A Cost Analysis of Skeletal Related Events among Elderly Men with Stage IV Metastatic (M1) Prostate Cancer

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Background

- Skeletal complications resulting from bone metastasis in advanced prostate cancer (PCa) are associated with significant morbidity, poor health-related quality of life and reduced survival.
- Nearly two thirds of the men diagnosed with PCa in the United States are aged 65 years or older and are at increased risk of skeletal related events (SREs).
- Current methods for estimating costs of SREs may not reflect the differences in health care utilization costs among older patients in advanced stages of the disease.

Objectives

To ascertain the incremental health care utilization costs associated with the treatment of SREs, controlling for possible selection biases in the non-randomized comparison of costs between patients with and without SREs among older patients diagnosed with confirmed metastatic PCa.

Methods

Study Design
- Case-control study design (Figure 1).

Dataset
- Linked Surveillance, Epidemiology and End Results (SEER)-Medicare database.

Study Sample
- Patients aged 66 years or older, diagnosed with incident stage IV (M1) prostate cancer between 2000 and 2007.

SREs
- Five mutually exclusive SRE categories were created: 1) pathological fracture only, 2) pathological fracture with concurrent surgery to the same bone , 3) spinal cord compression only, 4) spinal cord compression with concurrent surgery to the same bone, 5) bone surgery only.

Covariates
- Demographic characteristics: See Table 1.
- Clinical and treatment characteristics: See Table 1.

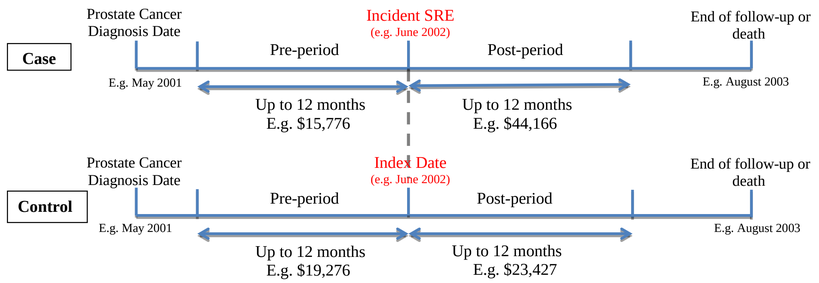
Analytical approach
- A propensity score matching technique combined with a difference-in-difference (DID) estimation method.

Analysis
- Descriptive and bivariate analyses were conducted for the unmatched and matched samples.
- Total annual health care costs were estimated for patients with SREs in the unmatched sample.
- Generalized linear models with a log-link and gamma variance functions were utilized to estimate incremental and DID cost estimates.

Sensitivity analysis
- Pre-post cost differences were calculated for 3- and 6-month follow-up periods.

Methods cont.

Figure 1. Study design and analytical approach



Results

Table 1. Descriptive and bivariate analyses of the full, unmatched and matched samples

Variable	Stage IV, M1 (N=7,198)		Unmatched Sample			Matched Sample			
			Without SREs (N=6,067)	With SREs (N=1,131)	p-value	Without SREs (N=928)	With SREs (N=928)	p-value	Standardized differences (%)
	N	%	Col. %	Col. %		Col. %	Col. %		
Demographics									
Race					0.03			0.60	
White non-Hispanic	5,420	75.3	75.0	76.8		77.8	76.5		4.3
African American non-Hispanic	1,035	14.4	14.9	11.7		12.9	12.4		2.3
Hispanic	433	6.0	5.9	6.8		5.8	6.9		(6.3)
Other	310	4.3	4.2	4.7		3.5	4.2		(5.5)
Age					0.30			0.60	
66-69	971	13.5	13.1	15.5		13.8	14.1		(1.3)
70-74	1,380	19.2	19.2	19.2		17.8	17.6		0.8
75-79	1,613	22.4	22.5	22.2		25.1	22.1		10.1
80-84	1,664	23.1	23.3	22.1		21.8	23.1		(4.4)
85+	1,570	21.8	22.0	21.0		21.6	23.2		(5.5)
Clinical Characteristics									
Charlson comorbidity index					0.13			1.00	
Zero	3,951	54.9	54.7	56.2		54.6	55.2		(1.5)
One	1,384	19.2	19.0	20.6		21.3	20.4		3.4
Two or higher	1,136	15.8	16.2	13.8		14.8	14.8		0.0
Missing	727	10.1	10.2	9.5		9.3	9.7		(2.1)
Treatment									
Bisphosphonate therapy	1,951	27.1	26.1	32.5	<0.01	31.7	29.3	0.30	7.3
External beam radiation therapy	2,241	31.7	28.8	47.2	<0.01	42.6	44.6	0.40	(2.3)
Anti-androgen therapy	5,325	74.0	73.2	78.3	<0.01	80.4	75.1	<0.01	18.0

Table 2. Total annual health care costs, pre- and post- index incremental costs by type of skeletal related event (SRE)

Variable	Total annual SRE costs by type (US $)					Incremental costs (SRE vs. No SRE cost difference) (US $)						
							Pre-index period			Post-index period		
	N	Mean	Std. Dev.	Min	Max	N	Mean	95% Confidence Interval		Mean	95% Confidence Interval	
Any SRE	1,131	44,166	36,282	-	327,604	928	-3,500	-5,531	-1,470	20,739	17,853	23,625
Pathologic fracture only	591	41,334	36,317	-	327,604	131	257	-3,801	4,314	12,360	6,679	18,041
Spinal cord compression only	157	35,391	27,899	56	181,274	497	-3,889	-6,306	-1,472	17,651	14,264	21,037
Bone surgery only	184	51,555	38,184	2,477	242,927	144	-2,759	-6,667	1,148	28,033	22,561	33,504
Pathologic fracture and concurrent surgery	149	46,813	32,385	495	282,281	123	-3,687	-7,862	488	24,329	18,484	30,175
Spinal cord compression and concurrent surgery	50	70,114	46,138	480	180,222	33	-11,764	-19,472	-4,056	57,048	46,265	67,832

Results cont.

Figure 2. Difference-in-difference (DID) cost estimates for skeletal related events among patients with stage IV (M1) prostate cancer diagnosed in 2000-2007

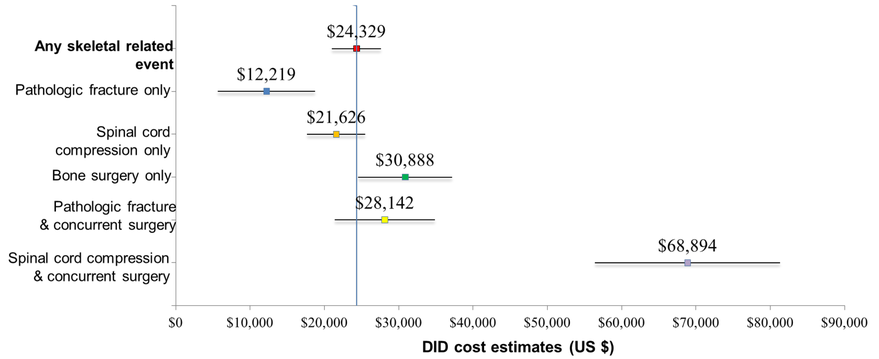
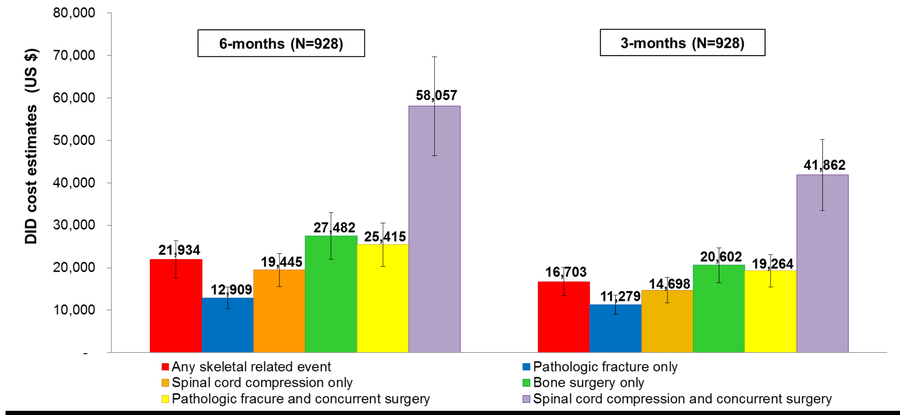


Figure 3. Sensitivity analysis



Conclusions

- The health care utilization costs among metastatic prostate cancer patients with SREs was $24,329 (95% CI: $21,010- $27,648) higher compared to those without SREs.
- Costs of SREs varied by type; spinal cord compression and concurrent surgery to the bone ($68,894: 95% CI $56,431-$56,431) was the most expensive.
- The specific method used to compare and isolate costs attributable to SREs could provide useful information to payers to quantify the economic impact of prostate cancer-related SREs.
- The analysis suggests that treatment and procedures to prevent SREs have the potential to yield cost offsets.

Disclosure

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