Final Progress Report for Research Projects Funded by Health Research Grants

Instructions: Please complete all of the items as instructed. Do not delete instructions. Do not leave any items blank; responses must be provided for all items. If your response to an item is "None", please specify "None" as your response. "Not applicable" is not an acceptable response for any of the items. There is no limit to the length of your response to any question. Responses should be single-spaced, no smaller than 12-point type. The report **must be completed using MS Word**. Submitted reports must be Word documents; they should not be converted to pdf format. Questions? Contact Health Research Program staff at 717-231-2825.

1. **Grantee Institution:** American College of Radiology

2. **Reporting Period (start and end date of grant award period):** 1/1/2011 – 12/31/2014

3. **Grant Contact Person (First Name, M.I., Last Name, Degrees):** Stephen M. Marcus, M.S.

4. **Grant Contact Person's Telephone Number:** 267-940-9403

5. **Grant SAP Number:** 4100054841

6. **Project Number and Title of Research Project:** 5: Improving the Collection of Patient-Reported Quality of Life Data – Expansion of Web-based QOL Collection Strategy

7. **Start and End Date of Research Project:** 7/1/2011-12/31/2014

8. **Name of Principal Investigator for the Research Project:** Benjamin Movsas, MD

9. **Research Project Expenses**.

   9(A) Please provide the total amount of health research grant funds spent on this project for the entire duration of the grant, including indirect costs and any interest earned that was spent:

   $ 75,277.12

   9(B) Provide the last names (include first initial if multiple individuals with the same last name are listed) of **all** persons who worked on this research project and were supported with health research funds. Include position titles (Principal Investigator, Graduate Assistant, Post-doctoral Fellow, etc.), percent of effort on project and total health research funds expended for the position. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name, First Name	Position Title	% of Effort on Project	Cost
Movsas	Principal Investigator	3%	$33,000.00
Pugh (Shook)	Sr. Statistician	5% Yr 1	$6,802.38

9(C) Provide the names of **all** persons who worked on this research project, but who *were not* supported with health research funds. Include position titles (Research Assistant, Administrative Assistant, etc.) and percent of effort on project. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name, First Name	Position Title	% of Effort on Project
Machtay	Co-Investigator	< 1%
Gwede	Co-Investigator	< 1%

9(D) Provide a list of **all** scientific equipment purchased as part of this research grant, a short description of the value (benefit) derived by the institution from this equipment, and the cost of the equipment.

Type of Scientific Equipment	Value Derived	Cost
None		

10. Co-funding of Research Project during Health Research Grant Award Period. Did this research project receive funding from any other source during the project period when it was supported by the health research grant?

Yes_____ No___X_____

If yes, please indicate the source and amount of other funds:

11. Leveraging of Additional Funds

11(A) As a result of the health research funds provided for this research project, were you able to apply for and/or obtain funding from other sources to continue or expand the research?

Yes_____ No___X_____

If yes, please list the applications submitted (column A), the funding agency (National Institutes of Health—NIH, or other source in column B), the month and year when the application was submitted (column C), and the amount of funds requested (column D). If you have received a notice that the grant will be funded, please indicate the amount of funds to be awarded (column E). If the grant was not funded, insert "not funded" in column E.

Do not include funding from your own institution or from CURE (tobacco settlement funds). Do not include grants submitted prior to the start date of the grant as shown in Question 2. If you list grants submitted within 1-6 months of the start date of this grant, add a statement below the table indicating how the data/results from this project were used to secure that grant.

A. Title of research project on grant application	B. Funding agency (check those that apply)	C. Month and Year Submitted	D. Amount of funds requested:	E. Amount of funds awarded:
None	☐NIH ☐ Other federal (specify:_____) ☐ Nonfederal source (specify:_)		$	$

11(B) Are you planning to apply for additional funding in the future to continue or expand the research?

Yes_____ No___X_____

If yes, please describe your plans:

12. Future of Research Project. What are the future plans for this research project?

The results of this project suggest that an electronic web-based strategy for collecting quality of life (QOL) can be extended to a more challenging patient population, specifically patients with head and neck cancers. The future plans of this research project are to further study this approach and extend this strategy to other clinical trials in order to make the option of an electronic web-based technology available to more patients eager to use this approach for completion of quality of life forms.

13. New Investigator Training and Development. Did students participate in project supported internships or graduate or post-graduate training for at least one semester or one summer?

Yes_____ No___X_____

If yes, how many students? Please specify in the tables below:

	Undergraduate	Masters	Pre-doc	Post-doc
Male				
Female				
Unknown				
Total				

	Undergraduate	Masters	Pre-doc	Post-doc
Hispanic				
Non-Hispanic				
Unknown				
Total				

	Undergraduate	Masters	Pre-doc	Post-doc
White				
Black				
Asian				
Other				
Unknown				
Total				

14. Recruitment of Out-of–State Researchers. Did you bring researchers into Pennsylvania to carry out this research project?

Yes_____ No___X_____

If yes, please list the name and degree of each researcher and his/her previous affiliation:

15. Impact on Research Capacity and Quality. Did the health research project enhance the quality and/or capacity of research at your institution?

Yes___X_____ No_____

If yes, describe how improvements in infrastructure, the addition of new investigators, and other resources have led to more and better research.

This health research project has led to improvements in the collection of quality of life data within the Radiation Therapy Oncology Group (RTOG). One of the goals of this project was to evaluate this electronic web-based strategy for collecting quality of life in a large NCI cooperative group (RTOG). Previously, RTOG performed a small pilot study in prostate cancer patients within a limited number of sites (approximately 20) with a timepoint of 6 months. A key benefit of this project was to extend this strategy to many more RTOG sites (approximately 100) and assess a one-year timepoint for quality of life completion rate in a more challenging patient population (those with head and neck cancer). As part of this project, there were regular meetings at the RTOG semiannual meetings to discuss this project and to help train research associates and other investigators in using the electronic web-based technology. As well, between meetings, there were many webinars for training as well. The success with this project has led to the incorporation of web-based technology for quality of life data into two additional head and neck trials coordinated by RTOG's successor group, NRG Oncology.

This health research project has also enhanced the quality and capacity of quality of life research at my institution, Henry Ford Health System. In particular, as we have a multidisciplinary team for management of head and neck cancer patients with close collaboration with the other specialties, our department received much positive feedback regarding this project. Other investigators, in other departments, were pleased to see that their head and neck cancer patients were able and eager to use electronic web-based strategy for completion of quality of life forms. I have been asked to give didactic lectures within the institution about quality of life and how to enhance compliance. The head and neck team has expressed interest in applying this electronic web-based technology to more of their patients. Similarly, other departments have expressed a similar interest in this regard and I have given grand rounds to the cancer center about this topic. Overall, this project, beyond its specific goals, also had the additional benefit of increasing the awareness of the importance of quality of life for patients and strategies that can be used to enhance quality of life completion rates.

16. Collaboration, business and community involvement.

16(A) Did the health research funds lead to collaboration with research partners outside of your institution (e.g., entire university, entire hospital system)?

Yes___X_____ No_____

If yes, please describe the collaborations:

This health research project led to increased collaboration with research partners across RTOG (across sites from all over North America and beyond) to increase the awareness regarding the importance of quality of life for patients, as well as the importance of enhancing the quality of life compliance rate. As a result of the success of this project, RTOG's successor group, NRG Oncology, has instituted this method for collection of quality of life data into two additional head and neck cancer protocols and discussions are underway to incorporate it into the research of other disease sites.

16(B) Did the research project result in commercial development of any research products?

Yes_____ No____X_____

If yes, please describe commercial development activities that resulted from the research project:

16(C) Did the research lead to new involvement with the community?

Yes_____ No____X_____

If yes, please describe involvement with community groups that resulted from the research project:

17. Progress in Achieving Research Goals, Objectives and Aims.

List the project goals, objectives and specific aims (as contained in the grant agreement). Summarize the progress made in achieving these goals, objectives and aims for the period that the project was funded (i.e., from project start date through end date). Indicate whether or not each goal/objective/aim was achieved; if something was not achieved, note the reasons why. Describe the methods used. If changes were made to the research goals/objectives/aims, methods, design or timeline since the original grant application was submitted, please describe the changes. Provide detailed results of the project. Include evidence of the data that was generated and analyzed, and provide tables, graphs, and figures of the data. List published abstracts, poster presentations and scientific meeting presentations at the end of the summary of progress; peer-reviewed publications should be listed under item 20.

This response should be a DETAILED report of the methods and findings. It is not sufficient to state that the work was completed. Insufficient information may result in an unfavorable performance review, which may jeopardize future funding. If research findings are pending publication you must still include enough detail for the expert peer reviewers to evaluate the progress during the course of the project.
Health research grants funded under the Tobacco Settlement Act will be evaluated via a performance review by an expert panel of researchers and clinicians who will assess project work using this Final Progress Report, all project Annual Reports and the project's strategic plan. After the final performance review of each project is complete, approximately 12-16 months after the end of the grant, this Final Progress Report, as well as the Final Performance Review Report containing the comments of the expert review panel, and the grantee's written response to the Final Performance Review Report, will be posted on the CURE Web site.

There is no limit to the length of your response. Responses must be single-spaced below, no smaller than 12-point type. If you cut and paste text from a publication, be sure symbols print properly, e.g., the Greek symbol for alpha (α) and beta (ß) should not print as boxes (□) and include the appropriate citation(s). DO NOT DELETE THESE INSTRUCTIONS.

Specific Aim: To test the hypothesis that, using a novel real-time web-based technology, the quality of life (QOL) compliance rate at one year will be significantly increased from 50% (using the prior methodology of collecting QOL via paper forms) to >65% (i.e., a 30% relative increase) in a study of head and cancer patients.

A secondary aim is to compare the QOL compliance rates at a shorter time point of 3 months, as well as the degree to which the specific items on the QOL forms are actually completed.

Over this grant period, several key milestones were accomplished on this project entitled "Improving the Collection of Patient-Reported Quality of Life (QOL) Data – Expansion of Web-based Quality QOL Collection Strategy". The Radiation Therapy Oncology Group (RTOG) study 0920, entitled "A Phase III Study Of Postoperative Intensity Modulated Radiation Therapy

(IMRT) +/- Cetuximab For Locally-Advanced Resected Head And Neck Cancer " was opened at many institutions internationally, including the amendment allowing for patients to complete their quality of life (QOL) forms using the electronic web-based technology (called VisionTree Optimal Care or VTOC). Moreover, this amendment to allow for the use of this HIPAA-compliant electronic system had to be approved by each individual Institutional Review Board (IRB). This process went well and this component of this study (with this amendment) was approved and opened at many RTOG institutions across North America. There was also training for VTOC including at the semiannual meetings and via webinars.

Over the grant period, 232 patients consented to complete patient-reported outcomes (PROs) or the quality of life (QOL) component of the study. This represents 86% of all study patients (Table 1). Of these 232 patients, 96 patients consented to complete their quality of life on this study using VisionTree Optimal Care (VTOC). This represents 41% of the patients who consented to participate in the QOL component of RTOG 0920 (Table 2). The pretreatment characteristics of these 96 patients who consented to use VTOC are shown in Table 3 (and compared to the patients who did not consent to use VTOC). The median age of the patients who used VTOC was 57 years, compared to 59 years among other patients in the study. 65 of the 96 patients (68%) were male (compared to 66% of the patients who did not use VTOC). Similarly, the breakdown by race was also similar. 88 of the 96 patients (92%) using VTOC were white compared to approximately 83% of the patients who did not. Of the 96 patients who consented to use VisionTree Optimal Care, 40 (41%) had an excellent Zubrod performance status of zero. This appeared somewhat lower than the rate of 48% of patients in the rest of the study who had a Zubrod performance status of zero. Overall, the smoking history was similar among patients who consented to use VTOC and the remaining patients. 34 of the 96 patients who consented to VTOC (35%) had never smoked, compared to 35% of patients who did not use VTOC. 23% of the VisionTree Optimal Care patients had less than 20 pack year history of smoking, 18% had 20 to 40 pack year of smoking, and 18% had a greater than 40 pack year history of smoking. The respective percentages in the remaining patients were 15%, 27%, and 20% (which is not significantly different).

Overall, the pathologic staging using the American Joint Committee on Cancer staging system (AJCC) was also similar between patients who consented to use VisionTree Optimal Care (VTOC) and the remaining group (Table 3). AJCC stages I, II, III, and IV among the VTOC patients was broken down as follows: 3%, 12%, 21%, and 62%, respectively. Among the remaining patients, the breakdown was: 4%, 15%, 18% and 59%, respectively. The breakdown by pathologic T-stage was also very similar. Among the patients who consented to VisionTree Optimal Care, the breakdown of T1, T2, T3 and T4 was 24%, 42%, 15% and 18%, respectively. In the remaining group, it was 19%, 40%, 13% and 24%, respectively. The breakdown by pathologic N-stage was as follows for N0, N1, and N2: for the VTOC group it was 30%, 18%, and 48%, respectively; in the remaining group it was 40%, 17%, and 42%, respectively. There were also no significant differences in the rates of perineural involvement or lymphovascular invasion. Thus, overall, the pretreatment characteristics for the patients who consented to use VisionTree Optimal Care (VTOC) were mostly as expected and overall comparable to the remaining group of patients in the study who did not choose to use VTOC.

There was, however, an important exception in this regard, regarding swallowing problems, with

a significant difference between the patients who consented to use VisionTree Optimal Care and those that did not. In particular, 49 of the 96 patients who consented to VTOC (51%) had no swallowing problems versus 65% of the patients who did not consent to use VTOC (p-value = 0.03). By contrast, 46% of the patients who consented to use VTOC had swallowing problems present prior to registering on this study versus only 32% of the patients who did not consent to VTOC (p-value = 0.03). While the reason for this difference is not clear, this may be an important difference in that patients who are more symptomatic may be less likely to be compliant with additional components of the study over time, such as quality of life.

At this time, 55 patients who consented to complete their quality of life on this study using VTOC passed the one year follow-up time point. 3 of the 55 patients (6%) who had consented to use VisionTree Optimal Care had passed away. Of the remaining 52 patients who were eligible to complete the validated Functional Assessment of Cancer Therapy – Head and Neck (FACT-HN) quality of life (QOL) form at one year, 32 patients completed the QOL form for a total completion rate (among living patients) of 62%. None of the patients withdrew their consent prior to the 1-year time point period. Of the patients who did not complete the FACT-HN form at the 1-year time point, the following were the reasons provided for the lack of compliance: Eight patients (14.5%) did not do so due to institutional error. One patient (1.8%) did not do so due to patient refusal. Four patients (7%) could not be contacted and one patient (1.8%) did not complete the QOL form for "other reason." Of note, for six patients (11%), the QOL form was not received and no reason was stated.

The hypothesis for this project was that the total compliance rate for the validated Functional Assessment of Cancer Therapy – Head and Neck form (FACT-HN) at one year would be significantly increased from the baseline level of 50% (using paper forms in a prior study, RTOG 0522) to 65% using the electronic web-based technology, VisionTree Optimal Care (a 30% relative increase). Of note, at this point, it is too early to make a formal assessment regarding this hypothesis, as more follow-up is needed on patients who consented to using VTOC and who completed radiation therapy at least one year ago. The information thus far suggests a trend in the right direction as 62% of the patients have completed the FACT-HN form at one year. This is a 24% improvement compared to the 50% completion rate in the past using paper forms (and is close to the planned increase to 65%). Additional follow-up is needed as planned. Of note, we previously found that the research associates liked using VTOC as it saved them time trying to catch patients in the clinic to fill out their QOL forms (estimated as saving about 10 minutes per form). Moreover initially, during the first year of accrual, there were 6 patients who did not complete the 1-year QOL form due to "institutional error" and subsequently, 6 months later, there were 8 patients. This suggests that there has been some improvement in this regard due to a learning curve in this study for using VisionTree Optimal Care.

Other endpoints also studied in this project include the completion rates for the other quality of life forms (including the EQ-5D, the University of Michigan Xerostomia-Related QOL scale, [XeQOLS], and the Dermatology Life Quality Index, [DLQI]). As shown in Table 4, 31 of 52 living patients (at the one year timepoint) completed the EQ-5D for a total completion rate at one year of 60%. For the University of Michigan's Xerostomia-Related QOL scale, 32 of 52 living patients completed this form at one year, for a total completion rate of 62% at one year. For the Dermatology Life Quality Index form, 31 of 52 living patients completed the DLQI at one year

for a total completion rate of 61% at one year. Thus, the total completion rate for all the forms among patients utilizing VTOC at one year ranges between 60 to 62 percent (or an average of 61%). This compares favorably to the overall completion rate among patients who did not utilize VTOC on this study, which averaged 56% for these forms at one year.

Another important issue relates to the compliance of specific items within each quality of life form. Table 5 shows the compliance of each item for the FACT-HN form at one year using VTOC. Overall, there was an excellent compliance in this regard ranging from 93% to 100% completion of each of the individual items. The one exception is the sensitive question regarding "I am satisfied with my sex life". Nevertheless, even this question had an 82% completion rate, which compares favorably to only 62% completion rate for this question among patients who did not use VTOC. This may be due to the fact that patients utilizing paper forms may be more concerned about the privacy of their information compared to utilizing a HIPAA-compliant web-based approach. Table 6 shows the compliance of the various items on the EQ-5D form using VTOC. There was 100% compliance for each of the questions, except for "usual activities" which had a compliance rate of 96%. Table 7 shows the compliance of the various items on the XeQOLS form, which was 100%. Table 8 shows the compliance at one year for the DLQI form. The compliance was 100% for each of the items, except for the question "Over the last week how much has your skin been a problem at work or studying," which had a compliance rate of 92%.

Another endpoint that was assessed in this study was the compliance of the quality of life forms at the 3 month timepoint using VTOC. As shown in Table 9, the total completion rate (among living patients) at 3 months was 61% using VTOC. This is similar to the completion rate using VTOC for FACT-HN at one year. The completion rates for the other QOL forms are also shown in Table 9 (53% for EQ-5D, 61% for XeQOLS, and 58% for DLQI). Table 10 shows the compliance for each item on the FACT-HN form at 3 months using VTOC. Overall the compliance ranged from 95% to 100% for each item. The one exception again was the question related to "I am satisfied with my sex life" which had a compliance rate of 71.4%. This again compared favorably to the compliance rate for this item among the patients who did not use VTOC, which was 61%. Table 11 shows the compliance for the EQ-5D items at 3 months using VTOC which was 100% for each item. Table 12 shows the 3-month compliance for each item on the XeQOLS form, which ranged from 98% to 100%. Finally, Table 13 shows the 3-month compliance for each item on the DLQI form, which was 100% for all items, except for the question "How much has your skin made it difficult for you to do any sport," which had a compliance of 98%.

In summary, the following important milestones were accomplished for this project. Patients were able to consent to using the electronic web-based technology, VisionTree Optimal Care (VTOC), with the appropriate IRB approval (as part of the RTOG study 0920). Overall, the pretreatment characteristics of the patients who consented to use VTOC were similar to the other patients enrolled in this study. Importantly, the total compliance rate at 1-year with the Functional Assessment of Cancer Therapy – Head and Neck (FACT-HN) form was 62%. While additional follow-up is needed, this is a 24% improvement in the QOL completion rate compared to the 50% completion rate in the past using paper forms (and is close to the planned increase to 65%). This suggests that even in a more complex and symptomatic group of patients (as with

head and neck cancer), it is valuable to also offer the option of completing the quality of life forms using an electronic web-based technology, rather than only offering paper forms. Indeed, it is noteworthy that patients who utilized VTOC actually had significantly increased swallowing symptoms compared to patients who did not utilize VTOC. Yet despite the increased symptoms, these patients still chose to use this web-based strategy to complete their quality of life forms with an overall improved QOL compliance rate.

The primary aim of this project was to test this new software system in a more challenging patient population, specifically patients with head and neck cancers. In this study, >40% of the patients who consented to participate in the quality component (of RTOG 0920) opted to use the electronic web-based strategy (VTOC). In this group of patients, who came from centers (across RTOG) from multinational sites, the compliance rate at 1-year for the FACT-HN form was 62%, a 24% increase compared to the historical 50% total completion rate utilizing paper forms in the past. This project suggests that this electronic web-based strategy for collecting QOL can be extended to a broader group of cancer patients with more challenging and symptomatic cancers, such as head and neck cancer. Further studies are ongoing within RTOG in other clinical oncology trials to further extend this finding and make the option of an electronic web-based technology available to more patients eager to use this approach for completion of quality of life forms.

Patient consented to QOL	232 (85.9%)
Patient did not consent to QOL	38 (14.1%)

Table 1 – Quality of Life (QOL) Consent in Randomized Eligible Patients Enrolled after Amendment including Vision Tree Optimal Care (VTOC) (n=270)

Patient consented to VTOC	96 (41.4%)
Patient did not consent to VTOC	136 (58.6%)

Table 2 - Vision Tree Optimal Care (VTOC) Consent in Randomized Eligible Patients who Consented to QOL Enrolled after Amendment including Vision Tree (n=232)

Table 3
Pretreatment Characteristics in Randomized Eligible Patients who Consented to QOL Enrolled after Amendment including VisionTree

	VTOC (n=96)	No VTOC (n=136)	P-value
Age (years)			
Median	57	59	0.19 [1]
Min - Max	24 - 79	27 - 80	
Q1 - Q3	50 - 64	52 - 66	
Gender			
Male	65 (67.7%)	90 (66.2%)	0.89 [2]
Female	31 (32.3%)	46 (33.8%)	
Race			
Asian	2 (2.1%)	10 (7.4%)	0.11 [2]
Black or African American	6 (6.3%)	9 (6.6%)	
Native Hawaiian or Other Pacific Islander	0 (0.0%)	1 (0.7%)	
White	88 (91.7%)	113 (83.1%)	
More than one race	0 (0.0%)	1 (0.7%)	
Unknown or not reported	0 (0.0%)	2 (1.5%)	
Ethnicity			
Hispanic or Latino	4 (4.2%)	5 (3.7%)	0.99 [2]
Not Hispanic or Latino	91 (94.8%)	124 (91.2%)	
Unknown	1 (1.0%)	7 (5.1%)	
Primary site *			
Oral cavity	68 (70.8%)	86 (63.2%)	0.34 [3]
Larynx	8 (8.3%)	20 (14.7%)	
Oropharynx, p16 positive	17 (17.7%)	28 (20.6%)	
Oropharynx, p16 negative	3 (3.1%)	2 (1.5%)	
EGFR *			
High (>/= 80% of cells positive)	82 (85.4%)	118 (86.8%)	0.68 [2]
Low (< 80% of cells positive)	13 (13.5%)	15 (11.0%)	
Not evaluable	1 (1.0%)	3 (2.2%)	
IGRT planned *			
No	39 (40.6%)	65 (47.8%)	0.29 [2]
Yes	57 (59.4%)	71 (52.2%)	
Zubrod performance status			
0	40 (41.7%)	70 (51.5%)	0.14 [2]
1	54 (56.3%)	62 (45.6%)	
Pending	2 (2.1%)	4 (2.9%)	
Swallowing problems			
No swallowing problems	49 (51.0%)	89 (65.4%)	**0.03 [2]**

Swallowing problems present for < 1 month	9 (9.4%)	7 (5.1%)	
Swallowing problems present for 1 to < 7 months	29 (30.2%)	33 (24.3%)	
Swallowing problems present for 7 to < 13 months	1 (1.0%)	2 (1.5%)	
Swallowing problems present for 13 to < 19 months	1 (1.0%)	0 (0.0%)	
Swallowing problems present, length unknown	4 (4.2%)	1 (0.7%)	
Unknown	1 (1.0%)	0 (0.0%)	
Pending	2 (2.1%)	4 (2.9%)	
Smoking history			
Never smoked	34 (35.4%)	47 (34.6%)	0.68 [2]
Pipe or cigar smoker only	4 (4.2%)	2 (1.5%)	
Cigarette smoker, < 20 pack years	22 (22.9%)	20 (14.7%)	
Cigarette smoker, 20-40 pack years	17 (17.7%)	36 (26.5%)	
Cigarette smoker, > 40 pack years	17 (17.7%)	27 (19.9%)	
Pending	2 (2.1%)	4 (2.9%)	
Pathologic T stage			
T1	23 (24.0%)	26 (19.1%)	0.24 [1]
T2	40 (41.7%)	55 (40.4%)	
T3	14 (14.6%)	18 (13.2%)	
T4	17 (17.7%)	33 (24.3%)	
Pending	2 (2.1%)	4 (2.9%)	
Pathologic N stage			
N0	29 (30.2%)	55 (40.4%)	0.10 [1]
N1	17 (17.7%)	23 (16.9%)	
N2a	5 (5.2%)	12 (8.8%)	
N2b	38 (39.6%)	33 (24.3%)	
N2c	3 (3.1%)	8 (5.9%)	
Nx	2 (2.1%)	1 (0.7%)	
Pending	2 (2.1%)	4 (2.9%)	
Pathologic AJCC stage			
I	3 (3.1%)	5 (3.7%)	0.56 [1]
II	11 (11.5%)	22 (16.2%)	
III	20 (20.8%)	24 (17.6%)	
IV	59 (61.5%)	80 (58.8%)	
Cannot be assessed	1 (1.0%)	1 (0.7%)	
Pending	2 (2.1%)	4 (2.9%)	
Perineural involvement			
No	87 (90.6%)	123 (90.4%)	0.99 [2]
Yes	6 (6.3%)	8 (5.9%)	
Unknown	1 (1.0%)	1 (0.7%)	
Pending	2 (2.1%)	4 (2.9%)	
Lymphovascular invasion			
No	61 (63.5%)	90 (66.2%)	0.77 [2]

Yes	32 (33.3%)	42 (30.9%)
Unknown	1 (1.0%)	0 (0.0%)
Pending	2 (2.1%)	4 (2.9%)

* Stratification factor.
Q1 = first quartile; Q3 = third quartile.
[1] Wilcoxon rank-sum test.
[2] Fisher's exact test.
[3] Pearson chi-square test.
EGFR = Epidermal growth factor receptor
IGRT = Image-guided radiation therapy
T = Tumor
N = Nodal
AJCC = American Joint Committee on Cancer

Table 4
12-month QOL Compliance in Randomized Eligible Patients who Consented to QOL Enrolled after Amendment including VisionTree with 12 Months Follow-Up Post-Treatment

	VTOC (n=55)
Functional Assessment of Cancer Therapy - Head & Neck (FACT-HN)	
Completed	32 (58.2%)
Withdrawn consent prior to time point	0 (0.0%)
Death prior to time point	3 (5.5%)
Not completed, institution error	8 (14.5%)
Not completed, patient refusal	1 (1.8%)
Not completed, patient too ill	0 (0.0%)
Not completed, patient could not be contacted	4 (7.3%)
Not completed, other reason	1 (1.8%)
Not received	6 (10.9%)
Total completion rate (among living patients)	**32/52 (62%)**
EQ-5D	
Completed	31 (56.4%)
Withdrawn consent prior to time point	0 (0.0%)
Death prior to time point	3 (5.5%)
Not completed, institution error	7 (12.7%)
Not completed, patient refusal	0 (0.0%)
Not completed, patient too ill	0 (0.0%)
Not completed, patient could not be contacted	4 (7.3%)
Not completed, other reason	0 (0.0%)
Not received	10 (18.2%)
Total completion rate (among living patients)	**31/52 (60%)**
University of Michigan Xerostomia-Related QOL Scale (XeQOLS)	
Completed	32 (58.2%)
Withdrawn consent prior to time point	0 (0.0%)
Death prior to time point	3 (5.5%)
Not completed, institution error	8 (14.5%)
Not completed, patient refusal	1 (1.8%)
Not completed, patient too ill	0 (0.0%)
Not completed, patient could not be contacted	4 (7.3%)
Not completed, tool not available in patient's language	0 (0.0%)
Not completed, other reason	1 (1.8%)
Not received	6 (10.9%)
Total cCompletion rate (among living patients)	**32/52 (62%)**
Dermatology Life Quality Index (DLQI)	
Completed	31 (56.4%)
Withdrawn consent prior to time point	0 (0.0%)
Death prior to time point	3 (5.5%)
Not completed, institution error	8 (14.5%)
Not completed, patient refusal	1 (1.8%)
Not completed, patient too ill	0 (0.0%)
Not completed, patient could not be contacted	4 (7.3%)

Table 4
12-month QOL Compliance in Randomized Eligible Patients who Consented to QOL Enrolled after Amendment including VisionTree with 12 Months Follow-Up Post-Treatment

	VTOC (n=55)
Not completed, other reason	1 (1.8%)
Not received	7 (12.7%)
Total completion rate (among living patients)	**31/52 (60%)**

Table 5
12-month FACT-
HN Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form
Enrolled after Amendment including VisionTree with 12 Months Follow-Up Post-Treatment

	VTOC
Physical well-being: I have a lack of energy	
Answered	100%
Physical well-being: I have nausea	
Answered	100%
Physical well-being: Because of my physical condition, I have trouble meeting the needs of my family	
Answered	100%
Physical well-being: I have pain	
Answered	100%
Physical well-being: I am bothered by sided effects of treatment	
Answered	100%
Physical well-being: I feel ill	
Answered	100%
Physical well-being: I am forced to spend time in bed	
Answered	100%
Social well-being: I feel close to my friends	
Answered	100%
Social well-being: I get emotional support from my family	
Answered	100%
Social well-being: I get support from my friends	
Answered	100%
Social well-being: My family has accepted my illness	
Answered	96.3%
Not answered	3.7%
Social well-being: I am satisfied with family communication about my illness	
Answered	96.3%
Not answered	3.7%
Social well-being: I feel close to my partner	
Answered	100%
Social well-being: I am satisfied with my sex life	
Answered	81.5%
Not answered	18.5%

Table 5
12-month FACT-
HN Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form
Enrolled after Amendment including VisionTree with 12 Months Follow-Up Post-Treatment

	VTOC
Emotional well-being: I feel sad	
Answered	100%
Emotional well-being: I am satisfied with how I am coping with my illness	
Answered	100%
Emotional well-being: I am losing hope in the fight against my illness	
Answered	100%
Emotional well-being: I feel nervous	
Answered	100%
Emotional well-being: I worry about dying	
Answered	100%
Emotional well-being: I worry that my condition will get worse	
Answered	100%
Functional well-being: I am able to work	
Answered	100%
Functional well-being: My work is fulfilling	
Answered	100%
Functional well-being: I am able to enjoy life	
Answered	100%
Functional well-being: I have accepted my illness	
Answered	100%
Functional well-being: I am sleeping well	
Answered	100%
Functional well-being: I am enjoying the things I usually do for fun	
Answered	100%
Functional well-being: I am content with the quality of my life right now	
Answered	100%
Additional concerns: I am able to eat the foods that I like	
Answered	96.3%
Not answered	3.7%
Additional concerns: My mouth is dry	
Answered	96.3%

Table 5
12-month FACT-
HN Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form
Enrolled after Amendment including VisionTree with 12 Months Follow-Up Post-Treatment

	VTOC
Not answered	3.7%
Additional concerns: I have trouble breathing	
Answered	92.6%
Not answered	7.4%
Additional concerns: My voice has its usual quality and strength	
Answered	96.3%
Not answered	3.7%
Additional concerns: I am able to eat as much food as I want	
Answered	96.3%
Not answered	3.7%
Additional concerns: I am unhappy with how my face and neck look	
Answered	96.3%
Not answered	3.7%
Additional concerns: I can swallow naturally and easily	
Answered	96.3%
Not answered	3.7%
Additional concerns: I smoke cigarettes or other tobacco products	
Answered	96.3%
Not answered	3.7%
Additional concerns: I drink alcohol	
Answered	96.3%
Not answered	3.7%
Additional concerns: I am able to communicate with others	
Answered	92.6%
Not answered	7.4%
Additional concerns: I can eat solid foods	
Answered	96.3%
Not answered	3.7%
Additional concerns: I have pain in my mouth, throat, or neck	
Answered	96.3%
Not answered	3.7%

Table 6
12-month EQ-
5D Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form Enrolled after Amendment including VisionTree with 12 Months Follow-Up Post-Treatment

	VTOC
Mobility	
Answered	100%
Self-care	
Answered	100%
Usual activities	
Answered	96.3%
Not answered	3.7%
Pain/discomfort	
Answered	100%
Anxiety/depression	
Answered	100%

Table 7
12-month XeQOLS Item Compliance in Randomized Eligible Patients who Consented to QOL via VTOC and Started Form Enrolled after Amendment including VisionTree with 12 Months Follow-Up Post-Treatment

	VTOC
My mouth/throat dryness limits the kinds or amounts of food I eat	
Answered	100%
My mouth/throat dryness causes discomfort	
Answered	100%
My mouth/throat dryness causes a lot of worry or concern	
Answered	100%
My mouth/throat dryness keeps me from socializing	
Answered	100%
My mouth/throat dryness makes me uncomfortable eating in front of other people	
Answered	100%
My mouth/throat dryness makes me uncomfortable speaking in front of other people	
Answered	100%
My mouth/throat dryness makes me nervous	
Answered	100%
My mouth/throat dryness makes me concerned about the looks of my teeth and mouth	
Answered	100%
My mouth/throat dryness keeps me from enjoying life	
Answered	100%
My mouth/throat dryness interferes with my daily activities	
Answered	100%
My mouth/throat dryness interferes with my intimate relationships	
Answered	100%
My mouth/throat dryness has a bad effect on tasting food	
Answered	100%
My mouth/throat dryness reduces my general happiness with life	
Answered	100%
My mouth/throat dryness affects all aspects of life	
Answered	100%
If you were to spend the rest of your life with your mouth/throat dryness just the way it is now, how would you feel about this?	
Answered	100%

Table 8
12-month DLQI Item Compliance in Randomized Eligible Patients who Consented to QOL and Started FormEnrolled after Amendment including VisionTree with 12 Months Follow-Up Post-Treatment

	VTOC
How itchy, sore, painful, or stinging has your skin been?	
Answered	100%
How embarrassed or self-conscious have you been because of your skin?	
Answered	100%
How much has your skin interfered with you going shopping or looking after your home or garden?	
Answered	100%
How much has your skin influenced the clothes you wear?	
Answered	100%
How much has your skin affected any social or leisure activities?	
Answered	100%
How much has your skin made it difficult for you to do any sport?	
Answered	100%
Has your skin prevented you from working or studying?	
Answered	100%
If no, over the last week how much has your skin been a problem at work or studying?	
Answered	92.0%
Not answered	8.0%
How much has your skin created problems with your partner or any of your close friends or relatives?	
Answered	100%
How much has your skin caused any sexual difficulties?	
Answered	100%
How much of a problem has the treatment for your skin been?	
Answered	100%

Table 9
3-month QOL Compliance in Randomized Eligible Patients who Consented to QOL Enrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC (n=77)
Functional Assessment of Cancer Therapy - Head & Neck (FACT-HN)	
Completed	46 (59.7%)
Withdrawn consent prior to time point	0 (0.0%)
Death prior to time point	1 (1.3%)
Not completed, institution error	10 (13.0%)
Not completed, patient refusal	3 (3.9%)
Not completed, patient too ill	1 (1.3%)
Not completed, patient could not be contacted	3 (3.9%)
Not completed, other reason	2 (2.6%)
Not completed, unknown reason	1 (1.3%)
Not received	10 (13.0%)
Total completion rate (among living patients)	**46/76 (61%)**
EQ-5D	
Completed	40 (52.0%)
Withdrawn consent prior to time point	0 (0.0%)
Death prior to time point	1 (1.3%)
Not completed, institution error	10 (13.0%)
Not completed, patient too ill	0 (0.0%)
Not completed, patient could not be contacted	3 (3.9%)
Not completed, other reason	2 (2.6%)
Not received	21 (27.3%)
Total completion rate (among living patients)	**40/76 (53%)**
University of Michigan Xerostomia-Related QOL Scale (XeQOLS)	
Completed	46 (59.7%)
Withdrawn consent prior to time point	0 (0.0%)
Death prior to time point	1 (1.3%)
Not completed, institution error	10 (13.0%)
Not completed, patient refusal	3 (3.9%)
Not completed, patient too ill	1 (1.3%)
Not completed, patient could not be contacted	3 (3.9%)
Not completed, tool not available in patient's language	0 (0.0%)
Not completed, other reason	2 (2.6%)
Not completed, unknown reason	1 (1.3%)
Not received	10 (13.0%)
Total completion rate (among living patients)	**46/76 (61%)**
Dermatology Life Quality Index (DLQI)	
Completed	44 (57.1%)
Withdrawn consent prior to time point	0 (0.0%)
Death prior to time point	1 (1.3%)
Not completed, institution error	12 (15.6%)
Not completed, patient refusal	3 (3.9%)

Table 9
3-month QOL Compliance in Randomized Eligible Patients who Consented to QOL Enrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC (n=77)
Not completed, patient too ill	1 (1.3%)
Not completed, patient could not be contacted	3 (3.9%)
Not completed, other reason	2 (2.6%)
Not completed, unknown reason	1 (1.3%)
Not received	10 (13.0%)
Total completion rate (among living patients)	**44/76 (58%)**

Table 10
3-month FACT-HN Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form Enrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC
Physical well-being: I have a lack of energy	
Answered	100%
Physical well-being: I have nausea	
Answered	100%
Physical well-being: Because of my physical condition, I have trouble meeting the needs of my family	
Answered	100%
Physical well-being: I have pain	
Answered	100%
Physical well-being: I am bothered by sided effects of treatment	
Answered	100%
Physical well-being: I feel ill	
Answered	100%
Physical well-being: I am forced to spend time in bed	
Answered	100%
Social well-being: I feel close to my friends	
Answered	100%
Social well-being: I get emotional support from my family	
Answered	100%
Social well-being: I get support from my friends	
Answered	100%

Table 10
3-month FACT-HN Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form Enrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC
Social well-being: My family has accepted my illness	
Answered	100%
Social well-being: I am satisfied with family communication about my illness	
Answered	97.6%
Not answered	2.4%
Social well-being: I feel close to my partner	
Answered	95.2%
Not answered	4.8%
Social well-being: I am satisfied with my sex life	
Answered	71.4%
Not answered	28.6%
Emotional well-being: I feel sad	
Answered	100%
Emotional well-being: I am satisfied with how I am coping with my illness	
Answered	100%
Emotional well-being: I am losing hope in the fight against my illness	
Answered	100%
Emotional well-being: I feel nervous	
Answered	100%
Emotional well-being: I worry about dying	
Answered	100%
Emotional well-being: I worry that my condition will get worse	
Answered	100%
Functional well-being: I am able to work	
Answered	100%
Functional well-being: My work is fulfilling	
Answered	100%
Functional well-being: I am able to enjoy life	
Answered	100%
Functional well-being: I have accepted my illness	
Answered	100%
Functional well-being: I am sleeping well	

Table 10
3-month FACT-HN Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form Enrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC
Answered	100%
Functional well-being: I am enjoying the things I usually do for fun	
Answered	100%
Functional well-being: I am content with the quality of my life right now	
Answered	100%
Additional concerns: I am able to eat the foods that I like	
Answered	100%
Additional concerns: My mouth is dry	
Answered	100%
Additional concerns: I have trouble breathing	
Answered	100%
Additional concerns: My voice has its usual quality and strength	
Answered	100%
Additional concerns: I am able to eat as much food as I want	
Answered	100%
Additional concerns: I am unhappy with how my face and neck look	
Answered	100%
Additional concerns: I can swallow naturally and easily	
Answered	100%
Additional concerns: I smoke cigarettes or other tobacco products	
Answered	100%
Additional concerns: I drink alcohol	
Answered	97.6%
Not answered	2.4%
Additional concerns: I am able to communicate with others	
Answered	100%
Additional concerns: I can eat solid foods	
Answered	100%
Additional concerns: I have pain in my mouth, throat, or neck	
Answered	100%

Table 11
3-month EQ-5D Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form Enrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC
Mobility	
Answered	100%
Self-care	
Answered	100%
Usual activities	
Answered	100%
Pain/discomfort	
Answered	100%
Anxiety/depression	
Answered	100%

Table 12
3-month XeQOLS Item Compliance in Randomized Eligible Patients who Consented to QOL and Started FormEnrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC
My mouth/throat dryness limits the kinds or amounts of food I eat	
Answered	100%
My mouth/throat dryness causes discomfort	
Answered	100%
My mouth/throat dryness causes a lot of worry or concern	
Answered	100%
My mouth/throat dryness keeps me from socializing	
Answered	100%
My mouth/throat dryness makes me uncomfortable eating in front of other people	
Answered	97.6%

Table 12
3-month XeQOLS Item Compliance in Randomized Eligible Patients who Consented to QOL and Started FormEnrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC
Not answered	2.4%
My mouth/throat dryness makes me uncomfortable speaking in front of other people	
Answered	100%
My mouth/throat dryness makes me nervous	
Answered	100%
My mouth/throat dryness makes me concerned about the looks of my teeth and mouth	
Answered	100%
My mouth/throat dryness keeps me from enjoying life	
Answered	97.6%
Not answered	2.4%
My mouth/throat dryness interferes with my daily activities	
Answered	100%
My mouth/throat dryness interferes with my intimate relationships	
Answered	97.6%
Not answered	2.4%
My mouth/throat dryness has a bad effect on tasting food	
Answered	100%
My mouth/throat dryness reduces my general happiness with life	
Answered	100%
My mouth/throat dryness affects all aspects of life	
Answered	97.6%
Not answered	2.4%
If you were to spend the rest of your life with your mouth/throat dryness just the way it is now, how would you feel about this?	
Answered	100%

Table 13
3-month DLQI Item Compliance in Randomized Eligible Patients who Consented to QOL and Started Form Enrolled after Amendment including VisionTree with 3 Months Follow-Up Post-Treatment

	VTOC
How itchy, sore, painful, or stinging has your skin been?	
Answered	100%
How embarrassed or self-conscious have you been because of your skin?	
Answered	100%
How much has your skin interfered with you going shopping or looking after your home or garden?	
Answered	100%
How much has your skin influenced the clothes you wear?	
Answered	100%
How much has your skin affected any social or leisure activities?	
Answered	100%
How much has your skin made it difficult for you to do any sport?	
Answered	97.6%
Not answered	2.4%
Has your skin prevented you from working or studying?	
Answered	100%
If no, over the last week how much has your skin been a problem at work or studying?	
Answered	100%
How much has your skin created problems with your partner or any of your close friends or relatives?	
Answered	100%
How much has your skin caused any sexual difficulties?	
Answered	100%
How much of a problem has the treatment for your skin been?	
Answered	100%

18. Extent of Clinical Activities Initiated and Completed. Items 18(A) and 18(B) should be completed for all research projects. If the project was restricted to secondary analysis of clinical data or data analysis of clinical research, then responses to 18(A) and 18(B) should be "No."

18(A) Did you initiate a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

_____Yes
__X___No

18(B) Did you complete a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

_____Yes
__X___No

If "Yes" to either 18(A) or 18(B), items 18(C) – (F) must also be completed. (Do NOT complete 18(C-F) if 18(A) and 18(B) are both "No.")

18(C) How many hospital and health care professionals were involved in the research project?

_____Number of hospital and health care professionals involved in the research project

18(D) How many subjects were included in the study compared to targeted goals?

_____Number of subjects originally targeted to be included in the study
_____Number of subjects enrolled in the study

Note: Studies that fall dramatically short on recruitment are encouraged to provide the details of their recruitment efforts in Item 17, Progress in Achieving Research Goals, Objectives and Aims. For example, the number of eligible subjects approached, the number that refused to participate and the reasons for refusal. Without this information it is difficult to discern whether eligibility criteria were too restrictive or the study simply did not appeal to subjects.

18(E) How many subjects were enrolled in the study by gender, ethnicity and race?

Gender:
_____Males
_____Females
_____Unknown

Ethnicity:
_____Latinos or Hispanics
_____Not Latinos or Hispanics
_____Unknown

Race:
_____American Indian or Alaska Native
_____Asian
_____Blacks or African American
_____Native Hawaiian or Other Pacific Islander
_____White
_____Other, specify:_____
_____Unknown

18(F) Where was the research study conducted? (List the county where the research study was conducted. If the treatment, prevention and diagnostic tests were offered in more than one county, list all of the counties where the research study was conducted.)

19. Human Embryonic Stem Cell Research. Item 19(A) should be completed for all research projects. If the research project involved human embryonic stem cells, items 19(B) and 19(C) must also be completed.

19(A) Did this project involve, in any capacity, human embryonic stem cells?
_____Yes
__X___No

19(B) Were these stem cell lines NIH-approved lines that were derived outside of Pennsylvania?
_____Yes
_____ No

19(C) Please describe how this project involved human embryonic stem cells:

20. Articles Submitted to Peer-Reviewed Publications.

20(A) Identify all publications that resulted from the research performed during the funding period and that have been submitted to peer-reviewed publications. Do not list journal abstracts or presentations at professional meetings; abstract and meeting presentations should be listed at the end of item 17. **Include only those publications that acknowledge the Pennsylvania Department of Health as a funding source** (as required in the grant agreement). List the title of the journal article, the authors, the name of the peer-reviewed publication, the month and year when it was submitted, and the status of publication (submitted for publication, accepted for publication or published.). Submit an electronic copy of each publication or paper submitted for publication, listed in the table, in a PDF version 5.0.5 (or greater) format, 1,200 dpi. Filenames for each publication should include the number of the research project, the last name of the PI, and an abbreviated title of the publication. For example, if you submit two publications for Smith (PI for Project 01), one publication for Zhang (PI for Project 03), and one publication for Bates (PI for Project 04),

the filenames would be:

Project 01 – Smith – Three cases of isolated
Project 01 – Smith – Investigation of NEB1 deletions
Project 03 – Zhang – Molecular profiling of aromatase
Project 04 – Bates – Neonatal intensive care

If the publication is not available electronically, provide 5 paper copies of the publication.

Note: The grant agreement requires that recipients acknowledge the Pennsylvania Department of Health funding in all publications. Please ensure that all publications listed acknowledge the Department of Health funding. If a publication does not acknowledge the funding from the Commonwealth, do not list the publication.

Title of Journal Article:	Authors:	Name of Peer-reviewed Publication:	Month and Year Submitted:	Publication Status (check appropriate box below):
1. None				☐Submitted ☐Accepted ☐Published

20(B) Based on this project, are you planning to submit articles to peer-reviewed publications in the future?

Yes___X_____ No_____

If yes, please describe your plans:

After further follow-up information is available, the plan is to further analyze the data and to submit the results to a peer review publication (such as the *International Journal of Radiation Oncology, Biology, and Physics* or *Practical Radiation Oncology*).

21. Changes in Outcome, Impact and Effectiveness Attributable to the Research Project.

Describe the outcome, impact, and effectiveness of the research project by summarizing its impact on the incidence of disease, death from disease, stage of disease at time of diagnosis, or other relevant measures of outcome, impact or effectiveness of the research project. If there were no changes, insert "None"; do not use "Not applicable." Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

This research project has a very important outcome and impact in the field of quality of life research. While patient reported outcomes (PROs), such as quality of life (QOL), are recognized as key endpoints in clinical trials, missing data is an ongoing problem that limits the clinical relevance of many QOL studies. A key challenge is that, unlike traditional endpoints, QOL data cannot be obtained retrospectively. A preliminary pilot study from the Radiation Therapy Oncology Group (RTOG) in prostate cancer patients showed that a novel

web-based privacy-secure software system improved the quality of life compliance at 6 months by enabling patients to fill out their QOL forms online at their own convenience and providing real-time reminders. However, this was a small pilot study in prostate cancer patients, a relatively healthy group of patients from about 20 institutions. Thus, further evaluation of this web-based strategy was necessary to determine its applicability to a more challenging complex patient population, such as patients with head and neck cancers, who typically have more involved symptoms and quality of life challenges. Moreover, the primary timepoint in this project was extended out to 1-year, rather than 6 months.

Importantly, this research project showed that even within a more challenging patient population, specifically patients with head and neck cancers, who were treated from scores of institutions (across RTOG) from multinational sites, the compliance rate at 1 year for FACT-HN QOL form was 62%, a 25% increase compared to the historical 50% total completion rate utilizing paper forms in the past. Moreover, despite the fact that they had increased swallowing symptoms, greater than 40% of the patients opted to use the electronic web-based strategy (VTOC). This study suggests that even in a more complex and symptomatic group of patients (as with head and neck cancer), it is valuable to also offer the option of completing the quality of life forms using electronic web-based technology, rather than only offering paper forms. This research project suggests that this electronic web-based strategy for collecting QOL can be extended to a broader group of cancer patients with more challenging and symptomatic cancers. Thus, this research project has an important impact on the future of quality of life research in that it provides a novel approach to collecting quality of life in future studies. Quality of life is an extremely important and relevant measure of outcome as it provides the patient perspective directly from the patients themselves. Patients want to know that their quality of life is valued and they want more convenient and modern methods to allow them to complete their quality of life, such as the electronic web-based technology. In this way, their quality of life information can be used to further enhance the quality of life for future patients.

22. Major Discoveries, New Drugs, and New Approaches for Prevention Diagnosis and Treatment. Describe major discoveries, new drugs, and new approaches for prevention, diagnosis and treatment that are attributable to the completed research project. If there were no major discoveries, drugs or approaches, insert "None"; do not use "Not applicable." Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

None

23. Inventions, Patents and Commercial Development Opportunities.

23(A) Were any inventions, which may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of work under this health research grant? Yes_____ No___X_____

If "Yes" to 23(A), complete items a – g below for each invention. (Do NOT complete items

a - g if 23(A) is "No.")

a. Title of Invention:

b. Name of Inventor(s):

c. Technical Description of Invention (describe nature, purpose, operation and physical, chemical, biological or electrical characteristics of the invention):

d. Was a patent filed for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?
Yes_____ No____

If yes, indicate date patent was filed:

e. Was a patent issued for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?
Yes_____ No____
If yes, indicate number of patent, title and date issued:
Patent number:
Title of patent:
Date issued:

f. Were any licenses granted for the patent obtained as a result of work performed under this health research grant? Yes_____ No____

If yes, how many licenses were granted?_____

g. Were any commercial development activities taken to develop the invention into a commercial product or service for manufacture or sale? Yes___ No____

If yes, describe the commercial development activities:

23(B) Based on the results of this project, are you planning to file for any licenses or patents, or undertake any commercial development opportunities in the future?

Yes_____ No____X_____

If yes, please describe your plans:

24. Key Investigator Qualifications. Briefly describe the education, research interests and experience and professional commitments of the Principal Investigator and all other key investigators. In place of narrative you may insert the NIH biosketch form here; however, please limit each biosketch to 1-2 pages.

BIOGRAPHICAL SKETCH

NAME Benjamin Movsas	POSITION TITLE Chairman, Department of Radiation Oncology Henry Ford Health System, Detroit, MI
eRA COMMONS USER NAME (credential, e.g., agency login)	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Harvard University, Cambridge MA	B.A.	1986	Biochemistry
Washington University Cambridge School of Medicine, St. Louis MO	M.D.	1990	Medicine
Sinai Hospital, Baltimore, MD	Internship	1990-1991	Internal Medicine
Johns Hopkins University Hospital, Baltimore MD	Fellowship	1991-1992	Radiology
National Cancer Institute, Bethesda, MD	Residency	1992-1995	Radiation Oncology

Personal Statement

I have been an academic radiation oncologist for over 20 years and have led multiple clinical trials. I completed my residency in Radiation Oncology at the National Cancer Institute (NCI), Division of Cancer Treatment, where my strong interest in clinical research began. The synergy of teaming research with clinical practice started during my years at Fox Chase Cancer Center in Philadelphia and has since then been a focal point of my career with the goal of improving patient reported outcomes. I became involved in the Radiation Therapy Oncology Group (RTOG) trials and served as overall national PI for a randomized lung cancer trial (RTOG 9801), as well as Quality of Life PI, for many RTOG trials. Over the last decade, I have served as the Chairman of the RTOG Quality of Life (QOL) subcommittee and now co-chair the Patient Centered Outcomes Research (PCOR) committee for the combined NRG cooperative group. I have collaborated with numerous investigators to conduct grant supported research.

A. Positions and Honors

Positions and Employment

1995 Associate Member, Department of Radiation Oncology, Fox Chase Cancer Center, Philadelphia, PA
1998 Vice-Chairman, Department of Radiation Oncology, Fox Chase Cancer Center
2004 Chairman, Department of Radiation Oncology, Henry Ford Health System, Detroit, MI
2006 Herndon Endowed Chair for Oncology Research, Henry Ford Hospital, Detroit, MI

Other Experience and Professional Memberships

Editorial Board Member, Journal of Clinical Oncology, 1999-2001
Chair, RTOG/NRG Quality of Life Committee, 2000-present
Member, NCI Head and Neck Steering Committee, 2011-2014
Chair, ASTRO Scientific Planning Committee, 2014-present

Honors

Castle Connolly Top Doctors for Cancer, 2005-Present
Fellow, American College of Radiology (FACR), 2012
Fellow, American Society of Therapeutic Radiology and Oncology (FASTRO), 2012

B. Selected Peer-reviewed Publications (Selected from >220 peer-reviewed publications)

Most relevant to the current application

1. Bruner DW, Bryan CJ, Aaronson N, Blackmore CC, Brundage M, Cella D, Ganz PA, Gotay C, Hinds PS, Kornblith AB, **Movsas B**, Sloan J, Wenzel L, Whalen G; National Cancer Institute. Issues and challenges with integrating patient-reported outcomes in clinical trials supported by the National Cancer Institute-sponsored clinical trials networks. J Clin Oncol 2007; 25: 5051-5057. PMID: 17991920.

2. Siddiqui F, Kohl R, Swann S, Watkins-Bruner D, **Movsas B**. Gender differences in pretreatment quality of life in a prospective lung cancer trial. *J Support Oncol* 2008;6:33-39. PMID: 18257399

3. **Movsas B**, Vikram B, Hauer-Jensen M, Moulder JE, Basch E, Brown SL, Kachnic LA, Dicker AP, Coleman CN, Okunieff P. Decreasing the adverse effects of cancer therapy: National Cancer Institute guidance for the clinical development of radiation injury mitigators. *Clin Cancer Res* 2011 Jan 15;17(2):222-8. Epub 2010 Nov 3. PMID:21047979

4. Curran WJ Jr, Paulus R, Langer CJ, Komaki R, Lee JS, Hauser S, **Movsas B**, Wasserman T, Rosenthal SA, Gore E, Machtay M, Sause W, Cox JD. Sequential vs. Concurrent chemoradiation for state III non-small cell lung cancer; Randomized phase III trial RTOG 9410. *J Natl Cancer Inst* 2011 Oct 5;103(19):1452-60. Epub 2011 Sep 8. PMID:21903745

5. Siddiqui F, Liu AK, Watkins-Bruner D, **Movsas B**. Patient-reported outcomes and survivorship in radiation oncology: overcoming the cons. *J Clin Oncol* 2014 Sep 10;32(26):2920-7. Epub 2014 Aug 11. PMID:25113760

Additional recent publication of importance to the field

1. **Movsas B**, Hunt D, Warkins-Bruner D, Lee WR, Tharpe H, Goldstein D, Moore J, Dayes IS, Parise S, Sandler H. Can electronic web-based technology improve quality of life data collection? Analysis of Radiation Therapy Oncology Group 0828. *Pract Radiat Oncol* 2014 May-Jun;4(3):187-91. Epub 2013 Sep 16. PMID:24766686

BIOGRAPHICAL SKETCH

NAME Machtay, Mitchell	POSITION TITLE Vincent K. Smith Professor and Chair, Radiation Oncology. University Hospitals Case Medical Center, Seidman Cancer Center, and Case Western Reserve University School of Medicine
eRA COMMONS USER NAME: Mitchell_Machtay	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Princeton University, Princeton NJ	B.S.E.	1981-1985	Chemical Engin.
New York Univ. School of Medicine, NY	M.D.	1985-1989	Medicine
The New York Hospital/Cornell Univ. Med. Ctr.	Intern	1989-1990	Medicine
The Hospital of the Univ. of Penn, Phila.	Resident	1990-1993	Radiation Oncol.

A.. Positions and Honors

Positions and Employment

1993-2002 Assistant Professor, Radiation Oncology, University of Pennsylvania Medical Center, Philadelphia, PA.

2000- Deputy Chair, Radiation Therapy Oncology Group (RTOG).

2002-2003 Associate Professor, Radiation Oncology, University of Pennsylvania Medical Center, Philadelphia PA

2004-2008 Walter J. Curran Jr. Associate Professor and Vice Chair of Radiation Oncology, Thomas Jefferson University, Philadelphia, PA

2008-2009 Walter J. Curran Jr. Professor and Vice Chair of Radiation Oncology, Thomas Jefferson University, Philadelphia, PA

2009- Vincent K. Smith Professor and Chair, Radiation Oncology, Case Western Reserve University and University Hospitals Case Medical Center, Cleveland, OH; Executive Committee Member of the Case Comprehensive Cancer Center, Cleveland.

Professional Society Memberships: American Society of Therapeutic Radiology and Oncology (ASTRO); American Society of Clinical Oncology (ASCO), American College of Radiology (ACR), International Association for the Study of Lung Cancer (IASLC), Radiation Therapy Oncology Group (RTOG).

Honors

1989 Alpha Omega Alpha Medical Honor Society, New York University School of Medicine (Class of 1989); recipient of the Grover C. Arnold Surgery Prize, New York University School of Medicine (Class of 1989)

1996 Giulio D'Angio Award for Teaching Excellence in the Dept. of Radiation Oncology

2000 ARRO (Assoc. of Residents in Radiation Oncology) "Teacher of the Year Award"

2004 Recipient of the first Walter J. Curran Jr. Professorship, an endowed faculty position (the first endowed professorship for a clinician at Jefferson Radiation Oncology)

2005-2009 Recognition in Philadelphia Magazine as a "Top Doctor" in Radiation Oncology

2006, 2009 Jefferson Department of Radiation Oncology Resident Teaching Award and ARRO 'Teacher of the Year'

2006- Recognition as one of "America's Top Doctors for Cancer" by Castle Connolly

C. Selected Peer-reviewed Publications (since 2004)

1. Cooper JS, Pajak TF, Forastiere AA, Jacobs J, Campbell BH, Saxman SB, Kish JA, Kim HE, Cmelak AJ, Rotman M, Machtay M, Ensley JF, Chao KS, Schultz CJ, Lee N, Fu KK; Radiation Therapy Oncology Group 9501/Intergroup. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med 350:1937-1944, 2004.
2. Machtay M, Rosenthal DI, Chalian AA, Lustig R, Hershock D, Miller L, Weinstein GS, Weber RS. A pilot study of postoperative reirradiation/chemotherapy/amifostine after surgical salvage for recurrent head and neck cancer. *Int J Radiat Oncol Biol Phys* 2004 May 1;59(1):72-7. PMID: 15093901
3. Machtay M, Pajak TF, Suntharalingam M, Shenouda G, Hershock D, Stripp DC, Cmelak AJ, Schulsinger A, Fu KK. Radiotherapy with or without erythropoietin for anemic patients with head and neck cancer: A randomized trial of the Radiation Therapy Oncology Group (RTOG 99-03). Int J Radiat Oncol Biol Phys. 2007 Nov 15;69(4):1008-17. Epub 2007 Aug 23. PMID: 17716826
4. Machtay M, Moughan J, Trotti A, Garden AS, Cooper JS, Forastiere A, Ang KK. Factors associated with severe late toxicity after concurrent chemoradiation for locally advanced head and neck cancer: An RTOG analysis. J Clin Oncol. 2008 Jul 20;26(21):3582-9. Epub 2008 Jun 16.PMID: 18559875.
5. Machtay M, Natwa M, Andrel J, Hyslop T, Anne PR, Lavarino J, Intenzo CM, Keane W. Pretreatment FDG-PET standardized uptake value as a prognostic factor for outcome in head and neck cancer. Head Neck. 2009 Feb;31(2):195-201 PMID: 19107945
6. Bednarz G, Machtay M, Werner-Wasik M, Downes B, Bogner J, Hyslop T, Galvin J, Evans J, Curran W Jr, Andrews D. Report on a randomized trial comparing two forms of immobilization of the head for fractionated stereotactic radiotherapy. Med Phys. 2009 Jan;36(1):12-7. PMID: 19235368
7. Den RB, Doemer A, Kubicek G, Bednarz G, Galvin JM, Keane WM, Xiao Y, Machtay M. Daily Image Guidance with Cone-Beam Computed Tomography for Head-and-Neck Cancer Intensity-Modulated Radiotherapy: A Prospective Study. Int J Radiat Oncol Biol Phys. 2010 Apr;76(5):1353-9. PMID: 19540071
8. Machtay M, Bae K, Movsas B, Paulus R, Gore EM, Komaki R, Albain K, Sause WT, Curran WJ. Higher biologically effective dose of radiotherapy is associated with improved outcomes for locally advanced non-small cell lung carcinoma treated with chemoradiation: an analysis of the RTOG. Int J Radiat Oncol Biol Phys 2012 Jan 1; 82(1): 425-34.
9. Machtay M, Paulus R, Moughan J, Komaki R, Bradley J, Choy H, ALbain K, Movsas B, Sause WT, Curran WJ. Defining local-regional control and its importance in locally advanced non-small cell lung carcinoma: A Radiation Therapy Oncology Group analysis. J Thorac Oncol 2012 Apr; 7(4); 716-22
10. Machtay M, Moughan J, Farach A, Martin-O'Meara E, Galvin J, Garden AS, Weber RS, Cooper JS, Forastiere A, Ang KK. Hypopharyngeal dose is associated with severe late toxicity in locally advanced head and neck cancer: An RTOG analysis. Int J Radiat Oncol Biol Phys 2012 Nov 15; 84(4):983-9.

PROFESSIONAL PROFILE/BIOSKETCH

NAME *(Last, First):* **Pugh, Stephanie Shook**

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	DATE AWARDED *(if applicable)*	FIELD OF STUDY
University of Texas, Austin TX	B.S.	05/06	Mathematics
University of Pittsburgh, Pittsburgh PA	Ph.D.	08/10	Biostatistics

EMPLOYMENT AND POSITIONS HELD

INSTITUTION AND LOCATION	RESPONSIBILITIES	DATE
Neuro-Oncology Practice	Associate editor of biostatistics	10/2013 -
American College of Radiology, Philadelphia PA	Assistant director of statistics; design, monitoring, and analysis of clinical trials for CCOP/NCORP, brain, and genitourinary committees	9/2013 -
University of Pennsylvania, Philadelphia PA	Adjunct Scholar	6/2013 -
American College of Radiology, Philadelphia PA	Design, monitoring, and analysis of clinical trials for CCOP committee	9/2010 – 8/2013

HONORS

List any honors. Include present membership or leadership in relevant organizations or advisory groups.

2011 Outstanding Teamwork, American College of Radiology

SELECTED PEER-REVIEWED PUBLICATIONS

Ryu S, **Pugh SL**, Gerszten PC, Yin FF, Timmerman RD, Hitchcock YJ, Movsas B, Kanner AA, Berk LB, Followill DS, Kachnic LA. "RTOG 0631 Phase II/III Study of Image-Guided Stereotactic Radiosurgery for Localized (1-3) Spine Metastases: Phase II Results." *Practical Radiation Oncology*. 4(2):76-81, 2014.

Brown P, **Pugh SL**, Laack NN, Wefel JS, Khuntia D, Meyers C, Choucair A, Fox S, Suh JH, Roberge D, Kavadi V, Bentzen SM, Mehta MP, Watkings-Bruner D. "Memantine for the Prevention of Cognitive Dysfunction in Patients Receiving Whole-Brain Radiotherapy (WBRT): a Randomized, Double-Blind, Placebo-Controlled Trial Neuro-Oncology." *Neuro-*

Oncology. 15(10):1429-1437, 2013.

Kachnic LA, **Pugh SL**, Tai P, Smith M, Gore E, Shah AB, Martin AG, Kim HE, Nabid A, and Lawton C. "RTOG 0518: Randomized Phase III Trial to Evaluate Zoledronic Acid for Prevention of Osteoporosis and Associated Fractures in Prostate Cancer Patients." *Prostate Cancer Prostatic Dis.* October 1, 2013; E-pub ahead of print

Hoffman KE, **Pugh SL**, James JL, Scarantino C, Movsas B, Valicenti RK, Fortin A, Pollack JD, Kim H, Brachman DG, Berk LB, Bruner DW, Kachnic LA. "The Impact of Concurrent Granulocyte Macrophage-Colony Stimulating Factor on Quality of Life in Head and Neck Cancer Patients: Results of the Randomized Placebo-Controlled Radiation Therapy Onocology Group 9901 Trial." *Quality of Life Research*. 2014 Feb 4. [Epub ahead of print]

Pisansky TM, **Pugh SL**, Greenberg RE, Pervez N, Reed DR, Rosenthal SA, Mowat RB, Raben A, Buyyounouski MA, Kachnic LA, Bruner DW. "Tadalafil to Prevent Erectile Dysfunction after Radiotherapy for Prostate Cancer – A Randomized, Double-Blind, Placebo-Controlled Trial (0831) of the Radiation Therapy Oncology Group." *JAMA*. 311(13):1300-1307, 2014.

Gondi V, **Pugh SL**, Tome WA, Caine C, Corn B, Kanner A, Rowley H, Kundapur V, DeNittis A, Greenspoon JN, Konski AA, Bauman GS, Shah S, Shi W, Wendland M, Kachnic L, Mehta M. "Preservation of Memory with Conformal Avoidance of the Hippocampal Neural Stem Cell Compartment during Whole-Brain Radiotherapy for Brain Metastases (RTOG 0933): A Phase 2 Multi-Institutional Trial." *JCO*. October 27, 2014. E-pub ahead of print.

PUBLIC SPEAKING OR PRESENTATIONS

Pugh SL, Ganz P, Deuck A, Troxel A, Dignam J. New Directions in Quality of Life Research. Invited session at the Society for Clinical Trials 34th Annual Meeting; May 19-22, 2013 in Boston, MA.

RESEARCH SUPPORT

INSTITUTION AND LOCATION	RESPONSIBILITIES	DATE
NIH/NCI/American College of Radiology	Senior biostatistician responsible for study design, monitoring, analysis, and reporting	06/01/94-05/31/15
State of Pennsylvania Department of Health	PI responsible for analysis of Quality of Life endpoints in RTOG protocols	1/1/11 – 12/31/14