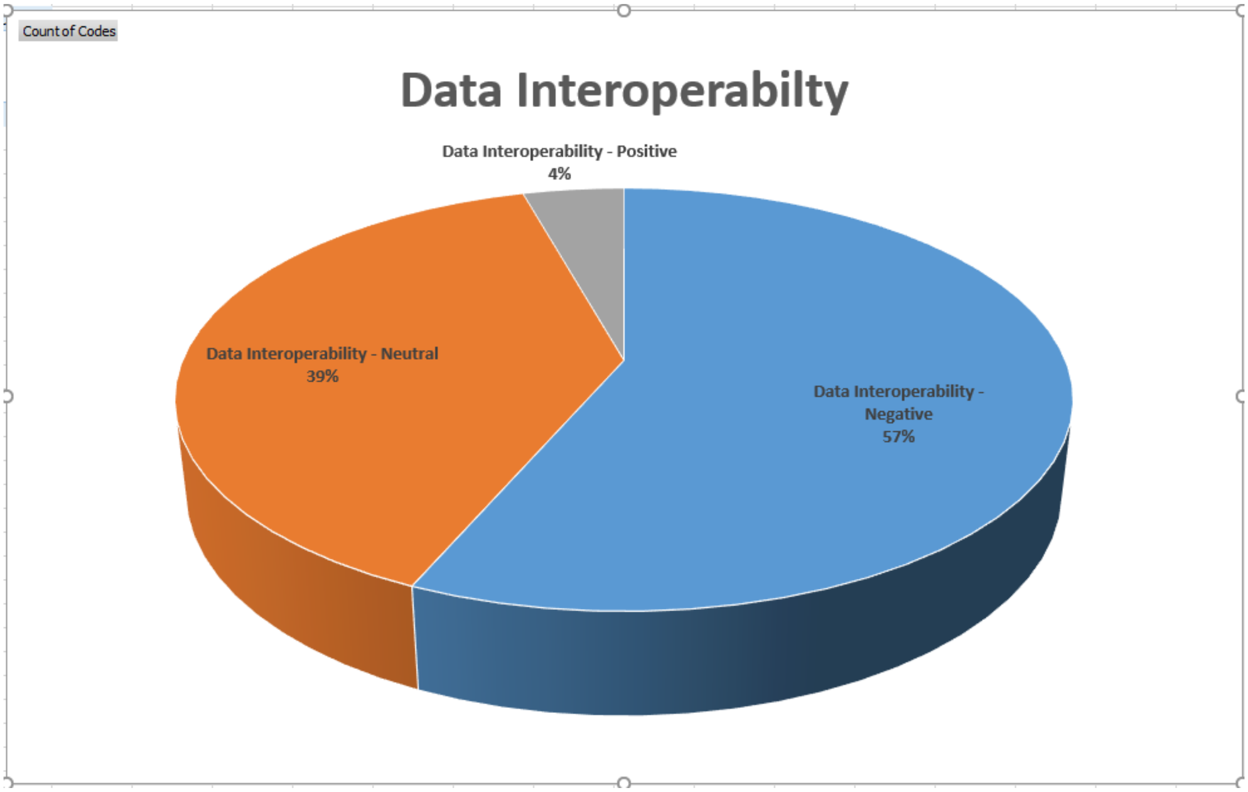

Figure 9 - Interoperability

Look and Feel

The responses were overwhelmingly positive regarding the look and feel of the system and the layout of tools. Participants often commented on the color schemes being easy on the eyes, and the left to right layout of tabs was very well aligned with the standard workflows.

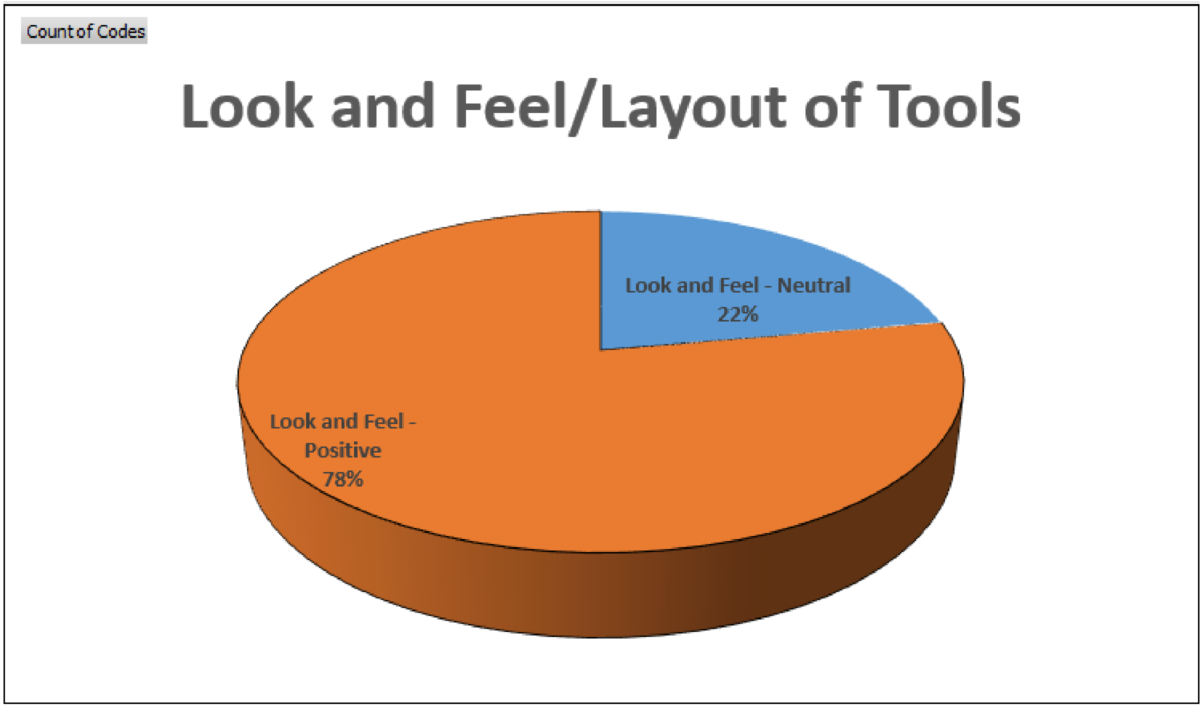

Figure 10 - Look and Feel

Training and Proficiency

Participants were asked about their experiences with training prior to implementation, follow up training, and self-perceived proficiency levels. Most participants had neutral and/or positive comments regarding the training. This question is vulnerable to recall bias, since the training occurred several years ago, and some participants had previous experience with RayStation®.

Table 5 - User reported experience with RayStation® training

Code	Number of Comments
Desire for more specific training	3
Follow Up Training - Neutral	3
Follow Up Training - None	1
Follow Up Training - Received Positive	2
Follow Up Training Received - Negative	1
Initial Training - Negative	1
Initial Training - Neutral	6
Initial Training - Positive	1
Grand Total	**18**

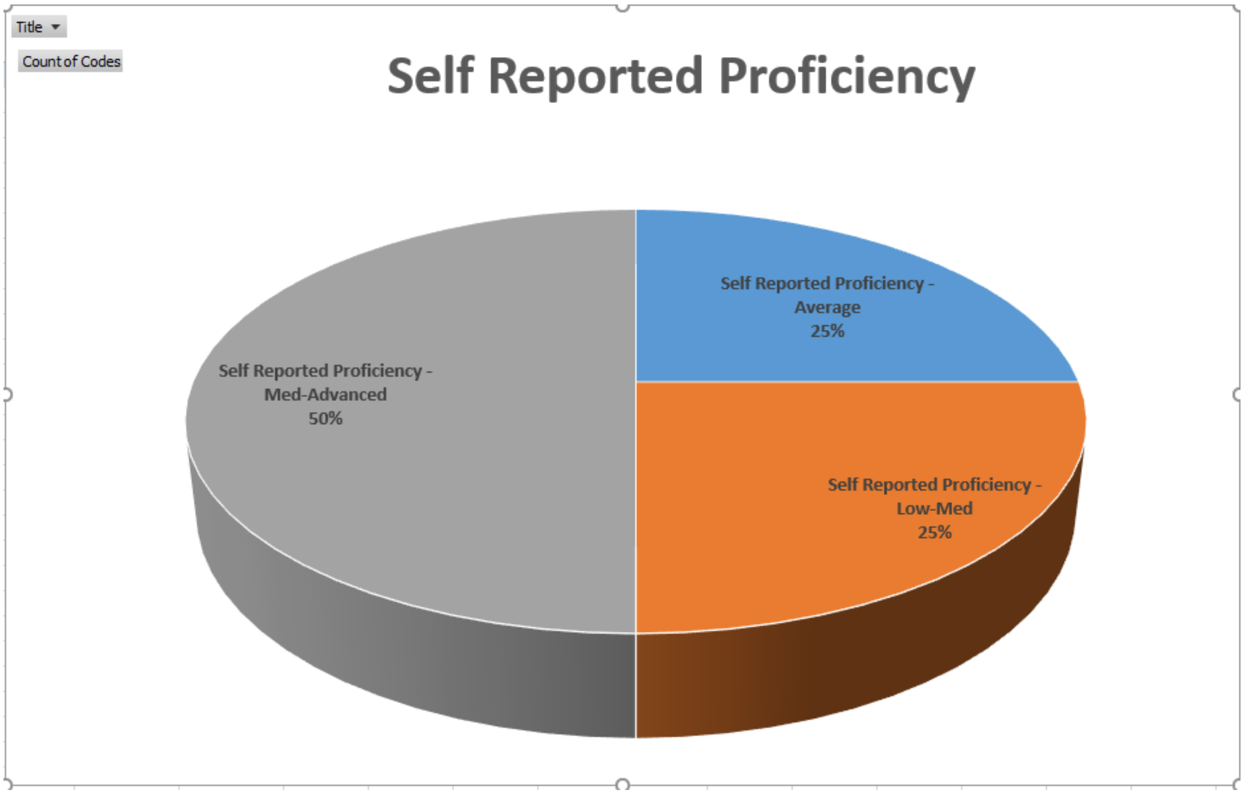

Figure 11 - Self Reported Proficiency

Limitations

User interviews were conducted and recorded over Microsoft Teams using the Record and Transcribe features. The transcriptions had a high error rate and were edited manually after each interview; however, a small number of comments could not be reconciled and were not included in the analysis.

Interviews were conducted several years after implementation and subject to recall bias. This was apparent, as some interviewees were unable to remember whether they had attended training, whereas others were able to give detailed accounts of the training received.

No budget was available to appoint additional coders, so the encoding was reviewed multiple times by the interviewer. Excerpts from all respondents were reviewed and compared to ensure consistency of the coding.

Future Discussion

The results of the user experience assessment indicate a high level of satisfaction with the RayStation® system overall. The users expressed very positive opinions regarding the look and feel, system layout, system performance, and available clinical tools. There were mixed results regarding the experience with training, and some indication that additional training may be helpful to increase efficiency. Additionally, there were several participants who felt that the clinic would benefit from an overarching strategy to evaluate system features and future upgrades and to develop best practices across the department.

There are known issues with the systems interconnectivity, which warrant further assessment and mitigation.

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Appendix A – Interview Questions

IT Interview Questions:

User Role and background:

1. Please indicate the number of hours per day that you spend supporting the RayStation® treatment planning system.
2. How many treatment planning systems have you used in the past?
3. Please describe any differences in the features between those systems and RayStation® .
4. Please describe any difference in system performance.
5. Please describe in detail how you perform day to day support of RayStation® .

Workflows:

6. Please describe your process for moving data between RayStation® and other systems.

Training:

7. Please describe the training (if any) that you received prior to RayStation® implementation.
8. Please describe any follow up training that you have received since go live.
9. Please describe your level of proficiency supporting RayStation® , and elaborate on any difficulties?

System Performance and Support:

10. Please describe how you access the system, and describe any barriers.
11. Please discuss your experience with technical issues, and how you go about getting them resolved.
12. Please describe your experience with the system performance, including system load time, click to response time, algorithm run time.
13. Are there any maintenance tasks, such as data archiving or purging, that you are responsible for? If so, please describe the steps.

Follow up:

14. Please describe any outcome that you hope to see as a result of this user experience analysis.
15. Please provide any other feedback that you would like to share about the RayStation® system.

Physics Interview Questions

User Role and background:

1. Please indicate the number of hours per day that you spend using the RayStation® treatment planning system.
2. How many treatment planning systems have you used in the past?
3. Please describe any differences in the features between those systems and RayStation® .
4. Please describe any difference in system performance.
5. Please describe in detail how you use RayStation® to perform your day-to-day work.

Workflows:

6. How does this system impact the workflow or data handoffs between physicists and treatment machines?

7. Please describe your process, and any barriers, for moving data between RayStation® and other systems.

Look and Feel:

8. Please describe the look and feel of the system.
9. Please describe your experience with the layout of tools.

Features:

10. Please discuss the features that you most commonly use, and what you like, or do not like about them.
11. Are there any underutilized features that may benefit our clinic?

Training:

12. Please describe the training (if any) that you received prior to RayStation® implementation.
13. Please describe any follow up training that you have received since go live.
14. Please describe your level of proficiency using RayStation® .

System Performance and Support:

15. Please describe how you access the system, and describe any barriers.
16. Please discuss your experience with technical issues, and how you go about getting them resolved.
17. Please describe your experience with the system performance, including system load time, click to response time, algorithm run time.
18. Are there any maintenance tasks, such as data archiving or purging, that you are responsible for? If so, please describe the steps.
19. Are the licenses available to you sufficient for you to perform your work? Are the appropriate licenses available when you need them?

Follow up:

20. Please describe any outcome that you hope to see as a result of this user experience analysis.
21. Please provide any other feedback that you would like to share about the RayStation® system.

Dosimetry Interview Questions

User Role and background:

1. Please indicate the number of hours per day that you spend using the RayStation® treatment planning system.
2. How many treatment planning systems have you used in the past?
3. Please describe any differences in the features between those systems and RayStation® .
4. Please describe any difference in system performance.
5. Please describe in detail how you use RayStation® to perform your day-to-day work.

Workflows:

6. How does this system impact the workflow handoffs between physicians and dosimetrists?
7. Please describe your process, and any barriers, for moving data between RayStation® and other systems.

Look and Feel:

8. Please describe the look and feel of the system.
9. Please describe your experience with the layout of tools.

Features:

10. Please discuss the features that you most commonly use, and what you like, or do not like about them.
11. Are there any underutilized features that may benefit our clinic?

Training:

12. Please describe the training (if any) that you received prior to RayStation® implementation.
13. Please describe any follow up training that you have received since go live.
14. Please describe your level of proficiency using RayStation® .

System Performance and Support:

15. Please describe how you access the system, and describe any barriers.
16. Please discuss your experience with technical issues, and how you go about getting them resolved.
17. Please describe your experience with the system performance, including system load time, click to response time, algorithm run time.
18. Are there any maintenance tasks, such as data archiving or purging, that you are responsible for? If so, please describe the steps.
19. Are the licenses available to you sufficient for you to perform your work? Are the appropriate licenses available when you need them?

Follow up:

20. Please describe any outcome that you hope to see as a result of this user experience analysis.
21. Please provide any other feedback that you would like to share about the RayStation® system.