

Using claims data to investigate RT use at the end of life

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Background

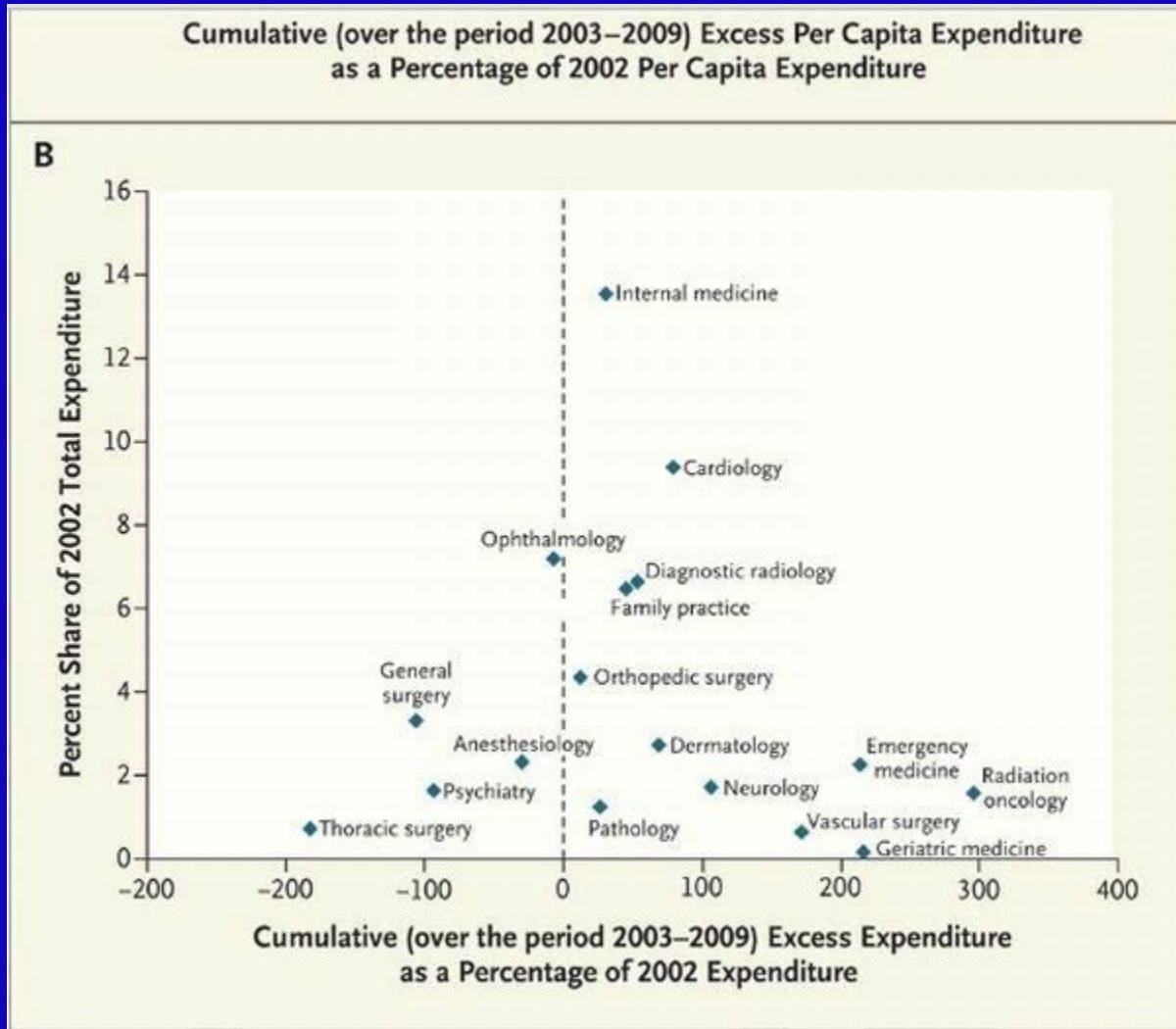
- 25% of Medicare budget spent on the last year of life. (Lubitz, et al., NEJM, 1993 and Riley, et al. HSR, 2010)
- Investigators have developed metrics for documenting aggressiveness of cancer care at the end of life
 - Overuse of chemotherapy before death
 - Treatment that results in high rates of ER, hosp, or ICU visits
 - Underutilization of hospice care

(Earle, et al. JCO 21, 2003)

Background

- Used claims data and these metrics to investigate end of life cancer care
- Documented patterns of increasingly aggressive care at the end of life since the mid-1990s
(Earle, et al. JCO 22, 2004 and JCO 26, 2008)
- None of these metrics looked at RT utilization

Estimated Excess Spending Selected Specialties



Alhassani A et al. N Engl J Med 2012;366:289-291.



Very few published studies on RT at the end of life in the US

- One US study suggested underutilization of RT for palliation in hospice population. (Lutz et al. JCO, 2004).
- German study suggested when it's used; poorly tailored with dying patients spending a large proportion of final days receiving RT. (Gripp et al. CANCER, 2010).

Begging to be looked at—where to start?

- What types of radiation therapy are delivered at the end of life?
 - Some techniques are more expensive than others, but untested/unproven in the palliative setting
- How much radiation therapy is delivered at the end of life?
 - RT reimbursed per treatment; but more isn't always better.

Changing trends in RT technologies in last year of life for metastatic disease

- SEER-Medicare database
- Pts dx'd with metastatic breast, colorectal, lung, pancreatic, or prostate cancer and died between 2000 and 2007

Guadagnolo BA, Huo J, Liao KP, et al. Cancer, 2012

Cohort definition, N=64,525

- Must have pathologic confirmation of cancer (not diagnosed at autopsy or death)
- Age 65 or >
- Medicare Part A/B coverage and no HMO coverage for 12 mos prior to date of cancer diagnosis
- Exclude if no claims data available in the 12 mos prior to date of diagnosis

Outcomes

- We determined the proportion of patients who received RT in the last 12 mos of life (or fewer if survived < 12 mos after dx).
- We ascertained the type of RT they received (eg, 2D-RT, 3D-RT, IMRT, or SRS) in the last 12 mos using claims codes.
- Pts could have more than one course of RT; more than one type of modality

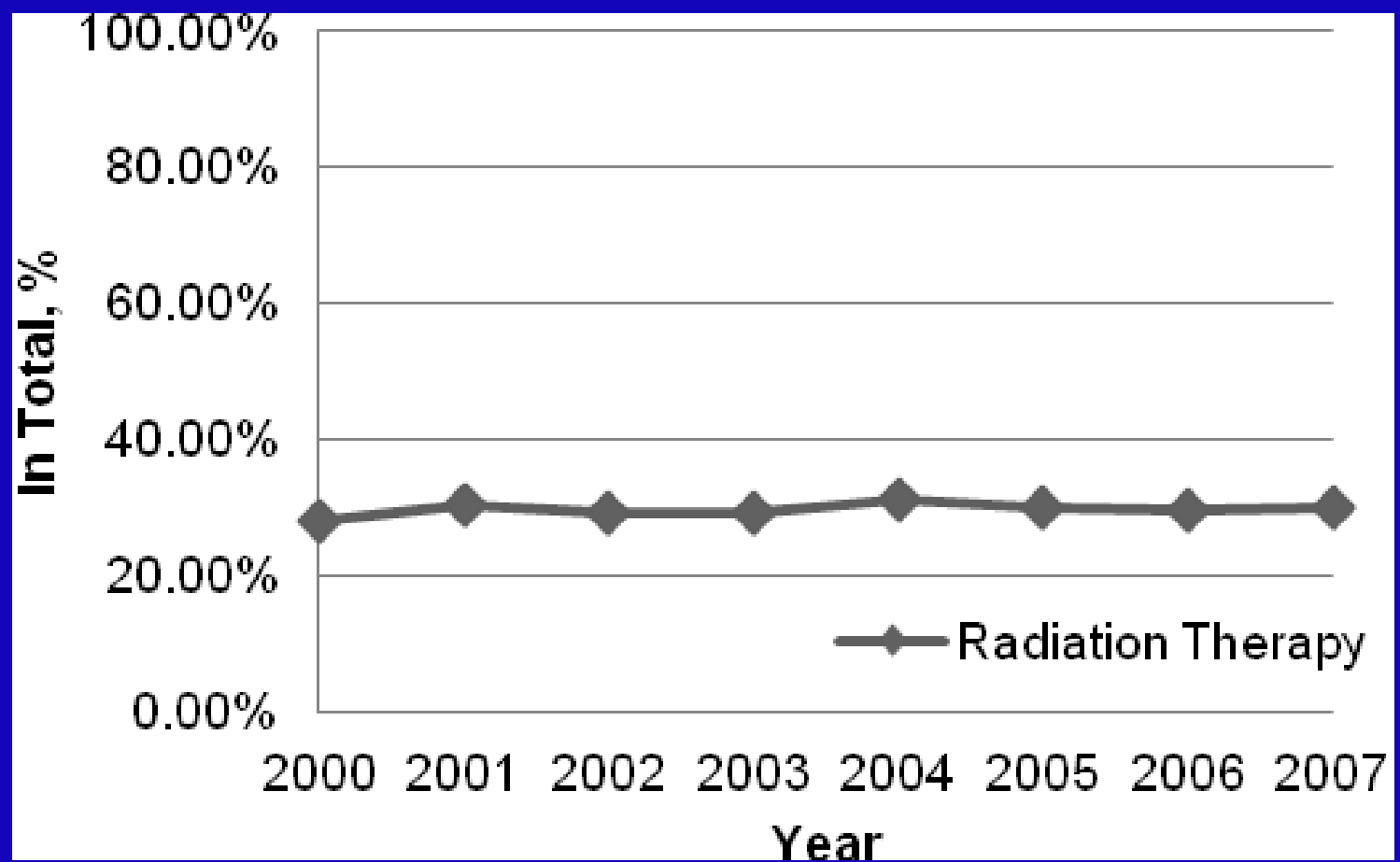
Outcomes

- 19,161 patients (29.7%) received any RT in their last 12 mos of life after diagnosis
- This proportion was stable from 2000-2007 (incident cases)...($p=0.11$, Cochran Armitage test of trend).
- RT more likely if not-black, married, younger, higher income neighborhood, low comorbidities, southern SEER region

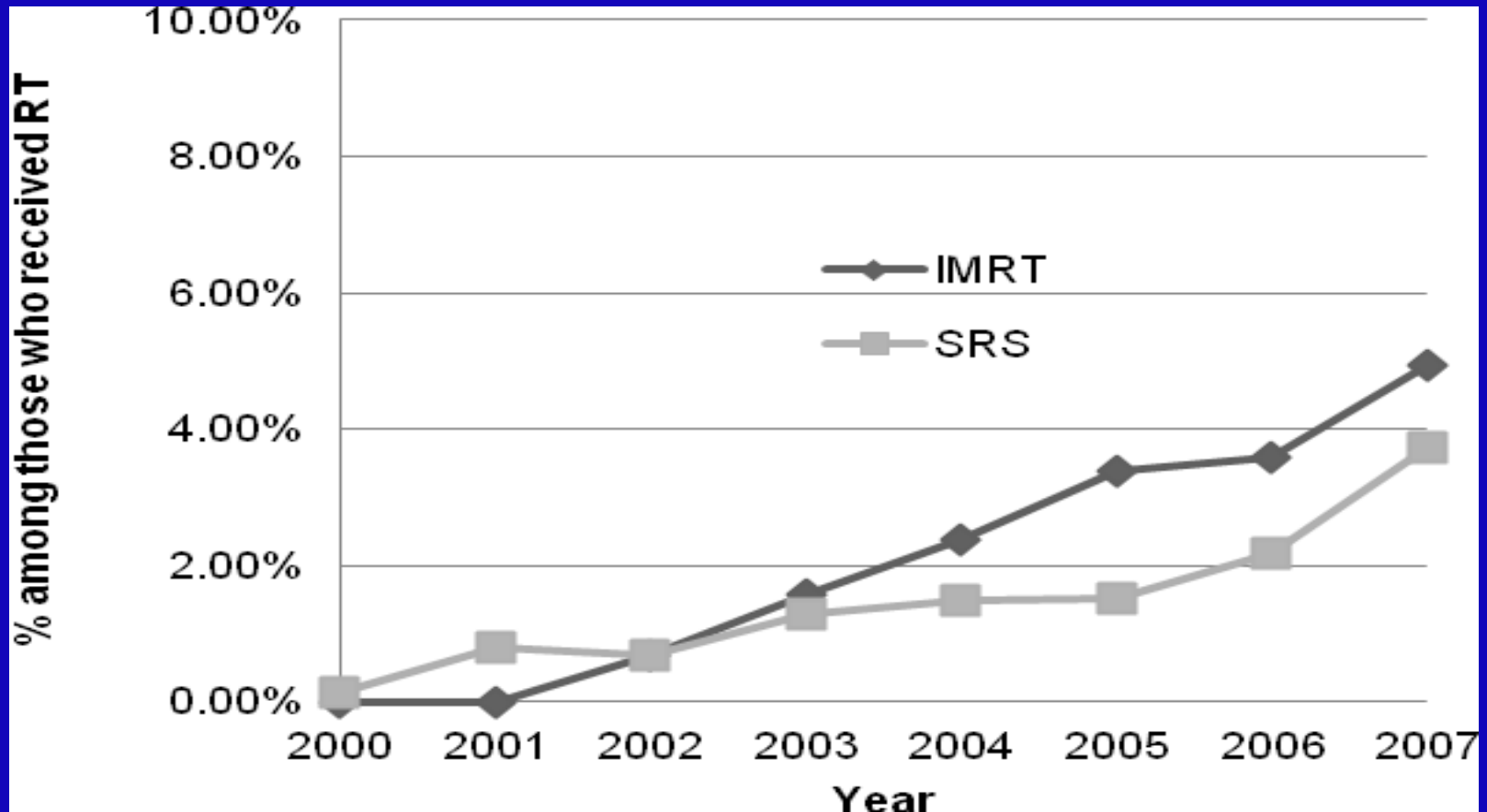
Outcomes

- Of 19,161 receiving RT, we could determine the types of RT in 18,718.
- Significant trends toward increasing use of advanced technology for these patients from 2000- to 2007

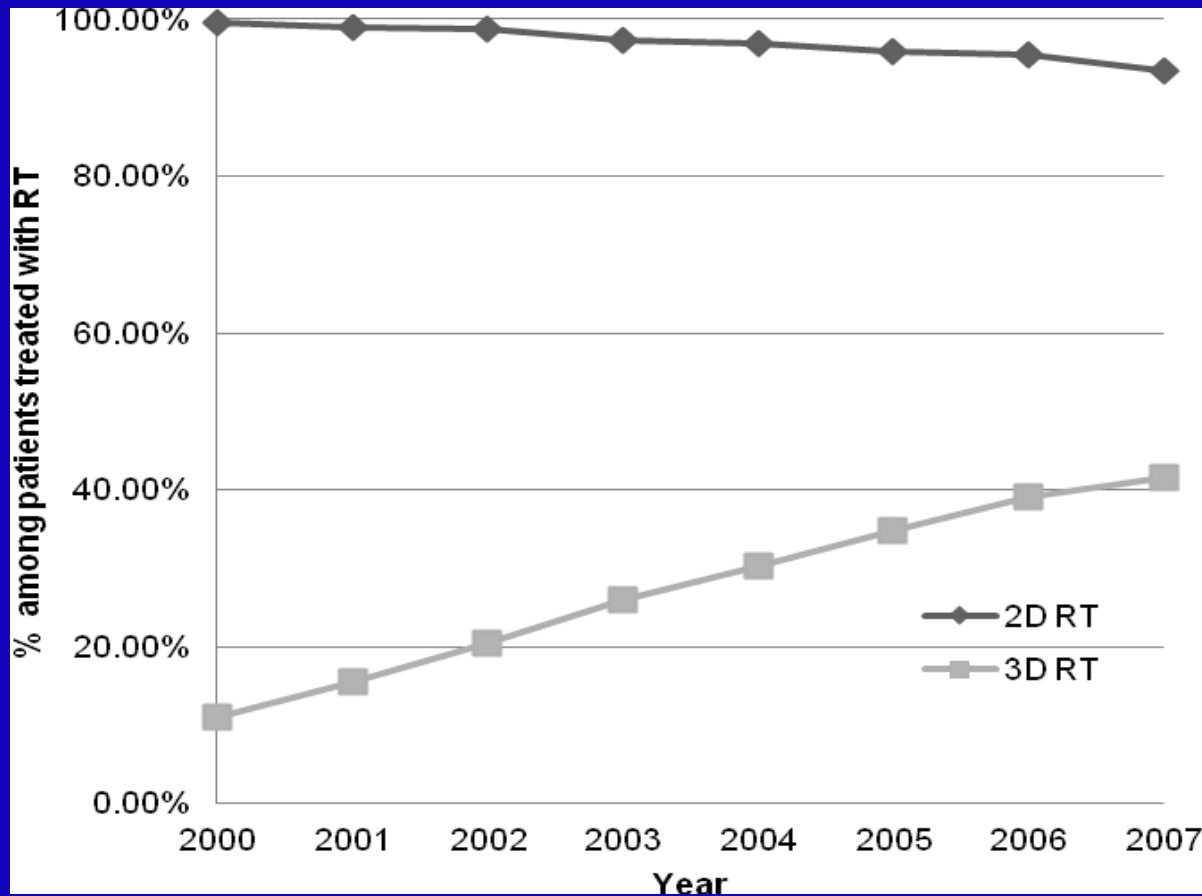
Percent of patients receiving RT in last year of life after dx ($p=0.11$)



Percent among those receiving RT who were treated with IMRT or SRS



% among those receiving RT who were treated with 2D and 3D RT



Receipt of 2D and 3D are not mutually exclusive.

IMRT and SRS predictors

- IMRT more likely if pancreatic cancer, advancing calendar year, non-white race, married, lowest income neighborhood quartile, trx in freestanding center, southern SEER region, highest density of radiation oncologists.
- SRS more likely, advancing calendar year, treatment in a hospital based facility, midwest or west/Hawaii SEER region.

A word about hospice

- Patients electing the Medicare hospice benefit at any point were more likely to have also received RT.
- However, they were less likely to be treated with IMRT.

Conclusions

- While the proportion receiving RT in the last yr of life after metastatic cancer dx has been stable, there is a trend away from the simplest/least costly techniques toward use of more complex and thus more costly techniques.
- Overall rates of advanced tech use seem to still be quite low (<6%), but slope of rates of emerging tech use has future cost implications

2nd study-How much RT is being used at the end of life

- No question that RT an effective tool for palliation of pain, neuro symptoms, etc.
- Some suggestion (Lutz, et al. JCO) that there is underutilization of RT for palliation.
- However can be given via a number of dosing regimens (1 fraction in one day vs. multiple days or weeks of treatment)

2nd study-How much RT is being used at the end of life

- Multiple studies showing RT courses of greater than 10 treatments offer no greater palliative benefit than courses of 10 treatments or fewer for treatments of brain, spinal, or bone mets.
- ASTRO evidence based guidelines state that courses of 1, 5, 6 or 10 fractions all provide equivalent symptom control with minimal toxicity for bone mets.

Cohort definition, N=202,299

- SEER-Medicare database
- Pts who died of breast, colorectal, lung, pancreatic, or prostate cancer between 2000 and 2007
- These chosen because they comprise the top 5 cancer causes of death (60% of cancer deaths in 2010).

Cohort definition, N=202,299

- Must have pathologic confirmation of cancer (not diagnosed at autopsy or death)
- Age 65 or >
- Medicare Part A/B coverage and no HMO coverage for 6 mos prior to study window of last 30 days of life (must have claims data available).

Outcomes

- Receipt of RT in the last 30 days of life
- Number of treatment days
- Costs of care

A word about costs

- Total costs of care normalized to the 2009 dollar
- Used Medicare adjusters for SEER regions and for medical inflation (Hospital Input Price Index for Part A and Medicare Economic Index for Part B—adjusters obtained via direct communication with NCI Health Economics Research section)

Results-RT in the last 30 days

- Total 15,287 (7.6%) received RT in last 30 days of life.
- Decrease in proportion receiving RT from 8.1% to 6.9% from 2000 to 2007 (Cochran Armitage test of trend $p < 0.0001$).
- Corresponding increase in hospice utilization: 44% in yrs 2000-03 vs. 51% 2004-07 ($p < 0.0001$)

Multivariate model—RT in last 30 days

- More likely in: younger age (65-69 vs. older ages); lung cancer; Charlson co-morbidity score of 0 (vs. ≥ 1 or unknown).
- Also more likely in: males; married patients; race other than non-Hispanic Black; Southern SEER region; urban residence; higher income quartiles (3rd and 4th)
- Biggest measure of effect: less likely if Hospice benefit elected: OR= 0.64 ; 95% CI=0.62-0.67

Results-Duration of RT (among those who got RT)

- Categorized as: 1 day, 2-5 days, 6-10 days, or > 10 days
- 53.7% received > 5 days of treatment
- 17.8% received > 10 days of treatment

Multivariate model: > 10 days of RT in the last 30 days of life

- Lung=pancreatic > breast and prostate
- Colorectal patients more likely than all other sites to receive > 10 days of treatment
- More likely in Non-Hispanic white patients
- Patients in Northeast SEER region had lower likelihood of > 10 days than all other regions

Multivariate model: > 10 days of RT in the last 30 days of life

- Patients treated in freestanding facility had greater likelihood than hospital based to receive > 10 days of RT: OR= 1.31, 95% CI= 1.20-1.43
- Patients not electing Hospice care approximately twice as likely to receive > 10 days of RT: OR= 1.97; 95% CI= 1.81-2.15

Resource utilization

- Higher proportion had hospital admission in the RT group vs. no RT (71% vs. 49%, $p < 0.0001$)
- Higher proportion had ICU admission in the RT group (17% vs. 14%, $p < 0.0001$)
- Higher proportion had an ER visit in the RT group (55% vs. 37%, $p < 0.0001$)

Costs of care---entire cohort

Table 6. Cost and Length of Stay for inpatient care (LOS) comparison between RT and no-RT cohorts (N=202,299)

Model	Radiation	Hospice	Mean	Adjusted Cost difference (RT-no RT) ²		
				diff	95%CI	
Total Cost (CMS pay) ¹	Yes	Yes	\$12,822	\$787	\$591	\$984
	Yes	No	\$18,898	\$3453	\$3176	\$3730
	No	Yes	\$8333	-\$2675	-\$2811	-\$2538
	No	No	(Ref.) \$16,416			
Length of stay (LOS)	Yes	Yes	5.03	-2.49	-2.63	-2.36
	Yes	No	9.25	0.63	0.47	0.80
	No	Yes	3.00	-5.06	-5.15	-4.98
	No	No	(Ref.) 8.61			

Note:

(1) Estimates was derived base on Extended generalized linear model (Basu and Rathouz, Biostatistics, 2005).

(2)Independent variables included

(2.a) For cost model: Radiation, hospice and LOS (with interaction of radiation and hospice);

(2.b) For LOS model: age at death, sex, ethnicity, SEER region, rural/urban, income, Charlson comorbidity index, radiation oncologist density, hospice, Radiation, and cause of death (with interaction of radiation and hospice);

(3) Goodness-of-fit: p=0.2985 for cost model and p= 0.8696 for LOS model

(4) LOS includes all ER, hospital, and ICU days

Costs of care among those who received RT (n=15,287)

		Adjusted cost differences		
RT/hospice sequence	Mean costs	Δ	95% CI	
No hospice (ref.)	\$18,898			
Hospice before RT completion	\$10,461	-\$1817	-\$3187	-\$447
RT completion before hospice	\$12,885	-\$2011	-\$2352	-\$1671

Variables in model: age at death, sex, race/ethnicity, SEER region, rural/urban, income, Charlson score, radiation oncologist density

Limitations

- Death is a retrospective endpoint-no information regarding performance status, patient or provider preferences/reasoning.
- Unable to obtain RT dosing information or determine whether multiple sequential courses were given which limits interpretation regarding number of days of treatment.

Limitations

- Unable to determine why patients got RT
- ICD9 coding imprecise about anatomical site and reason...eg, current code for metastases to brain and spine are same code.
- This will change for ICD10 (more specificity, laterality, etc.)

Conclusions

- Low overall proportion receiving RT in the last month--? Underutilization
- Variation in receipt of RT and number of treatments by non-clinical factors.
- Hospice care significantly decreases receipt of RT, number of treatment days and costs—
? Acceptance of death, ? De-incentivization from capitated payments under Hospice benefit.

Future analyses

- Using updated SEER-Medicare data sets (with incident cases through 2009) to look at advanced technology use in last 90 days of life, costs of RT in that time period.
- TX registry/Medicaid data to look at influence of Medicaid status and dual eligibility on receipt of RT, duration of RT, and types of RT at the end of life.

Future considerations

- More research needed in era of quality indicators (ASTRO palliative care guidelines) which can be used as metrics to track care patterns.
- Research with administrative data could be aided by development of more specific palliative radiotherapy diagnosis and procedure codes.

Thank you

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