

Assessing Controversial Direct-To-Consumer Advertising for Hereditary Breast Cancer Testing: Reactions from Women and Their Physicians in a Managed Care Organization

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Objective: To describe the impact on patients and physicians at a managed care organization (MCO) of a direct-to-consumer advertising (DTC-ad) campaign concerning testing for the BRCA1 and BRCA2 genes.

Study Design: Observational study.

Methods: In 2003, we mailed a 30-item questionnaire to 750 randomly chosen female members of Kaiser Permanente Colorado (KPCO) aged 25 to 54 years, and 100 female KPCO members with a history of breast cancer genetic referral. We mailed a 7-item questionnaire to 180 randomly chosen KPCO primary care providers.

Results: Of 394 patient respondents, 245 (62%) reported exposure to the DTC-ad of whom 63% reported that the DTC-ad caused no anxiety at all. A high level of perceived breast cancer risk and being of Hispanic ethnicity each were independently associated with reported anxiety due to the DTC-ad (adjusted odds ratio [OR] = 3.23, 95% confidence interval [CI] = 1.35, 7.73, and adjusted OR = 4.19, 95% CI = 1.48, 11.83, respectively). Greater knowledge was seen among respondents exposed to the DTC-ad than among those reporting no exposure ($P = .015$). Of the physician respondents, 84% reported that the DTC-ad caused no strain on the doctor-patient relationship, and nearly 80% reported no effect on daily clinical practice. Genetic referrals soared more than 200% compared with the prior year, when there was no advertising.

Conclusion: The DTC-ad had a marked impact on genetic services, but little apparent negative impact on patients or primary care providers at an MCO.

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In the mid-1990s germline mutations in the BRCA1 and BRCA2 (BRCA1/2) genes were found to be associated with an increased risk for breast and ovarian cancers, and Myriad Genetics Laboratories, Inc. (Myriad) obtained the patent for direct sequencing.¹⁻³ Professionals and lay advocates were greatly concerned about the ethical ramifications of this patent, predicting that any subsequent marketing campaign by the laboratory would have mostly negative effects on women's health-care.⁴ However, until 2002 there was no major marketing campaign.⁵

In May 2002 Myriad began educational outreach to providers in the Denver and Atlanta metropolitan areas to prepare them for a direct-to-consumer advertising (DTC-ad) campaign concerning testing for the BRCA1/2 genes (BRACAnalysis), which would run from mid-September 2002 through mid-February 2003.⁵ These 2 markets and the targeted demographic group, women aged 25 to 54 years, were selected based on research conducted by Myriad, which assessed factors ranging from Myriad's own infrastructure to the sophistication of local genetic services.⁵ Myriad's intensive 5-month campaign used television, radio, and print media and was projected to reach more than 90% of the targeted population an average of 16.5 times each.

Advertisements presented 4 middle-aged female actors stating that breast cancer ran in their families and they had sought testing. Although technically correct in content and without distortion or exaggeration, the DTC-ad's explicit and implicit consumer testimonials repeatedly stressed that if breast cancer "runs" in a woman's family, she should undergo BRACAnalysis "now." The advertisements encouraged women to call a toll free number or talk with their doctor.

Controversy arose as Myriad initiated its campaign.⁶⁻¹⁰ At issue: for every 10,000 women reached by the advertisements, only 15 would have a BRCA1/2 mutation that conferred high risk.¹¹ Although women of Jewish ancestry have a higher risk of a mutation, the DTC-ad was targeted at the general population.⁵ With a low prevalence of

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women in the general population having a BRCA1/2 mutation, this advertising "overreach" carried potential for creating patient anxiety, contributing to patient misconception, and straining the patient-provider relationship. The literature suggesting limited knowledge of patients and providers about BRCA1/2 testing supported these concerns.¹²⁻¹⁴ However, such literature also can justify the DTC-ad, because benefits of genetic services may be high and such services are underutilized.¹⁵⁻²¹

In this study the effect of Myriad's inaugural marketing campaign for BRACAnalysis on the patients and physicians of Kaiser Permanente Colorado (KPCO) is assessed. Specific outcomes are patient anxiety and misconception, strain on the doctor-patient relationship, and demand for healthcare services.

METHODS

We received institutional review board approval for data collection from KPCO, a nonprofit, closed-panel managed care organization (MCO) serving nearly 370 000 members in the Denver metropolitan area. Clinical referral guidelines for cancer genetic services have existed at KPCO since 1997 and require pretest genetic counseling. Referrals must be provider generated.

Patient Survey

We mailed an anonymous survey in the spring of 2003 to a random group of 750 female KPCO members aged 25 to 54 years who had been members for at least 33 months between February 2000 and January 2003. Because the general population is mostly not at increased risk for a BRCA1/2 mutation, we oversampled for higher risk by randomly selecting 100 additional female members with a breast and ovarian cancer genetic referral made during the DTC-ad period.

The survey assessed exposure to the DTC-ad. Exposure was defined as having heard of BRACAnalysis or of genetic testing for hereditary breast or ovarian cancer risk through a television, radio, newspaper, or magazine advertisement. We identified 2 levels of exposure: any versus none.

Subjects reporting exposure were asked to rate on a 3-point scale (very, somewhat, not at all) the emotions the advertisement made them feel. Based on literature and focus group work by Myriad, these emotions included anger, anxiety, sympathy, concern for self or family, confusion, skepticism, excitement, gratefulness for being told about genetic testing, and a sense of urgency.

Survey respondents categorized their perceived risk for breast cancer as high, average, or low compared with that of women their own age. Respondents also reported

on demographic factors (age, race/ethnicity, education, income, employment, marital status, numbers of siblings and offspring, and level of spirituality), and healthcare utilization (use of routine care within previous 2 years, previous mammogram, previous breast biopsy).

For determination of actual BRCA1/2 mutation risk, we collected the risk factors of personal and family cancer histories and Jewish ancestry, and used the Myriad mutation prevalence tables (MPTs).²² Although there are other computer-based mutation probability assessment models, the MPT (the only tool based on actual test results) best fit the level of information available.²²⁻²⁴ Using the MPT, we created a high-probability category for patients equating to a 10% or greater chance of testing positive for a BRCA1/2 mutation, a moderate category equating to a probability from 5% up to 10%, and a low category for less than a 5% chance of testing positive with BRACAnalysis.

We captured patient knowledge using 9 questions from a previously validated scale of cancer genetic knowledge.²⁵ Seven of the questions were specifically addressed in the DTC-ad content.

Physician Survey

Also in 2003 we administered an anonymous written survey to a random sample of physicians in the KPCO departments of obstetrics/gynecology, family practice, and general internal medicine (n = 180). In addition to collecting medical specialty and number of years since completing residency training, we asked physicians how much undue anxiety the DTC-ad created among patients (very, somewhat, none), how much time was needed to correct patients' misconceptions due to the DTC-ad, and how the DTC-ad affected the patient-provider relationship. We asked how the DTC-ad affected the number of office visits and patient telephone calls, and how those numbers compared with the numbers in the preceding year. We further asked how the DTC-ad affected routine clinical practice overall (very positively, somewhat positively, no effect, somewhat negatively, very negatively).

We assessed the increase in demand for genetic services compared with the demand 1 year before the DTC-ad through numbers of provider-generated referrals. Referrals are tracked in an electronic genetic database.

Analyses

The chi-square test of proportions assessed the statistical significance of association between perceived risk for breast cancer and patient emotions. For multivariate analyses, we used logistic regression with reported emotion (any vs none) as the dependent vari-

able and level of perceived breast cancer risk (high, average, low) as the independent variable. Potential confounders in each model included age, race/ethnicity, income, and education. Neither personal history of cancer nor level of actual risk of a mutation significantly added to the logistic regression models. Other potential demographic confounders captured in the patient survey and potential demographic interactions also did not add to the models. We found no collinearity between the demographic factors in the final models. Because the women with high risk for a mutation were mostly sampled from a special population source, we modeled the final associations between perceived risk of breast cancer and emotions both with and without the high-risk subgroup. There was no significant change in the results; thus, we kept the entire high-risk group in the final models.

We created a patient knowledge score, defined as the number of correct answers to the 9 knowledge questions with missing and "Don't know" replies counting zero. We assessed differences in knowledge scores by DTC-ad exposure using the Wilcoxon rank-sum test. We tested statistical association between exposure and each of the knowledge questions using the chi-square test.

For the physician survey, we used the chi-square test to determine differences among medical specialties in reported changes in clinical practice attributable to the ad campaign.

Table 1. Characteristics of Respondents to Patient Survey by Reported Exposure to Myriad Genetic Laboratories, Inc's Direct-to-Consumer Advertising Campaign for BRACAnalysis, Kaiser Permanente Colorado, 2003 (n = 394)

Characteristic	No. (%)		P*
	Did See DTC-ad (n = 245)	Did Not See DTC-ad (n = 149)	
Age, y			
23-39	67 (27.7)	41 (28.5)	.45
40-49	97 (40.1)	65 (45.1)	
50+	78 (32.2)	38 (26.4)	
Race			
White/non-Hispanic	202 (82.8)	120 (81.1)	.21
Hispanic	24 (9.8)	19 (12.8)	
Black/African American	13 (5.3)	3 (2.0)	
Other	5 (2.1)	6 (4.1)	
Education[†]			
Less than high school	5 (2.1)	5 (3.4)	.25
High school graduate	35 (14.3)	18 (12.2)	
Trade/tech school	11 (4.5)	11 (7.4)	
Some college	61 (25.0)	47 (31.8)	
College graduate	61 (25.0)	37 (25.0)	
More than college	71 (29.1)	30 (20.3)	
Household income, \$			
Up to 39 000	51 (22.3)	43 (31.6)	.05
40 000-49 000	35 (15.3)	12 (8.8)	
50 000-59 000	31 (13.5)	12 (8.8)	
60 000-69 000	16 (7.0)	15 (11.0)	
70 000-79 000	28 (12.2)	10 (7.4)	
80 000+	68 (29.7)	44 (32.4)	
Previous utilization[‡]			
None	17 (7.0)	18 (12.4)	.03
1-3 visits	180 (74.1)	114 (78.6)	
4-8 visits	38 (15.6)	11 (7.6)	
9+ visits	8 (3.3)	2 (1.4)	
Perceived risk breast cancer			
Low	115 (47.7)	67 (46.5)	.07
Moderate	77 (32.0)	59 (41.0)	
High	49 (20.3)	18 (12.5)	
Actual mutation risk[§]			
Low	139 (57.9)	93 (66.0)	.19
Moderate	50 (20.8)	28 (19.9)	
High	51 (21.3)	20 (14.2)	

DTC-ad indicates direct-to-consumer advertising.

*P values were obtained by the chi-square test of proportions.

[†]Highest completed level of education.

[‡]Utilization of primary care for routine visit within the previous 2 years.

[§]Actual mutation risk is the pretest probability of a BRCA1 or BRCA2 mutation as per the Myriad mutation prevalence tables. Low = probability of finding a BRCA1/2 mutation less than 5%; moderate = 5% to 10%; high = 10% or greater.

The chi-square test was used to test for the significance of the change in the number of genetic counseling referrals attributable to DTC-ad. Specifically, the total number of referrals during the active advertising period was compared with the total number in the previous year, controlling for changes in average membership for women aged 25 to 54 years. All analy-

ses were done using SAS version 8.02 (SAS Institute Inc, Cary, NC).

RESULTS

Patient Survey

The patient survey received a 48% response rate with 394 completed surveys and 25 undeliverable. Most respondents were in their 40s, and more than 80% were non-Hispanic white (Table 1). The majority (78%) had some college or higher as the highest completed level of education, and 91% had utilized healthcare services within the previous 2 years. We could only compare respondents with nonrespondents by age, with 45 years as the median age for respondents and 43 years as the median age for nonrespondents (data not shown).

Of the respondents, 245 (62%) reported exposure to the DTC-ad. There were no significant demographic differences between those exposed and not exposed to

the DTC-ad, with the exception that those reporting exposure were more likely to report greater previous healthcare utilization ($P = .03$; Table 1). There were no significant differences between respondents exposed and not exposed to the DTC-ad with respect to perceived risk of breast cancer or in actual BRCA1/2 mutation risk (Table 1). The other demographic and utilization measures captured by the survey were not significantly associated with exposure (data not shown).

Among the women who reported exposure to the DTC-ad, 63% reported that the DTC-ad caused them no anxiety at all, 76% reported no confusion, and 71% reported no urgency; however, 65% reported feeling somewhat or very concerned. Each of these emotions was significantly associated with higher perceived risk for breast cancer ($P < .05$ for all emotions; data not shown). For each of the other examined emotions, the overwhelming response was of no effect, and there was no significant association with perceived risk (data not shown).

Table 2. Logistic Regression Model Reporting Associations With Patient-reported Anxiety Due to Myriad Genetic Laboratories, Inc's Direct-to-Consumer Advertising Campaign for BRACAnalysis, Kaiser Permanente Colorado, 2003 (n = 76)

Characteristic	Total N	Any Anxiety		Crude OR (95% CI)	Adjusted [†] OR (95% CI)	P
		No.* (%)				
Perceived risk of breast cancer						
Low	80	22 (27.5)		1.00 (reference)	1.00 (reference)	
Average	76	29 (38.2)		1.63 (0.83, 3.2)	1.94 (0.92, 4.08)	.08
High	42	23 (54.8)		3.19 (1.46, 7.0)	3.23 (1.35, 7.73)	<.01
Age group, y						
23-39	59	28 (47.5)		1.00 (reference)	1.00 (reference)	
40-49	76	23 (30.3)		0.48 (0.24, 0.98)	0.64 (0.29, 1.43)	.27
50+	63	24 (38.1)		0.68 (0.33, 1.4)	0.77 (0.34, 1.77)	.53
Race						
White	162	55 (34.0)		1.00 (reference)	1.00 (reference)	
Hispanic	23	15 (65.2)		3.65 (1.46, 9.1)	4.19 (1.48, 11.8)	<.01
Black & other	16	6 (37.5)		1.17 (0.4, 3.4)	1.47 (0.47, 4.59)	.50
Education						
Less than high school/high school graduate	34	13 (38.2)		1.00 (reference)	1.00 (reference)	
Trade/tech school/some college	60	22 (36.7)		0.94 (0.39, 2.23)	1.34 (0.48, 3.75)	.58
College graduate or more	107	41 (38.3)		1.00 (0.45, 2.22)	1.64 (0.63, 4.25)	.30
Income, \$						
Less than 30 000	26	16 (61.5)		1.00 (reference)	1.00 (reference)	
30 000-49 000	51	20 (39.2)		0.40 (0.15, 1.06)	0.36 (0.12, 1.07)	.07
50 000-79 000	59	20 (33.9)		0.32 (0.12, 0.83)	0.31 (0.11, 0.89)	.03
80 000+	53	16 (30.2)		0.10 (0.10, 0.72)	0.27 (0.09, 0.81)	.02

CI indicates confidence interval; OR, odds ratio.

*Totals do not equal 100% due to missing values.

[†]Adjusted model included age, race/ethnicity, income, and education.

Logistic regression showed a high level of perceived breast cancer risk and Hispanic ethnicity each to be independently associated with reported anxiety due to the DTC-ad (adjusted odds ratio [OR] = 3.23, 95% confidence interval [CI] = 1.35, 7.73, and adjusted OR = 4.19, 95% CI = 1.48, 11.83, respectively) (Table 2). Higher reported incomes were associated with less report of anxiety due to the DTC-ad. Logistic regression showed similar findings for the other reported emotions: concern was associated with high perceived risk for breast cancer (OR = 6.09, 95% CI = 2.18, 16.98); confusion was associated with high perceived risk (OR = 3.71, 95% CI = 1.38, 9.98) and Hispanic ethnicity (OR = 2.57, 95% CI = 0.87, 7.54); and urgency was associated with high perceived risk (OR = 8.63, 95% CI = 3.37, 22.12) and Hispanic ethnicity (OR = 3.35, 95% CI = 1.13, 9.97) (data not shown).

The median knowledge score of 6 did not differ by exposure. However, knowledge scores skewed higher among the exposed group (5% and 95% quantiles of 3 and 9 in the exposed group vs 1 and 8 in the unexposed group; $P = .015$) (data not shown). The individual questions had mixed association with DTC-ad exposure. Among the 7 questions specifically referred to in the actual advertisement, a large percentage of respondents answered "Don't know" regardless of exposure (Table 3).

Physician Survey

Among the 180 physicians surveyed, we obtained 97 completed surveys for a 54% response rate. The respondents were mostly in internal medicine (40%), with 32% in family practice and 28% in gynecology (data not shown). More than 85% of the respondents were more than 5 years out from completing residency training.

The majority of physician respondents (65%) reported that the DTC-ad caused no undue patient anxiety, which did not vary by medical specialty ($P = .96$; Table 4). In regard to patient misconception, 58% reported that time spent to correct patient misconceptions was not at all affected by the DTC-ad. By medical specialty, gynecologists were more likely to report needing "a little" more time to correct patient misconception due to the DTC-ad ($P = .07$; Table 4).

Whereas 80% of physicians reported that the DTC-ad did not cause any strengthening of the doctor-patient relationship, 84% reported that the DTC-ad caused no strain (Table 4). Gynecologists were more likely to report a strengthening of the relationship as a result of the DTC-ad ($P = .03$), with no difference by specialty for reports of straining the relationship ($P = .80$). The majority of physician respondents (69%) reported that the DTC-ad caused no pressure to order a genetic refer-

ral, with no difference by medical specialty ($P = .94$).

The majority (74%) of physicians reported no difference in number of patient office visits, and 81% reported no difference in number of patient phone calls due to the DTC-ad, with no difference by medical specialty ($P = .96$ and $.50$, respectively; Table 4). Only 14% of physicians reported negative effects of the DTC-ad; 79% reported no effect on daily clinical practice. Gynecologists were more likely to report the DTC-ad had a positive effect on their clinical practice ($P = .04$).

Genetic counseling referrals during the DTC-ad increased 240% compared with the same months 1 year before the DTC-ad (data not shown). During the DTC-ad, fewer women with a high probability of a mutation were referred than the year before (48% vs 69%; $P < .01$). The percentage of referred patients undergoing counseling did not change between the 2 time periods, and the percentage of testing uptake varied but reflected the change in mutation probability among referred patients.

DISCUSSION

Even after completion of Myriad's DTC-ad, controversy about its potential effects continued.^{26,27} To our knowledge, our study is the first to report effects based on data, and overall, the data show that few negative effects actually occurred.

The DTC-ad caused little anxiety or confusion among our patient survey respondents and little report of patient anxiety among the physician survey respondents. This may reflect Myriad's use of focus groups to design an advertisement that did not frighten women.²⁸

Although the DTC-ad caused little anxiety overall, those with higher risk perceptions reported more anxiety. This finding is consistent with breast cancer literature on risk perception and anxiety, and may in part reflect the fact that the Myriad advertisement cast a wide net when targeting women "with a family history of breast cancer."²⁹ Without a more specific definition of family history, it is likely that women with higher perceived breast cancer risk would consider themselves to be at a higher probability for a mutation, regardless of their true mutation risk, and feel some level of anxiety when viewing ads for genetic testing.

Our finding that Hispanics, the fastest growing ethnic group in the United States, are more likely to have an anxious response to the advertisement merits further investigation. Although the DTC-ad was only in English, we do not believe a language barrier to be the most likely explanation, because our survey also was only in English. The better potential explanation may be found in cultural studies of cancer control interventions,

Table 3. Patient Knowledge of Cancer Genetics by Reported Exposure to Myriad Genetic Laboratories, Inc's Direct-to-Consumer Advertising Campaign for BRACAnalysis, Kaiser Permanente Colorado, 2003 (n = 394)

Knowledge Question [†]	No. (%)		P [‡]
	Did See DTC-ad	Did Not See DTC-ad	
Mammogram will always detect breast cancer			
True	8 (3.3)	9 (6.0)	.21
False	220 (89.8)	125 (83.9)	
Don't know	17 (6.9)	15 (10.1)	
Breast cancer is always inherited[†]			
True	1 (0.4)	2 (1.3)	.33
False	221 (90.2)	128 (85.9)	
Don't know	23 (9.4)	19 (12.8)	
If a woman looks like or has the personality of relative with breast cancer, she is likely to have inherited the gene[†]			
True	9 (3.7)	6 (4.0)	.05
False	207 (84.5)	112 (75.2)	
Don't know	29 (11.8)	31 (20.8)	
All women with the gene for breast cancer will get breast cancer[†]			
True	12 (4.9)	5 (3.3)	.61
False	188 (76.7)	112 (75.2)	
Don't know	45 (18.4)	32 (21.5)	
A genetic test for breast cancer will detect other abnormalities			
True	22 (9.0)	17 (11.4)	.53
False	77 (31.4)	40 (26.9)	
Don't know	92 (59.6)	92 (61.7)	
Men can carry a gene for breast cancer[†]			
True	173 (70.6)	95 (63.8)	.37
False	7 (2.9)	5 (3.4)	
Don't know	65 (26.5)	49 (32.9)	
A woman who does not have an altered gene can still get breast cancer[†]			
True	207 (84.5)	104 (69.8)	<.01
False	1 (0.4)	5 (3.4)	
Don't know	37 (15.1)	40 (26.9)	
There is more than 1 gene that can increase breast cancer risk[†]			
True	109 (44.5)	63 (42.3)	.31
False	4 (1.6)	0 (0.0)	
Don't know	132 (53.9)	86 (57.7)	
The gene for breast cancer can also increase risk for other cancers[†]			
True	93 (38.0)	44 (29.5)	.09
False	10 (4.1)	12 (8.1)	
Don't know	142 (58.0)	93 (62.4)	

DTC-ad indicates direct-to-consumer advertising.

*Knowledge questions were taken from reference 25.

†All P values were obtained using the chi-square test of proportions or Fisher's exact test.

‡These questions are specifically addressed in the Myriad Genetic Laboratories, Inc's DTC-ad campaign for BRACAnalysis.

which suggest that selected attitudes about cancer among Latinas fit a cultural theme of *fatalismo* and that there is very little one can do to prevent getting cancer.³⁰⁻³² Latinas also may be more concerned about the disadvantages of genetic testing.³³

The impact on test ordering was less pronounced, likely due to the KPCO testing criteria and due to access delays, as the majority of the referral increase was among lower risk women not meeting those testing criteria.³⁷

Our patient knowledge findings affirm previous work showing misconceptions about BRCA1/2 among the general population. A study conducted concurrently by the Centers for Disease Control and Prevention on the effects of Myriad's marketing campaign reported little difference in knowledge of genetic testing between women in the general population in the DTC-ad cities versus women in the control cities.³⁴ Our study assessed knowledge of breast cancer genetics (vs testing) by self-reported exposure to the advertisements. Although the difference in knowledge score by exposure was modest, the DTC-ad may have contributed to lessening patient misconception. Similar to data regarding pharmaceutical DTC advertising, the physician findings also support that this DTC-ad may have contributed to better patient understanding.^{35,36}

More in-depth analysis of our work showed that the DTC-ad caused an increase in demand for genetic services at KPCO.³⁷ Compared with a health plan in a non-DTC-ad market, KPCO saw a marked impact on cancer genetic services in terms of overall volume and on the risk level of patients being referred.³⁷

Table 4. Physician Report of Effects of Myriad Genetic Laboratories, Inc's Direct-to-Consumer Advertising Campaign for BRACAnalysis on Routine Clinical Care by Medical Specialty, Kaiser Permanente Colorado, 2003 (n = 97)

Question	Total	No. (%) by Provider Specialty			P*
		FP	IM	Ob/Gyn	
Undue patient anxiety					
Very	3 (3.0)	1 (3.2)	1 (2.6)	1 (3.7)	.96
A little	31 (32.0)	9 (29.0)	12 (30.8)	10 (37.0)	
Not at all	63 (65.0)	21 (67.7)	26 (66.7)	16 (59.3)	
Time to correct patient misconceptions					
Very	19 (19.6)	6 (19.4)	7 (18.0)	6 (22.2)	.07
A little	22 (22.7)	6 (19.4)	5 (12.8)	11 (40.7)	
Not at all	56 (57.7)	19 (61.3)	27 (69.2)	10 (37.0)	
Doctor-patient relationship strengthened					
Very/somewhat	6 (6.2)	1 (3.2)	0 (0)	5 (18.5)	.03
A little	13 (13.4)	3 (9.7)	5 (12.8)	5 (18.5)	
Not at all	78 (80.4)	27 (87.1)	34 (87.2)	17 (63.0)	
Doctor-patient relationship strained					
Very/somewhat	7 (7.2)	2 (6.5)	3 (7.7)	2 (7.4)	.81
A little	8 (8.3)	1 (3.2)	4 (10.3)	3 (11.1)	
Not at all	82 (84.5)	28 (90.3)	32 (82.1)	22 (81.5)	
Pressure to order referral					
Very/somewhat	10 (10.3)	3 (9.7)	4 (10.3)	3 (11.1)	.94
A little	20 (20.6)	6 (19.4)	7 (18.0)	7 (25.9)	
Not at all	67 (69.1)	22 (71.0)	28 (71.8)	17 (63.0)	
Change in daily office visits					
Little increase or increase	25 (25.8)	8 (25.8)	8 (20.5)	9 (33.3)	.96
No difference	72 (74.2)	23 (74.2)	31 (79.5)	18 (66.7)	
Change in daily telephone calls					
Little increase or increase	18 (18.6)	5 (16.1)	7 (18)	6 (22.2)	.50
No difference	79 (81.4)	26 (83.9)	32 (82.1)	21 (77.8)	
Effect of DTC-ad on clinical practice overall					
Very positive or somewhat positive	6 (6.2)	1 (3.2)	0 (0)	5 (18.5)	.04
No effect	77 (79.4)	25 (80.7)	32 (82.1)	20 (74.1)	
Very negative or somewhat negative	14 (14.4)	5 (16.1)	7 (18.0)	2 (7.4)	

DTC-ad indicates direct-to-consumer advertising; FP, family practice; IM, general internal medicine; Ob/Gyn, obstetrician/gynecologist. *All P values were obtained by the chi-square test of proportions or Fisher's exact test.

Our provider survey, however, additionally shows that the DTC-ad led to little demand on primary care services in that there was little reported increase in office visits or telephone calls during the active DTC-ad period. This may in part reflect KPCO utilizing a screener to identify family history that meets KPCO cancer genetic referral guidelines, thereby making it easy for KPCO providers to make a referral.

While impact on daily volume did not increase, we also found that the DTC-ad did not lead to more demands on the physician in terms of pressure to order a referral or strain on the patient-provider relationship. Further, we found no overall negative effect of the DTC-ad on physicians' daily practice. These data are differ-

ent in magnitude from pharmaceutical DTC-ad effects and may indicate a difference between DTC-ad for genetic versus nongenetic products.

Our survey work is limited by response rate, which may be attributable to lack of financial incentives. With few data on nonrespondents, we cannot be sure of the impact of selection bias. For the patient survey, a \$3 video coupon was available only to survey respondents. Our physician survey was abbreviated to enhance the response rate, as we were unable to afford any incentive. The KPCO response may not be generalizable to women in MCOs in other geographic regions or to those with health coverage where counseling and testing are not covered benefits.

Perhaps more importantly, however, we did not capture the effect of local media on patients' survey responses. Media in the Denver metropolitan area included newspaper, television, and radio commentaries. We also did not capture awareness of benefit coverage. Such factors may have influenced women's perceptions regarding their own risk, genetic testing, and the DTC-ad.

However, this study is the only effort to our knowledge that quantifies the effect of the DTC-ad at the patient, provider, and health-system levels. Further, MCOs are unique in their ability to assess these outcomes independent of concerns about testing costs (more than \$2700 in 2003) or about the financial implications of referral.

CONCLUSION

It appears that Myriad conducted a DTC-ad campaign with little negative impact outside of targeting too broad an audience, which drove patient demand for genetic information. Future advertising, however, could be markedly different in content or framing and thereby have markedly different outcomes. Thus, efforts for national DTC-ad standards should continue, and these efforts should consider rigorous study designs for more conclusive understanding of benefits and harms. Additionally, providers and payers should be aware that in the age of DTC-ad, provision of genetic services may require new models of delivery.

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