

# 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 717-783-2548.

1. **Grantee Institution:** American College of Radiology
2. **Reporting Period (start and end date of grant award period):** 1/1/2010 – 12/31/13
3. **Grant Contact Person (First Name, M.I., Last Name, Degrees):** Stephen M Marcus, MS
4. **Grant Contact Person’s Telephone Number:** 267-940-9403
5. **Grant SAP Number:** 4100050889
6. **Project Number and Title of Research Project:** #4 - Investigation and Analyses of Patient Co-Morbidities in a Survey of Radiation Oncology Facilities in the USA and their Association with Treatment Decisions in Radiation Oncology
7. **Start and End Date of Research Project:** 1/1/2010 – 7/2/2012
8. **Name of Principal Investigator for the Research Project:** Jean Owen, PhD
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:

\$ 129,454.70

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
Owen	Principal Investigator	3% Yr 2; 7% Yr 3	\$23,506.42
Khalid	Epidemiologist	33% Yr 2; 24% Yr 3	\$61,661.14

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

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

**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 to be awarded:
	<input type="checkbox"/> NIH <input type="checkbox"/> Other federal (specify: _____) <input type="checkbox"/> Nonfederal source (specify: _____)		\$	\$
	<input type="checkbox"/> NIH <input type="checkbox"/> Other federal (specify: _____) <input type="checkbox"/> 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?

Additional manuscripts

**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				
<b>Total</b>				

	Undergraduate	Masters	Pre-doc	Post-doc
Hispanic				
Non-Hispanic				
Unknown				
<b>Total</b>				

	Undergraduate	Masters	Pre-doc	Post-doc
White				
Black				
Asian				
Other				
Unknown				
<b>Total</b>				

**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 \_\_\_\_\_ No X \_\_\_\_\_

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

**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 \_\_\_\_\_ No X \_\_\_\_\_

If yes, please describe the collaborations:

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 ( $\alpha$ ) and beta ( $\beta$ ) should not print as boxes (□) and include the appropriate citation(s). DO NOT DELETE THESE INSTRUCTIONS.**

## SPECIFIC AIMS

1. To describe the distribution of co-morbidities by socio-demographic characteristics such as age, race, geographic region, insurance status and socio-economic status in patients diagnosed with cancer of the breast, cervix, stomach, lung and prostate.
2. To investigate the association of the prevalence of co-morbidities with treatment decisions and variations in compliance with recommended disease management guidelines for such patients.
3. To examine the interaction of co-morbidities by site and stage of disease with gender, race, and age.

## SUMMARY

Project investigators addressed each of the Specific Aims by analyzing data from the Quality Research in Radiation Oncology survey of patients with cancer of the breast, cervix, stomach, lung, and prostate. The results from this project provided the basis for a manuscript that has been accepted for publication by the *Journal of Oncology Practice*, as well as three presentations at the Annual Meeting of the American Society for Radiation Oncology (ASTRO) in October 2011.

The manuscript is:

Owen, J.B., Khalid, N., Ho, A., Kachnic, L.A., Komaki, R., Tao, M.L., Currey, A., Wilson, J.F.: Can patient comorbidities be included in Clinical Performance Measures for radiation oncology? *J Oncol Prac*, In Press.

The presentations are:

1. Kachnic, L., Khalid, N., Owen, J., Goodman, K., Minsky, B., Thomas Jr., C. and Wilson, J. F.: Impact of Co-Morbidities on Practice Patterns in the Management of Gastric Cancer: Findings from the Quality Research in Radiation Oncology (QRRO) GI Committee Process Survey. Proc Amer Soc Thera Rad Onc (ASTRO), Miami Beach, FL, *Int J Radiat Oncol Biol Phys*, [81] pg. S557-558, Abs. #2724, 2011.
2. Komaki, R., Khalid, N., Kong, F., Langer, C., Crozier, C., Owen, J., Wei, X., Wilson, J. F. and Movsas, B.: Co-Morbidities Affect Cancer Treatment Strategies and Outcome in Patients with Locally Advanced Non-Small Cell Lung Cancer (NSCLC) - Report of Quality Research In Radiation Oncology (QRRO) Data For Stage III NSCLC Patients. Proc Amer Soc Thera Rad Onc (ASTRO), Miami Beach, FL, *Int J Radiat Oncol Biol Phys*, [81] pg. S575, Abs. #2760, 2011.
3. Tao, M., Khalid, N., White, J., Owen, J., Pierce, L. and Wilson, J. F.: Prevalence and Impact of Co-morbidities on Treatment of Breast Cancer. Proc Amer Soc Thera Rad Onc (ASTRO), Miami Beach, FL, *Int J Radiat Oncol Biol Phys*, [81] pg. S557, Abs. #2723, 2011.

## METHODS

### *QRRO / PCS history, survey design, and data collection methods*

Since 1973 the American College of Radiology (ACR) has conducted observational surveys of the processes of care in radiation oncology through the Quality Research in Radiation Oncology (QRRO) (formerly called the Patterns of Care Study). Detailed information is collected by chart review and abstraction of patient and tumor characteristics, imaging, laboratory tests, treatment planning, surgery, radiation therapy, and systemic therapy including data elements designed for the purpose of measuring quality of care and comparing care actually received by patients to well-established clinical guidelines.

The QRRO survey used stratified two-stage cluster sampling with radiation oncology facilities from a master list of those operating in the United States in 2007 being stratified, a random sample of facilities selected from each stratum, and a random sample of eligible cases for each disease site selected from each participating facility. Facilities were classified into the following strata: academic (main teaching hospital of a medical school or National Cancer Institute–designated Comprehensive Cancer Center); large nonacademic (other facility with  $\geq 3$  linear accelerators actively treating patients), medium nonacademic (other facility with 2 linear accelerators actively treating patients), and small nonacademic (other facility with 1 linear accelerator actively treating patients). One hundred and six facilities were selected and invited to participate in the survey of which 45 (42%) of participated in the study: 14 academic, 13 large nonacademic, 7 medium nonacademic, and 11 small nonacademic facilities.

The ACR Institutional Review Board (IRB) approved the study as qualifying for a waiver of consent under the Common Rule and a waiver of authorization under the Health Insurance Portability and Accountability Act (HIPAA). Participating institutions also received approval from their IRBs or other boards according to their institution policies.

### *Case Eligibility and Study Samples*

QRRO disease site committees defined the eligibility criteria for each disease site study. For the breast study inclusion criteria were: received Radiation Therapy (RT) in 2007, female, any invasive breast disease, clinical Stage I, II or IIIA, and mastectomy or lumpectomy as primary treatment. Exclusion criteria were: bilateral lesions or prior or concurrent malignancies or previous RT. For the cervix study inclusion criteria were: received RT in 2005 through 2007 and carcinoma of the cervix only. Exclusion criteria were: prior pelvic RT, distant metastases, prior or concurrent malignancies, or prior hysterectomy. For the prostate study inclusion criteria were: RT during 2007, adenocarcinoma of the prostate, no neo-adjuvant hormonal therapy or neo-adjuvant hormonal therapy for no more than 6 months prior to RT. Exclusion criteria were: distant metastases, prior or concurrent malignancies, previous chemotherapy or RT as a primary treatment, prostatectomy, and histologically proven positive (para aortic) PA nodes. For the gastric study inclusion criteria were: RT in 2005 through 2007, histology of adenocarcinoma, squamous, or adenosquamous, Stage Ib, II, III or IV (non-metastatic disease), tumor in the stomach or gastroesophageal (GE) junction, Karnofsky  $\geq 60$ . Exclusion criteria were: distant metastases, prior malignancies within past 5 years. The lung cancer study had two separate groups, Stage I, II or III non-small cell lung cancer (NSCLC) and limited stage small cell lung cancer (SCLC). Inclusion criteria were: RT from 2006 through 2007 and Karnofsky  $\geq 60$ . Exclusion criteria were: distant metastases or malignant pleural effusion, prior thoracic radiotherapy, and concurrent or prior malignancy within 5 years. For all disease sites in-situ or non-melanoma skin cancers did not fall into the exclusion for prior malignancy.

Using these eligibility criteria the participating institutions provided lists of all eligible cases for each study. QRRO randomly selected the study samples from these lists and QRRO Clinical Data Abstractors reviewed each case during the site visit for final determination of eligibility. From each institution the first 10 randomly selected eligible cases were included in the prostate, breast, cervix, and gastric studies, the first eight randomly selected eligible cases in the non-small cell lung cancer study, and the first five randomly selected eligible cases in the small cell lung cancer study. (If an institution had fewer than the target number of cases for a study, all eligible cases were included.)

### *Data Collection*

Trained research associates performed on-site reviews of the medical records of selected eligible cases and abstracted information for the structured data elements on patient characteristics, tumor characteristics, staging work-up, co-morbidities, and treatment into an online database.

### *Co-morbidities*

To assess and measure co-morbid conditions QRRO used the Adult Comorbidity Evaluation Index (ACE-27) because of its clinical relevance and sensitivity. This index reflects not only a

wide range of coexisting conditions relevant to cancer therapy choice and outcome, but also the severity of these conditions. The ACE-27 is a 27-item validated co-morbidity index for use with patients with cancer. It covers 11 organ systems plus substance abuse, obesity and a malignancy co-morbidity score (not including the index cancer). Diseases are graded into three levels of severity: grade 1 (mild), grade 2 (moderate), or grade 3 (severe), according to the level of individual organ decompensation and prognostic significance. From these data elements the index can be computed to provide an overall co-morbidity score of severe, moderate, mild, or none, based on the highest severity of a condition - severe in the case of one or more grade 3 co-morbidity or two or more grade 2 co-morbidities in different organ systems, moderate in the case of one grade 2 co-morbidity in one organ system, mild in the case of any number of grade 1 co-morbidities, or none. The co-morbidities were recorded and assessed by two trained and certified data abstractors. (Piccirillo JF, Tierney RM, Costas I, Grove L, Spitznagel EL Jr. Prognostic Importance of Co-morbidity in a Hospital-Based Cancer Registry. JAMA 2004, 291(20):2441-2447)

In addition, for each patient the data element, “Was treatment contra-indicated or changed due to comorbidities?”, was recorded as “yes” if any note in the chart indicated that a change in treatment had occurred because of co-morbidities and “no” otherwise.

#### *Clinical Performance Measures*

Prior to the survey the members of the each QRRO disease site Committee identified specific measurable clinical performance measures (CPMs) that were surrogates for quality of treatment for the study cancer. The methods used for developing these CPMs have been previously reported and are based on best available evidence as synthesized in widely disseminated treatment guidelines that were available at the time the patients in the studies were treated. (Crozier JHQ paper) These guidelines base treatment recommendations on tumor and patient characteristics, but provide little guidance on including patient co-morbidities in the treatment decision.

#### *Data Analysis*

National estimates were calculated from the survey data using SUDAAN statistical software (Research Triangle Institute, Research Triangle Park, NC), which incorporates the design elements and weights that reflect the relative contribution of each patient in the analysis of this complex survey. Weights reflect the proportion of cases in the sample and population for each stratum to give appropriate point estimates and standard errors from which national averages of the measures can be derived.

For each disease site, analysis includes descriptive and inferential statistics. The descriptive portion includes socio-demographic variables and prevalence of co-morbidities. Distribution of co-morbidities by patient characteristics such as age, gender and race, and by prognostic factors such as age, race, disease stage, histology, and nodal status are examined.

Although national estimates were computed using weights, results comparing small subsets of patients are reported for the surveyed sample. Since the CPMs are computed for small subsets of patients, they are reported as unweighted case counts in each category

## RESULTS BY SPECIFIC AIM

Specific Aim 1: To describe the distribution of co-morbidities by socio-demographic characteristics such as age, race, geographic region, insurance status and socio-economic status in patients diagnosed with cancer of the breast, cervix, stomach, lung and prostate.

One common approach to measuring comorbidities is to record whether or not the patient had any comorbidity. Table 1 presents results for categories of age, race/ethnicity, medical coverage, and marital status for each of the disease sites of breast, cervix, stomach, lung and prostate, with lung cancer divided into Small Cell Lung Cancer (SCLC) and Non-small Cell Lung Cancer (NSCLC). The p-values show statistically significant differences between those with and without comorbidity for age and for medical coverage for most disease sites. Race/ethnicity and marital status show statistically significant differences in the presence or absence of comorbidities for patients with breast and cervical cancer, while race/ethnicity also shows statistically significant differences for NSCLC. Other variables including facility stratum, geographic region, and gender were also analyzed but showed no pattern of relationship to the presence or absence of comorbidities.

The clinical importance of comorbidities in the treatment of cancer patients depends not only on whether at least one comorbidity is present but also on severity and combinations of comorbidities. Project investigators analyzed the survey data using the Adult Comorbidity Evaluation Index (ACE-27). Table 2 presents results for categories of age, race/ethnicity, medical coverage, and marital status for each of the disease sites by the ACE-27 Index. In terms of statistically significant differences results are similar to the previous table. The p-values show statistically significant differences by ACE-27 Index value for age and for medical coverage for most disease sites. Race/ethnicity shows statistically significant differences for patients with cervical or prostate cancer or NSCLC, while marital status shows statistically significant differences for breast and cervical cancer. Other variables including facility stratum, geographic region, and gender were also analyzed but showed no pattern of relationship to the ACE-27 Index value.

Specific Aim 2: To investigate the association of the prevalence of co-morbidities with treatment decisions and variations in compliance with recommended disease management guidelines for such patients.

Table 3 shows the distribution of the same set of variables by the variable "treatment contra-indicated or changed due to comorbidities". Overall treatment changed most often for NSCLC patients and least often for breast cancer patients. Age is significantly related to treatment change for gastric cancer patients with change more frequent for older patients. Race/ethnicity is not significantly related to treatment change. Marital status is significantly related to treatment change in the cervix cancer study with change more frequent among single patients. Medical

coverage is significantly related to treatment change for cervix, prostate, and gastric cancer studies. Patients with treatment change more often have Medicare, with or without supplement.

Other variables examined revealed that treatment change is not related to gender. Census region is significantly related only for the prostate study with treatment change more frequent among patients in the Midwest and Northeast than in the South and West. Facility stratum is significantly related only for NSCLC with patients in academic facilities more likely to have treatment change.

Multivariate logistic regression models were investigated to show the association of patient factors with the dependent variable “treatment changed or contra-indicated due to comorbidities.” An initial model included as independent variables factors presented in previous tables, age, disease site, gender, race, and medical coverage, as well as ACE-27 Index. The final model shown in Table 4 includes those variables that showed substantial relationships in the initial model or in bivariate analyses. ACE-27 Index is very highly associated with treatment change for patients with severe or moderate index values compared to those with none or mild ( $p < 0.0001$ ). Age and medical coverage, two other variables that would be expected to be correlated with ACE-27 Index, make no (age) or little (medical coverage) significant contribution to predicting treatment change once ACE-27 is included in the multivariate model. Medicare with supplement is more likely to be associated with treatment change than private / TriCare / other insurance ( $p = 0.0394$ ). Disease site is also highly associated with treatment change after adjusting for other variables in the model. Compared to the reference category of breast cancer, the sites of cervix ( $p = 0.0005$ ), non-small cell lung ( $p = 0.0002$ ), gastric ( $p = 0.0020$ ), and prostate ( $p < 0.0001$ ) cancer are more likely to have treatment changed due to comorbidities.

Within individual disease sites investigators found that Stage III NSCLC patients with severe comorbidities had a lower rate of concurrent chemoradiotherapy and a higher incidence in which the original treatment plan was changed due to comorbidities than other patients.

Among patients in the gastric cancer study the presence of comorbidity was statistically significantly associated with the following: performing less than a total gastrectomy, less than a complete primary resection, and laparoscopic resection, as well as influencing a change in planned multi-disciplinary treatment.

For the breast cancer study which included patients with early-stage breast cancer only, the prevalence of meaningful comorbidity was low and there was little association of comorbidity status and treatment delivery.

Specific Aim 3: To examine the interaction of co-morbidities by site and stage of disease with gender, race, and age.

Tables 1 and 2, discussed under Specific Aim 1, presented results for the interaction between the presence or absence of comorbidities and the ACE-27 Index by disease site. Project investigators analyzed comorbidities by stage of disease for each disease site and found no significant interactions.

Table 1: Characteristics of patients by presence of any reported comorbidity - by disease site

DISEASE SITE ↓	Totals	Age at start of RT			Race/Ethnicity <sup>(1)</sup>			Medical Coverage <sup>(2)</sup>				Marital Status <sup>(3)</sup>		
		< 65	65-74	>=75	White Not Hisp	Black Not Hisp	Hispanic /Other	Med - icare	Medi- care+	Private /Tricar e	Medi- caid/ Self	Married /Partner	Single/ Alone	Unk
Breast (n=439)														
N (weighted) 83,438		p<0.0001			p=0.0817			p<0.0001				p=0.0008		
	n %*													
>=1 comorbidity (%)*	258 59.3	52.8	27.1	20.1	70.6	18.1	11.3	15.2	30.1	47.5	7.0	50.2	33.3	16.4
No comorbidity (%)*	181 40.5	78.1	15.2	6.7	80.8	9.8	9.4	5.1	14.6	76.8	3.5	71.3	20.7	8.0
Cervix (n=261)														
N (weighted) 10,400		p<0.0001			p=0.0060			p=0.0001				p=0.0135		
	n %*													
>=1 comorbidity (%)*	135 52.0	62.5	15.1	22.4	57.1	27.1	15.8	11.2	26.9	45.0	16.9	34.5	52.2	13.3
No comorbidity (%)*	126 48.0	92.7	3.1	4.2	60.9	11.2	27.9	2.8	6.1	61.0	30.1	43.8	31.6	24.6
Prostate (n=414)														
N (weighted) 64,333		p=0.4703			p=0.2332			p=0.0124				p=0.1776		
	n %*													
>=1 comorbidity (%)*	325 78.4	28.1	46.5	25.4	73.5	19.4	7.1	26.1	38.6	33.2	2.1	71.1	16.9	12.0
No comorbidity (%)*	89 21.6	36.2	45.0	18.8	69.2	13.5	17.3	23.6	17.2	56.8	2.4	82.5	10.0	7.5
Lung (NSCLC)(n=340)														
N (weighted) 31,864		p=0.0004			p=0.0162			p=0.0003				p=0.5428		
	n %*													
>=1 comorbidity (%)*	302 89.6	36.9	33.4	29.7	79.7	14.5	5.8	19.6	39.1	32.3	9.0	52.3	32.7	15.0
No comorbidity (%)*	38 10.4	77.9	9.2	12.8	48.2	26.8	25.0	13.7	6.4	62.0	18.0	46.3	43.1	10.6
Lung (SCLC) (n=144)														
N (weighted) 6,288		p=0.0156			p=0.5229			p=0.1043				p=0.4098		
	n %*													
>=1 comorbidity (%)*	119 87.5	56.4	35.4	8.2	82.7	12.0	5.3	16.7	20.0	52.4	10.8	61.8	31.2	7.0
No comorbidity (%)*	25 12.5	70.7	5.0	24.3	89.6	8.6	1.8	1.8	29.3	63.5	5.4	42.2	47.4	10.4

DISEASE SITE ↓	Totals	Age at start of RT			Race/Ethnicity <sup>(1)</sup>			Medical Coverage <sup>(2)</sup>				Marital Status <sup>(3)</sup>		
		< 65	65-74	>=75	White Not Hisp	Black Not Hisp	Hispanic /Other	Medicare	Medicare+	Private /Tricare	Medicaid/Self	Married /Partner	Single/ Alone	Unk
Gastric (n=248)														
N (weighted) 9,547		p<0.0001			p=0.7435			p=0.0088				p=0.5304		
	n %*													
>=1 comorbidity (%)*	169 67.8	40.2	36.0	23.9	62.6	18.2	19.2	16.0	32.5	42.0	9.5	68.3	23.0	8.7
No comorbidity (%)*	79 32.2	83.7	11.5	4.9	59.5	15.5	24.9	5.6	13.8	65.0	15.6	66.2	18.0	15.8

\* Percentages based on weighted number of patients.

<sup>(1)</sup> Race: “Hispanic/Other” Other includes “Asian”, “Native Hawaiian or Other Pacific Islander”, “American Indian or Native Alaskan”, “More than one race”, “Other” and “Unknown”. (n=xxx for “Unknown”)

<sup>(2)</sup> Medical Coverage: “Medicare” includes “Medicare, and Medicare HMO; “Medicare+” includes Medicare plus supplemental insurance (Blue Cross/Blue Shield, HMO, Champus/VA/Tricare or Other insurance); “Medicaid/Self” includes “Medi-cal, etc.”, “Self-pay” and insurance status unknown. (n=xxx for “Unknown”)

<sup>(3)</sup> Marital Status: “Single/Alone” includes Widowed, Divorced, Separated, Never Married and Unknown. (n=xxx for “Unknown”)

Table 2: Characteristics of patients with comorbidities measured by the ACE-27 Index - by disease site

DISEASE SITE ↓	# (%) weighted patients	Age at start of RT			Race/Ethnicity <sup>(1)</sup>			Medical Coverage <sup>(2)</sup>				Marital Status <sup>(3)</sup>		
		< 65	65-74	>=75	White Not Hisp	Black Not Hisp	Hispanic /Other	Med - icare	Medi- care+	Private /Tricare	Medi- caid/ Self	Married /Partner	Single/ Alone	Unk
Breast (n=439)		p=0.0011			p=0.3201			p=0.0006				p=0.0001		
N (weighted) 83,438		%			%			%				%		
None	33,963 (41)	78.1	15.2	6.7	80.8	9.8	9.4	5.1	14.6	76.8	3.5	71.3	20.7	8.0
Mild	35,551 (43)	53.8	26.9	19.3	68.0	20.3	11.7	13.3	31.3	49.7	5.7	59.3	25.5	15.1
Moderate	11,345 (14)	47.1	28.8	24.0	77.5	11.5	11.0	20.2	29.0	39.5	11.2	22.4	54.9	22.7
Severe	2,579 (3)	64.5	21.8	13.7	76.0	17.4	6.6	20.3	19.0	54.2	6.6	47.1	46.3	6.6
Cervix (n=261)		p=0.0003			p=0.0322			p=0.0004				p=0.0370		
N (weighted) 10,400														
None	4,991 (48)	92.7	3.1	4.2	60.9	11.2	27.9	2.8	6.1	61.0	30.0	43.8	31.6	24.6
Mild	2,716 (26)	58.4	14.9	26.7	51.9	32.3	15.9	12.8	25.3	47.5	14.3	33.6	56.3	10.1
Moderate	1,798 (17)	73.4	10.9	15.7	63.3	16.4	20.3	2.2	30.4	53.1	14.3	42.6	38.8	18.6
Severe	894 (9)	53.1	23.9	23.0	60.5	33.0	6.5	24.1	25.0	21.0	29.8	21.0	66.8	12.2
Prostate (n=414)		p=0.4510			p=0.0145			p=0.0183				p=0.2480		
N (weighted) 64,333														
None	13,888	36.2	45.0	18.8	69.2	13.5	17.3	23.6	17.2	56.8	2.4	82.5	10.0	7.5
Mild	31,794	29.7	43.8	26.5	71.6	18.3	10.1	23.9	37.0	36.9	2.2	76.5	14.0	9.5
Moderate	13,725	27.6	55.8	16.6	81.0	18.4	0.6	26.0	39.7	31.5	2.8	62.8	18.8	18.4
Severe	4,927	18.9	37.8	43.3	65.5	29.0	6.5	40.2	45.8	13.9	0.0	59.4	29.8	10.7
Lung (NSCLC)(n=340)		p=0.0090			p=0.0104			p=0.0012				p=0.2830		
N (weighted) 31,864														
None	3,314	77.9	9.2	12.8	48.2	26.8	25.0	13.7	6.4	62.0	18.0	46.3	43.1	10.6
Mild	11,335	40.2	33.7	26.1	72.8	17.3	9.9	20.6	30.8	39.3	9.3	54.3	35.9	9.8
Moderate	8,303	36.4	31.6	32.0	87.0	9.7	3.3	12.5	53.3	26.8	7.3	51.4	25.2	23.3
Severe	8,912	33.0	34.8	32.2	81.6	15.4	2.9	24.9	36.3	28.7	10.1	50.5	35.6	14.0
Lung (SCLC) (n=144)		p=0.0575			p=0.4858			p=0.3894				p=0.6024		
N (weighted) 6,288														

DISEASE SITE ↓	# (%) weighted patients	Age at start of RT			Race/Ethnicity <sup>(1)</sup>			Medical Coverage <sup>(2)</sup>				Marital Status <sup>(3)</sup>		
		< 65	65-74	>=75	White Not Hisp	Black Not Hisp	Hispanic /Other	Med - icare	Medi- care+	Private /Tricare	Medi- caid/ Self	Married /Partner	Single/ Alone	Unk
None	784	70.7	5.0	24.3	89.6	8.6	1.8	1.8	29.3	63.5	5.4	42.2	47.4	10.4
Mild	2,520	50.0	42.8	7.3	77.2	11.2	11.5	7.7	19.9	59.1	13.2	60.3	35.0	4.7
Moderate	1,647	68.2	19.5	12.3	86.0	14.0	0.0	9.3	27.1	51.5	12.1	62.6	24.1	13.3
Severe	1,336	54.1	41.1	4.8	88.8	11.2	0.0	42.7	11.6	40.9	4.8	63.5	32.8	3.8
Gastric (n=248)		p=0.0002			p=0.0873			p=0.0224				p=0.6595		
N (weighted)	9,547													
None	3,078	83.7	11.5	4.9	59.5	15.5	24.9	5.6	13.8	65.0	15.6	66.2	18.0	15.8
Mild	4,143	48.0	34.9	17.1	52.8	22.5	24.7	14.3	24.3	51.0	10.4	74.8	18.5	6.7
Moderate	1,395	23.3	40.3	36.4	86.8	5.6	7.6	21.3	44.6	30.6	3.5	58.5	31.4	10.1
Severe	931	30.5	34.5	34.9	70.1	17.6	12.4	15.4	51.0	19.2	14.4	53.7	30.9	15.4

\* Percentages based on weighted number of patients.

<sup>(1)</sup> Race: “Hispanic/Other” Other includes” Asian”, “Native Hawaiian or Other Pacific Islander”, “American Indian or Native Alaskan”, “More than one race”, “Other” and “Unknown”. (n=xxx for “Unknown”)

<sup>(2)</sup> Medical Coverage: “Medicare” includes “Medicare, and Medicare HMO; “Medicare+” includes Medicare plus supplemental insurance (Blue Cross/Blue Shield, HMO, Champus/VA/Tricare or Other insurance); “Medicaid/Self” includes “Medi-cal, etc.”, “Self-pay” and insurance status unknown. (n=xxx for “Unknown”)

<sup>(3)</sup> Marital Status: “Single/Alone” includes Widowed, Divorced, Separated, Never Married and Unknown. (n=xxx for “Unknown”)

Table 3: Characteristics of patients with treatment contra-indicated or changed due to comorbidities - by disease site

DISEASE SITE ↓	Totals	Age at start of RT			Race/Ethnicity <sup>(1)</sup>			Medical Coverage <sup>(2)</sup>				Marital Status <sup>(3)</sup>		
		< 65	65-74	>=75	White Not Hisp	Black Not Hisp	Hispanic /Other	Med - icare	Medi- care+	Private /Tricar e	Medi- caid/ Self	Married /Partner	Single/ Alone	Unk
Breast (n=439)														
N (weighted)	83,438	p=0.3192			p=0.4136			p=0.3740				p=0.1092		
	n %*													
Rx contra-indicated (%)*	17 3.0	34.8	34.7	30.4	87.2	7.8	4.9	22.1	44.1	31.9	2.0	21.1	71.1	7.8
Rx not changed (%)*	422 97.0	64.0	21.9	14.2	74.3	15.0	10.7	10.8	23.2	60.3	5.7	60.0	26.9	13.1
Cervix (n=261)														
N (weighted)	10,400	p=0.0605			p=0.0711			p=0.0341				p=0.0375		
	n %*													
Rx contra-indicated (%)*	27 13.2	50.3	25.5	24.2	60.9	30.7	8.5	23.6	35.5	29.4	11.6	18.8	70.5	10.7
Rx not changed (%)*	234 86.8	81.1	6.9	12.1	58.6	17.8	23.6	4.6	14.1	56.2	25.0	42.0	38.0	19.9
Prostate (n=414)														
N (weighted)	64,333	p=0.7627			p=0.1226			p=0.0227				p=0.3342		
	n %*													
Rx contra-indicated (%)*	85 19.5	27.3	43.9	28.8	73.8	22.1	4.2	30.6	48.0	19.8	1.6	66.2	23.1	10.7
Rx not changed (%)*	329 80.5	30.4	46.7	22.8	72.2	17.2	10.6	24.3	30.6	42.7	2.3	75.4	13.5	11.1
Lung (NSCLC)(n=340)														
N (weighted)	31,864	p=0.1281			p=0.1455			p=0.4171				p=0.8875		
	n %*													
Rx contra-indicated (%)*	115 29.8	33.6	30.4	36.0	80.9	15.2	3.9	21.9	39.8	28.5	9.8	51.4	32.5	16.1
Rx not changed (%)*	225 70.2	44.3	31.2	24.5	74.5	16.1	9.4	17.8	33.9	38.3	10.0	51.7	34.3	13.9
Lung (SCLC) (n=144)														
N (weighted)	6,288	p=0.7530			p=0.1991			p=0.1456				p=0.1002		

DISEASE SITE ↓	Totals		Age at start of RT			Race/Ethnicity <sup>(1)</sup>			Medical Coverage <sup>(2)</sup>				Marital Status <sup>(3)</sup>		
			< 65	65-74	>=75	White Not Hisp	Black Not Hisp	Hispanic /Other	Med - icare	Medi- care+	Private /Tricare	Medi- caid/ Self	Married /Partner	Single/ Alone	Unk
	n	%*													
Rx contra-indicated (%)*	15	7.9	48.2	43.9	7.9	74.7	25.3	0.0	31.4	7.9	60.7	0.0	55.0	45.0	0.0
Rx not changed (%)*	129	92.1	59.1	30.5	10.4	84.3	10.4	5.3	13.4	22.3	53.2	11.0	59.7	32.2	8.1
Gastric (n=248)															
N (weighted) 9,547			p=0.0077			p=0.3925			p=0.0287				p=0.7534		
	n	%*													
Rx contra-indicated (%)*	25	13.6	20.2	17.4	62.4	75.6	12.6	11.8	30.2	45.9	21.7	2.2	59.7	29.2	11.1
Rx not changed (%)*	223	86.4	59.5	29.8	10.7	59.4	18.1	22.5	9.9	23.4	53.8	12.9	68.8	20.2	11.0

\* Percentages based on weighted number of patients. n=sample number of patients. N=weighted number of patients.

<sup>(1)</sup> Race: “Hispanic/Other” Other includes “Asian”, “Native Hawaiian or Other Pacific Islander”, “American Indian or Native Alaskan”, “More than one race”, “Other” and “Unknown”. (n=xxx for “Unknown”)

<sup>(2)</sup> Medical Coverage: “Medicare” includes “Medicare, and Medicare HMO; “Medicare+” includes Medicare plus supplemental insurance (Blue Cross/Blue Shield, HMO, Champus/VA/Tricare or Other insurance); “Medicaid/Self” includes “Medi-cal, etc.”, “Self-pay” and insurance status unknown. (n=xxx for “Unknown”)

<sup>(3)</sup> Marital Status: “Single/Alone” includes Widowed, Divorced, Separated, Never Married and Unknown. (n=xxx for “Unknown”)

Table 4: Multivariate logistic regression analysis identifying variables associated with treatment changes or contra-indicated due to comorbidities

CHARACTERISTIC	Treatment changed or contra-indicated due to		
	Odds Ratio	95% CI	p
Intercept	0.01	0.00-0.01	0.0000
Disease Site			
Breast	Reference		
Cervix	4.39	1.92-10.06	0.0005
Prostate	7.41	3.39-16.21	0.0000
Lung -- NSCLC	4.24	1.97-9.15	0.0002
Lung -- SCLC	0.68	0.22-2.15	0.5156
Gastric	4.07	1.68-9.90	0.0020
ACE-27 Index			
None / Mild	Reference		
Moderate	11.08	6.08-20.18	0.0000
Severe	71.49	34.86-146.59	0.0000
Age at start of treatment			
<65 years	Reference		
65-74 years	0.65	0.30-1.40	0.2697
>= 75 years	0.99	0.43-2.32	0.9901
Medical coverage			
Private / Tricare	Reference		
Medicare	1.95	0.88-4.30	0.0994
Medicare +	2.25	1.04-4.88	0.0394
Medicaid / self-pay / Unknown	0.79	0.40-1.58	0.5094

**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  
 No

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

Yes  
 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
- 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):
Can patient comorbidities be included in Clinical Performance Measures for radiation oncology?	Owen, J.B., Khalid, N., Ho, A., Kachnic, L.A., Komaki, R., Tao, M.L., Currey, A., Wilson, J.F.:	<i>Journal of Oncology Practice</i>	7/2013	<input type="checkbox"/> Submitted <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Published
2.				<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input type="checkbox"/> Published
3.				<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input type="checkbox"/> 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:

Manuscripts on specific disease sites are planned.

**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.

Patient comorbidities may affect the applicability of performance measures that are inherent in multidisciplinary cancer treatment guidelines. This project described the distribution of common comorbid conditions by disease site and by patient and facility characteristics in patients receiving radiation therapy (RT) as part of treatment for cancer of the breast, cervix, lung, prostate, and stomach and investigates the association of comorbidities with treatment decisions. It showed that a validated instrument, the Adult Comorbidity Evaluation Index (ACE-27), is highly predictive of treatment modifications for patients treated for these cancers receiving radiation as part of their care. A standardized tool identifying patients who should be excluded from clinical performance measures allows more accurate use of these measures.

**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. For Nonformula grants only – include information for only those key investigators whose biosketches were not included in the original grant application.*

## BIOGRAPHICAL SKETCH

NAME Jean B. Owen, PhD		POSITION TITLE Consultant, Quality of Care/ Health Services Research/ Health Economics	
eRA COMMONS USER NAME (credential, e.g., agency login)			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
Harvard University, Cambridge, MA	B.A.	1971	Economics
Boston College, Chestnut Hill, MA	Ph.D.	1980	Economics
Medical College of Wisconsin, Milwaukee, WI	Graduate certificate	2014 (ongoing)	Research Ethics

### A. Personal Statement

As project director of the Quality Research in Radiation Oncology (QRRO) project (formerly the PCS) I led the development of clinical performance measures and survey processes to measure quality of care benchmarks in radiation oncology. Among other projects were cost effectiveness analyses within multi-institutional clinical trials, a Practice Accreditation Program in Radiation Oncology, a Practice Quality Improvement program, and a study using the National Cancer Data Base and Patient Care Evaluation study processes. Since leaving the American College of Radiology I have been working as an independent consultant specializing in innovative design, planning, compliance, implementation, analysis, and reporting of projects in quality improvement, accreditation, registries, and cost analyses of medical practices, while also pursuing a Graduate Certificate in Research Ethics to enhance my expertise in incorporating patient privacy and other ethical issues into the design of observational studies. I received the American Society for Radiation Oncology (ASTRO) Honorary Member award for 2013.

### B. Positions and Honors

Research Economist, School of Public Health, Harvard University, Boston, MA 1980-82  
 Assistant Professor of Economics, University of Massachusetts, Lowell, MA, 1982-86  
 Senior Analyst- Senior Scientist, Health Data Institute, Inc., Lexington, MA, 1986-88  
 Director- Senior Director, QRRO, American College of Radiology, Philadelphia, PA, 1989-2012  
 B.A. *magna cum laude*, Harvard University  
 Visiting Fellow, Japan Society for the Promotion of Science, 1999  
 Invited speaker, Japan-US PCS Workshop, National Cancer Center, Tokyo, Japan, February 2003  
 Honorary Member, American Society for Radiation Oncology (ASTRO), 2013

### C. Selected Peer-reviewed Publications (from 80+ manuscripts, 100+ conference proceedings)

1. Crozier, C., Wittman-Erickson, B., Movsas, B., **Owen, J.**, Khalid, N. and Wilson, J. F.: QRRO®: Shifting the Focus to Practice Quality Improvement in Radiation Oncology. *J for Healthcare Quality*, 33(5):49-57, 2011.
2. Hamilton, A.S., Wu, X., Lipscomb, J., Fleming, S.T., Lo, M., Wang, D., Goodman, M., Ho, A., **Owen, J.**, Rao, C. and German, R.R.: Regional, Provider, and Economic Factors Associated with the Choice of Active Surveillance in the Treatment of Men with

- Localized Prostate Cancer. *J Natl Cancer Inst Monogr*, 45:213-220, 2012.  
PMCID:PMC3540885
3. Fleming, S.T., Hamilton, A.S., Sabatino, S.A., Kimmick, G.G., Wu, X.C., **Owen, J.B.**, Huang, B., and Hwang, W.: Treatment Patterns for Prostate Cancer: Comparison of Medicare Claims Data to Medical Record Review. *Medical Care*, [www.lww-medicalcare.com](http://www.lww-medicalcare.com), 2012.
  4. Zelefsky, M., Cohen, G., Bosch, W., Morikawa, L., Khalid, N., Crozier, C., Lee, R., Zietman, A., **Owen, J.**, Wilson, J. F. and Devlin, P.: Results from the Quality Research in Radiation Oncology (QRRO) Survey: Evaluation of Dosimetric Outcomes for Low Dose Rate Prostate Brachytherapy. *Brachytherapy*, 12:19-24, 2013.  
PMCID:PMC3518616
  5. Zelefsky, M., Lee, W.R., Zietman, A., Khalid, N., Crozier, C., **Owen, J.**, and Wilson, J.F.: Evaluation of Adherence to Quality Measures for Prostate Cancer Radiotherapy in the United States: Results from the Quality Research in Radiation Oncology (QRRO) Survey. *Practical Radiation Oncology*, 3(1):2-8, 2013. PMCID:PMC3587045.
  6. Cetnar, J.P., Hampton, J.M., Williamson, A.A., Downs, T., Wang, D., **Owen, J.B.**, Crouse, B., Jones, N., Wilson, J.F., Trentham-Dietz, A.: Place of Residence and Primary Treatment of Prostate Cancer: Examining Trends in Rural and Nonrural Areas in Wisconsin. *Urology*, 81(3):540-546, 2013.
  7. Goodman, K., Khalid, N., Kachnic, L., Minsky, B., Crozier, C., **Owen, J.**, Wilson, J. F. and Thomas Jr., C.: Quality Research in Radiation Oncology (QRRO) Analysis of Clinical Performance Measures in the Management of Gastric Cancer. *Int J Radiat Onco Biol Phys*, 85(2):355-362, 2013. PMCID:PMC3545084
  8. Komaki, R., Khalid, N., Langer, C., Kong, F., **Owen, J.**, Crozier, C., Wilson, J.F., Wei, S., and Movsas, B.: Quality Research in Radiation Oncology Survey Shows Improvements over a Decade in the Quality of Care for Lung Cancer Patients in the United States. *Int J Radiat Onco Biol Phys*, 85(4):1082-1089, 2013.
  9. Hamilton, A.S., Fleming, S.T., Wang, D., Goodman, M., Wu, X.C., **Owen, J.B.**, Lo, M., Ho, A., Anderson, R.T., Thompson, T.: Clinical and Demographic Factors Associated with Receipt of Guideline Concordant Initial Therapy for Localized Prostate Cancer. *Am J Clin Oncol*, In Press.
  10. Rengan, R., Ho, A., **Owen, J.**, Khalid, N., Wilson, J.F., Movsas, B.: Impact of Sociodemographic Factors on the Radiotherapeutic Management of Lung Cancer: Results of a Quality Research in Radiation Oncology (QRRO) Survey. *Practical Radiation Oncology*, In Press.
  11. Eifel, P., Ho, A., Khalid, N., Erickson, B., **Owen, J.**: Patterns of Radiation Therapy Practice for Patients Treated for Intact Cervical Cancer in 2005-2007: A Quality Research in Radiation Oncology Study. *Int J Radiat Onco Biol Phys*, In Press.
  12. **Owen, J.B.**, Khalid, N., Ho, A., Kachnic, L.A., Komaki, R., Tao, M.L., Currey, A., Wilson, J.F.: Can patient comorbidities be included in Clinical Performance Measures for radiation oncology? *J Oncol Prac*, In Press.
  13. Wang, D., Ho, A., Hamilton, A., Wu, X.C., Lo, M., Fleming, S., Goodman, M., Thompson, T., **Owen, J.**: Type and Dose of Radiotherapy used for Initial Treatment of Non-Metastatic Prostate Cancer. *Radiation Oncology*, In Press.