

Cancer hospital advertising and outcomes: trust the messenger?

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Hospitals have made substantial investments in advertising for cancer services in the past two decades, totalling over US\$200 million in 2016 alone.^{1,2} Advertisements promoting cancer centres are unavoidable in the USA. They hang on highway billboards and on air during prime-time programming. Some advertisements claim superior outcomes, others highlight access to clinical trials, and many present heart-warming patient stories that might be non-representative of actual outcomes.³ Data suggest that patients are highly aware of advertisements and are likewise influenced by them.⁴

Decades of research have shown wide and consistent variations in cancer care outcomes between US hospitals.^{5,6} Although patients might wish to select their cancer care provider based on objective measures of cancer care quality and outcomes,^{7,8} few measures are publicly available. Advertising is designed to improve cancer centre recognition and attract patients in an increasingly competitive environment. It has the potential to provide valuable information about screening and treatment options, and it could benefit patients by attracting them to hospitals with the best outcomes. However, if hospital advertising for cancer services is not correlated with

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patient outcomes, information shared through advertising might mislead patients and generate inaccurate expectations of treatment benefit.⁹

We did an analysis to evaluate whether advertising spending for a hospital's cancer services was associated with long-term survival outcomes of patients with cancer treated in those centres. For the measures of advertising spending and long-term survival, we applied methods that have been described previously.^{9, 10} We captured hospital advertising spending for cancer services in 2014 across six different US media outlets (television, magazines, radio, newspapers, billboards, and the Internet), using data from the media-monitoring agency Kantar Media (New York, NY, USA).⁹ Medicare fee-for-service 100% research-identifiable files were used to determine hospital risk-adjusted 5-year mortality ratios, including cases from 2011–12.¹⁰ We included the top 50 hospitals (or sets of hospitals) in terms of their advertising spending, accounting for over 89% of the \$173 million spent on cancer centre advertising in 2014.

The primary test of association was a linear regression, with advertising spending as the predictor. The outcome was a risk-adjusted mortality ratio that was determined by dividing the observed number of deaths by an expected number. A risk-adjusted mortality ratio below 1 indicates that a hospital performed better than expected, whereas a ratio greater than 1 means a hospital had higher mortality than expected. In total, we used four models to assess the relationship between advertising spending and risk-adjusted mortality. This study was deemed exempt research by the institutional review board of Memorial Sloan Kettering Cancer Center (New York, NY). The Centers for Medicare & Medicaid Services and Kantar Media granted data-use approvals. Additional methodological details can be found in the appendix (pp 1–2).

For the top 50 hospital advertisers, the median number of fee-for-service Medicare patients with cancer treated was 764 (range 93–5945). Spending for advertising that promoted cancer services

was unevenly distributed across hospitals (figure). Median spending was \$305 900. The 50th hospital spent \$106 300, the average hospital spent \$3 064 600, and the top advertising spender—Cancer Treatment Centers of America—spent more than the other 49 hospitals combined, totalling \$101 740 900. 5-year hospital risk-adjusted mortality ratio for patients with cancer ranged from 0·83 to 1·13, meaning hospitals' mortality ratio ranged from 17% (0·83) below expected to 13% (1·13) higher than expected. Results between the four models were fairly inconsistent. Some of the models found a positive relation between advertising spending and survival outcomes; other models found a negative relation. For two of the four models, this relationship was not significant. None of the models had an R^2 greater than 38%, indicating that hospital advertising did not account for most of the variability in hospital survival outcomes. The figure shows the full explanation of the model results. A list of all hospitals with spending, volume, and survival outcomes is available in the appendix (pp 3–4).

We found little evidence that the cancer centres to which people were most likely to be exposed through advertisements were the cancer centres with the best patient outcomes. There was considerable variation in both advertising spending and survival outcomes among the top 50 hospital advertisers. Some hospitals in our sample with excellent outcomes did not have particularly high advertising spending, and the highest-spending set of hospitals—operating as Cancer Treatment Centers of America—had poorer patient outcomes than all other hospitals in our sample. Patients might be inadvertently pursuing treatment choices that do not align with their intentions or preferences by assuming that advertising across national media is indicative of high-quality cancer treatment. Over the past decade, cancer centres have markedly increased the amount of consumer-directed advertising spending. Assuming current trends continue, cancer-centre advertising is likely to constitute a major source of patient information that might

influence decisions about where patients with cancer seek treatment. This effect would be good for patients if advertising were predictive of improved patient outcomes. However, our findings suggest that the relation is inconsistent and not particularly strong, with many outliers.

Some limitations should be considered when interpreting our findings. For long-term survival, we only included fee-for-service Medicare beneficiaries, and the generalisability of this outcome to other patients is unknown. Advertising spending totals did not include spending for social media, which has been widely adopted by US hospitals as a means to support hospitals' reputations and attract patients. We also did not have data available on the content of cancer centre advertisements, and we were thus unable to distinguish between advertisements promoting specific cancer therapies and advertisements promoting general cancer centre reputations. Our analysis was limited to cancer centre advertising in the USA, but the USA has the highest health-care spending in the world, and in the past two decades there has been a marked growth in spending for health-care advertising.¹

Hospital advertising for cancer services continues to increase in the USA, and patients have more options for where to seek cancer care. However, cancer care quality remains uneven. Our findings suggest that cancer care advertising is not reliably valuable for patients as a surrogate of cancer care quality. The absence of correlation underscores the need for publicly available objective data on cancer centres' patient outcomes and other measures of quality that can be easily accessed and interpreted by patients to aid them in decision making. Patients, clinicians, and other stakeholders should view cancer centre advertisements with scrutiny.

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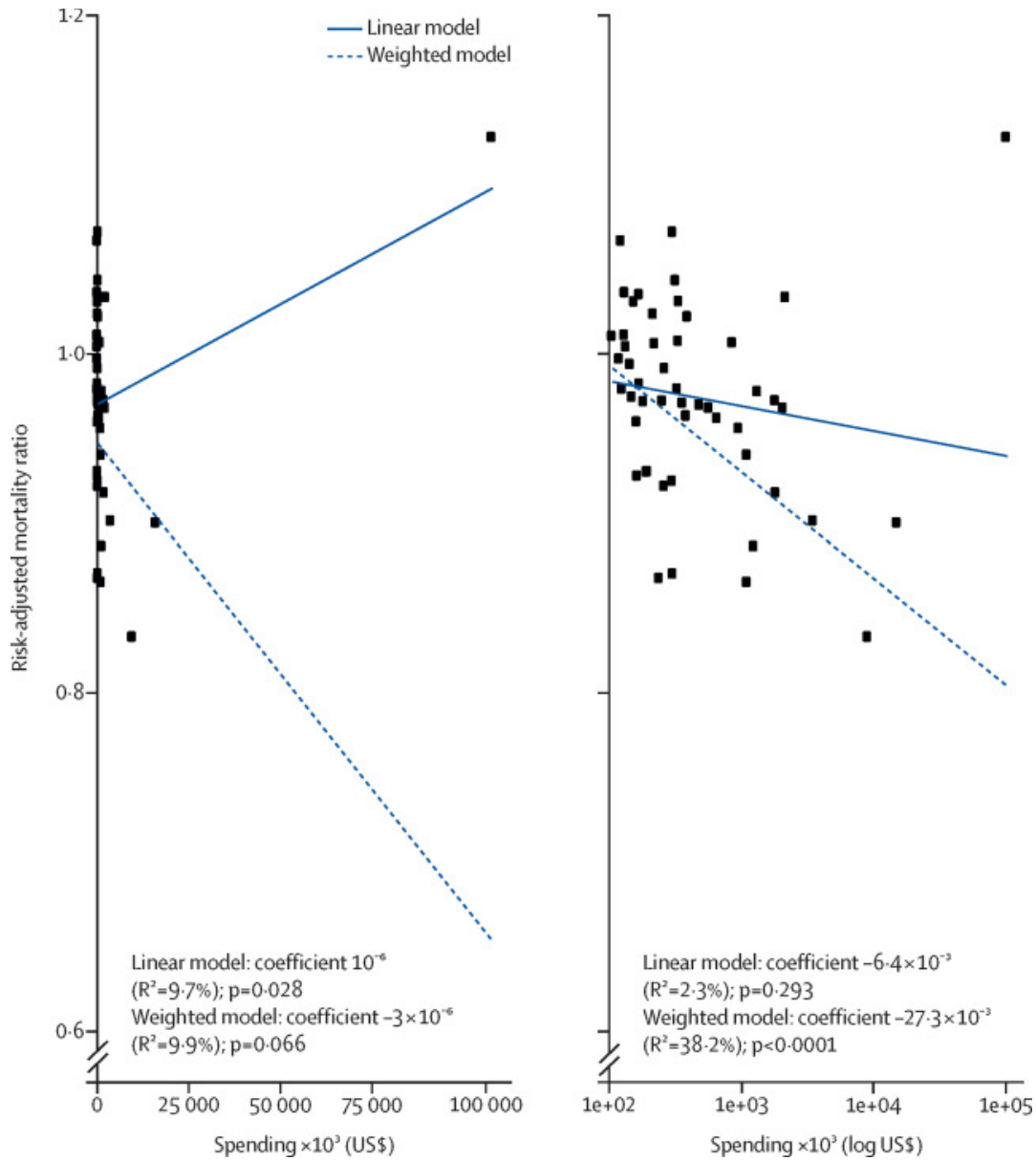
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Figure 1.



Scatterplots of hospitals' advertising spending for cancer services in 2014, compared with risk-adjusted 5-year mortality for fee-for-service Medicare beneficiaries beginning treatment in 2011–12.

Appendix A. Methodological details

We evaluated whether hospitals' advertising spending was associated with long-term survival among cancer patients treated in those centers. For both measures, we applied previously described methods.^{1,2} We captured hospital advertising spending for cancer services in 2014 using data from the media-monitoring agency Kantar Media (New York, New York). We included advertising by centers with the terms "cancer," "oncology," "radiation," or another cancer therapy (e.g., proton therapy) in their name or advertisement.² Free-standing clinics and solo outpatient centers were excluded.

Medicare Fee-for-Service (FFS) 100% Research Identifiable Files were used to determine hospital risk-adjusted five-year mortality ratios, including cases from 2011-12. Each case had new claims for cancer care after a year (or more) without a claim for a cancer diagnosis, and mortality data through 2017.¹ When multiple hospitals were involved under one advertising campaign, we pooled their outcomes weighted by the number of patients treated at each hospital. We included the top 50 hospitals (or sets of hospitals) in terms of their advertising spending, accounting for over 89% of the 173 million dollars spent on advertising in 2014.

Statistical analysis

The primary test of association was a linear regression, with advertising spending as the predictor. The outcome was a risk-adjusted mortality ratio which was determined by dividing the observed number of deaths by an expected number. In brief, the 3M Clinical Risk Group (CRG) risk adjustment model in combination with adjustments for age and median income level of the zip code of residence serve to adjust for differences in patient severity and population demographics. A risk-adjusted mortality ratio below one indicates that a hospital performed better than expected, where a ratio greater than one means a hospital had higher mortality than what was expected. The R-squared from the regression model was used to see how well advertising spending explained outcomes. We conducted additional analyses that included a log transformation of the x variable (i.e., spending) and weighting of the outcome (y) variable (i.e.,

risk- adjusted five-year mortality) by the volume of patients at the hospital. In total, there were four models used to assess the relationship between advertising spending and risk-adjusted mortality. This study was deemed exempt research by the institutional review board of Memorial Sloan Kettering Cancer Center. The Centers for Medicare & Medicaid Services and Kantar Media granted data use approvals.

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Appendix B. Advertising spend and risk-adjusted five-year mortality for top 50 hospital advertisers

Rank by advertising spend	Hospital advertiser¹	State(s)²	Advertising spend (\$) in thousands³	Total number of FFS Medicare patients⁴	Five-year risk-standardized mortality ratio⁵
1	Cancer Treatment Centers of America	AZ, GA, IL, OK, PA	101741	506	1.13
2	MD Anderson Cancer Center	AZ, NJ, TX	15155	7587	0.90
3	Memorial Sloan Kettering Cancer Center	NY	9086	5945	0.83
4	Fox Chase Cancer Center	PA	3520	1233	0.90
5	Huntsman Cancer Institute	UT	2178	901	1.03
6	Sutter Cancer Center	CA	2089	2026	0.97
7	Dana-Farber Cancer Institute	MA	1836	2993	0.94
8	Seattle Cancer Care Alliance	WA	1821	1591	0.97
9	Winthrop NYCyberKnife Center	NY	1336	1162	0.98
10	CDH Proton Center	IL	1256	1910	0.89
11	H Lee Moffitt Cancer Center	FL	1113	2794	0.87
12	University of Florida	FL	1113	1839	0.94
13	James Cancer Hospital	OH	962	1646	0.96
14	Edward Cancer Center	IL	864	720	1.01
15	Swedish Cancer Institute	WA	663	1818	0.96
16	Smilow Cancer Hospital	CT	573	2235	0.97
17	Siteman Cancer Center	MO	486	2844	0.97
18	University of MD Greenebaum Cancer Center	MD	396	817	1.02
19	Karmanos Cancer Institute	MI	386	971	0.96
20	Scripps Proton Therapy Center	CA	363	1965	0.97
21	Northside Hospital Cancer Institute	GA	340	1712	1.03
22	Cancer Institute of NJ	NJ	338	171	1.01
23	Morristown Medical Center	NJ	332	1325	0.98
24	Houston Methodist Cancer Center	TX	322	93	1.04
25	NYU Cancer Institute	NY	306	1630	0.87
26	HealthEast CyberKnife Center	MN	305	151	1.07
27	University of Chicago Medicine Comprehensive Cancer Center	IL	303	1351	0.93
28	Hartford HealthCare Cancer Institute	CT	266	2514	0.99
29	Abramson Cancer Center	PA	264	3047	0.92
30	Memorial Cancer Institute	FL	255	433	0.97
31	City of Hope Cancer Center	CA	241	1178	0.87
32	University of KS Cancer Center	KS	224	1851	1.01
33	Christus Schumpert Cancer Treatment Center	LA	218	559	1.02
34	Sylvester Comprehensive Cancer Center	FL	197	659	0.93
35	University Hospitals Seidman Cancer Center	OH	194	1414	0.93
36	UPMC Cancer Centers	PA	184	3949	0.97
37	Edwards Comprehensive Cancer Center	WV	172	389	0.98
38	Mary Bird Perkins Cancer Center	LA	171	1454	1.04
39	John Theurer Cancer Center	NJ	165	1870	0.93
40	Kettering Cancer Care	OH	164	709	0.96
41	Intermountain Cancer Center	UT	156	679	1.03
42	St Peters Hospital Cancer Care Center	NY	150	957	0.97
43	Stephenson Cancer Center OU Medical	OK	146	900	0.99
44	USC Norris Comprehensive Cancer Center	CA	135	263	1.00
45	Upstate Cancer Center	NY	133	767	1.04
46	Integris Cancer Institute of OK	OK	132	1210	1.01

47	Providence Cancer Center	AK, OR, WA	127	5486	0.98
48	Reid Cancer Center	IN	124	531	1.07
49	Montefiore Einstein Center for Cancer Care	NY	120	951	1.00
50	Inova Comprehensive Cancer & Research Institute	VA	106	2580	1.01

¹Advertisers include hospitals or set of hospitals involved under one advertising campaign.

²These are the states for the hospitals that were used to calculate the five-year risk-adjusted mortality ratio for that advertiser.

³Advertising spend for 2014.

⁴Volume is summed over the set of hospitals involved under one advertising campaign.

⁵Hospital risk-adjusted mortality ratio for patients with FFS Medicare coverage beginning treatment in 2011-2012.