

# Relationships as Medicine: Quality of the Physician–Patient Relationship Determines Physician Influence on Treatment Recommendation Adherence

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**Objective.** To determine whether quality of physician–patient relationships influences uptake of physician treatment recommendations in men with clinically localized prostate cancer (PCa).

**Study Setting.** Data were collected July 2010 to August 2014 at two cancer centers and three community facilities.

**Study Design.** Analyses were prospective and cross-sectional. We modeled associations between quality of the patient–physician relationship and influence of physician recommendations on treatment choice using generalized estimating equations (GEE).

**Data Collection.** Data were collected via survey and medical record abstraction.

**Principal Findings.** Participants ( $N = 1166$ ) were 14.7 percent minority; 37.1 percent had low-, 47.5 percent had intermediate-, and 15.4 percent had high-risk PCa. Those reporting a better physician–patient relationship perceived that their physician's treatment recommendation was more influential ( $RR = 1.05$ , 95 percent CI = 1.04–1.05,  $p < .001$ ) and were more likely to choose the recommended treatment ( $OR = 2.92$ , 95 percent CI = 2.39, 3.58,  $p < .001$ ). A pattern of interactions emerged indicating that quality of the physician–patient relationship was more strongly associated with influence of recommendations for more, versus less aggressive treatment in those with low-risk, but not intermediate-risk disease.

**Conclusions.** Prioritizing quality of the physician–patient relationship through training, practice change, and patient feedback may increase adherence. However, strategies need to align with efforts to reduce physician recommendations for ineffectual treatments to prevent overtreatment.

**Key Words.** Patient-centered care, physician–patient relationship, prostate cancer, adherence, overtreatment

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There are many clinical contexts in which patients are likely to have better health or better clinical outcomes if they are adherent to their physicians' recommendations, including smokers counseled to quit smoking, individuals with chronic disease advised to make lifestyle changes, and people having difficulty managing their medication regimens. There is extensive evidence that nonadherence to medication, screening, and lifestyle change result in poorer patient outcomes, and avoidable hospitalizations and medical costs (DiMatteo et al. 2002; Sokol et al. 2005; Harmon, Lefante, and Krousel-Wood 2006; Simpson et al. 2006). Improvements in health and reductions in waste are possible if medication adherence can be improved (Bender 2014). In contrast, following physician recommendations can have negligible or adverse clinical effects when recommended treatments lack clinical efficacy or costs outweigh benefits. This is an issue of growing concern (Cassel and Guest 2012; Loeb et al. 2014) and many tests and procedures may fall into this category (American Board of Internal Medicine [ABIM] Foundation 2015). A key to identifying ways to control both under- and overtreatment may be better understanding how the relational context between patients and their physicians influences adherence to physician recommendations.

Reviews and editorials have identified an important role for physicians in promoting medication or screening adherence, and lifestyle change (Lyznicki et al. 2001; Stead et al. 2013). In a self-report survey of respondents from 17 countries across four continents that asked about generalized tendencies to adhere to medical advice, nonadherence tendencies were lower among those who reported better quality relationships with their providers or if their providers were more patient-centered communicators (Camacho, De Jong, and Stremersch 2014). A number of studies have demonstrated that greater trust in physicians is associated with improved treatment adherence (Piette et al. 2005; Nguyen et al. 2009; Hillen, de Haes, and Smets 2011; Anhang Price et al. 2014; Bauer et al. 2014), cancer screening (Hillen, de Haes, and Smets 2011), lifestyle change (Jones et al. 2012), and ultimately better clinical outcomes (Lee and Lin 2009). More patient-centered care, where patients are involved in decision making by the physician, is also associated with better adherence (Trachtenberg, Dugan, and Hall 2005; Bauer et al. 2014). In sum,

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there is mounting evidence that the quality of the patient–physician relationship is an important factor in treatment adherence and therefore is likely to ultimately improve patient outcomes and health care efficiency.

Trusting, close, patient-centered relationships with one’s physician could, however, have an unintended negative consequence. Trusting one’s physician has been associated with cancer patients being less involved in treatment decision making and more likely to follow their physicians’ cancer treatment recommendations (Hillen, de Haes, and Smets 2011). If physicians recommend treatments that are unnecessary or conflict with patient preferences and values, patients may not ultimately choose the best course of treatment for themselves.

Prostate cancer treatment decision making is a suitable model for studying the influence of the physician–patient relationship on treatment decision making, including the potential for physicians to encourage unnecessary treatment. There are multiple treatment options available to men with localized PCa, including surgery and radiotherapy. The treatments have different side effect profiles that include incontinence, erectile dysfunction, and bowel pain and dysfunction. Active surveillance, or periodic monitoring of the cancer, may also a viable option for men with low-risk disease (Klotz et al. 2010; Mohler et al. 2010). Given multiple treatment options and risk for significant side effects, it has been recommended that patients and providers collectively weigh clinical indicators with the benefits and risks of each (Thompson et al. 2007). As men and their physicians can choose between multiple options, factors other than clinical information likely influence the treatment men receive. For example, there may be considerable variability in the influence of the quality of the physician–patient relationship on PCa treatment choice, making PCa treatment decision making a suitable model for detecting such a relation. Furthermore, prostate cancer is both under- and overtreated (Cooperberg et al. 2007; Corcoran, Peele, and Benoit 2010; Loeb et al. 2014); therefore, it also offers the opportunity to examine whether the physician–patient relationship can play a role in increasing the likelihood of overtreatment.

Previously, we found an association between quality of patients’ relationships with their physicians and perceived influence of PCa patients’ treatment recommendations in a small sample of men who went on to choose active surveillance (Orom et al. 2014). In the present study, we expand this inquiry to a large sample of PCa patients recruited at, or shortly after, diagnosis who were followed longitudinally. Our goals were twofold: (1) to test whether quality of patients’ relationships with their physicians is associated with influence of treatment recommendations for men who go on to choose

any of the main treatments for PCa (active surveillance, surgery, radiation), and (2) we wanted to evaluate whether more positive physician–patient relationships play a role in encouraging adherence to physician recommendations for aggressive treatment given to men with low-risk disease. To test the latter, we explored whether the association between quality of the relationship and influence of physician recommendations varies depending on the severity of the disease and the aggressiveness of the recommended treatment.

## METHODS

### *Procedure*

Data were from a larger longitudinal study of PCa treatment decision making and survivorship (Orom et al. 2015, 2016; Mollica et al. 2016). Participants with newly diagnosed clinically localized PCa were approached at two comprehensive cancer centers and three community facilities between July 2010 and August 2014. Participants were approached at a postbiopsy consultation, shortly after diagnosis, or at a second opinion visit. Participants completed a baseline survey upon enrolling in the study and a second survey after they had made their treatment decision, but prior to treatment. The first survey was completed in the clinic, or if patients did not have time to complete it in the clinic, they were permitted to finish completing it at home and to return it by mail. The second survey was completed at home and returned by mail. Clinical data were abstracted from participants' medical records. Study procedures were institutional review board–approved and participants completed a written informed consent.

### *Study Sample*

Of 5,202 patients who were eligible to participate, 3,337 (64 percent) were approached. Of these, 2,476 (74.2 percent) consented to participate and 2,008 completed the first survey. Men were eligible to be included in the study sample if they had also completed a second survey and had medical record data ( $N = 1,631$ ) and had received at least one physician recommendation for active surveillance, prostatectomy or external beam radiation, but were not one of the 23 men who received more than one recommendation from a given physician ( $n = 1,281$ ). We also excluded participants who identified as a race/ethnicity other than Hispanic, non-Hispanic white, or non-Hispanic black (hereafter referred to as white and black) ( $n = 21$ ); or had missing values on any of the

person-level variables included in the multivariable analyses (employment, marital status, race/ethnicity, recruitment site, treatment choice, D'Amico risk score, age, and education) ( $n = 94$ ). The final sample contained 1,166 individuals. Attrition reduced diversity in the final sample. Participants who did not complete the second survey were more likely to have high-risk rather than low-risk disease, to be unmarried, and to be of minority race/ethnicity ( $p < .05$ ).

## MEASURES

### *Predictor Variables*

*Physician–Patient Relationship Composite Variable.* As PCa patients often consult more than one physician prior to making their treatment decision, including seeking second opinions from urologists and radiation oncologists, we asked participants to rate their relationships with up to five physicians. Shortly after making their treatment decision, but prior to treatment (second survey), participants rated the urologist who diagnosed the cancer (urologist 1), up to three physicians from whom they received second opinions (urologist 2, radiation oncologist 1, radiation oncologist 2), and a primary care physician if they consulted him or her about their PCa. Participants completed retrospective ratings of trust, closeness, and physician's participatory decision-making style for each physician. *Trust in physician* was assessed with a 10-item measure of patient trust in physicians (range = 1–5) (Kao et al. 1998). *Closeness with physician* was assessed with an adapted Inclusion of Other in the Self (IOS) scale (Aron, Aron, and Smollan 1992). Participants were shown seven overlapping circles that represent increasing closeness between patient and physician and choose the set of circles that best represents how close they feel to a given physician (range = 1–7). *Participatory decision-making style* was assessed with the 3-item Participatory Decision Making (PDM) scale (Kaplan et al. 1995) (range = 0–100). As trust, closeness, and participatory decision-making style were correlated ( $r = 0.25$ – $0.53$ ,  $p < .001$ ), we summed the z-scores for these three constructs, creating a composite measure of quality of the patient–physician relationship.

### *Outcome Variable*

In the second survey, for each physician they had consulted, participants were asked to indicate whether they had received a treatment recommendation. *Perceived influence of treatment recommendation* from a given physician was assessed with the item: "How much was your decision influenced by the

urologist's/radiation oncologist's/primary care physician's recommendation? (Not at all/A little/Quite a bit/Very much)" (range = 1–4).

In the second survey, we also assessed which treatment had been recommended (active surveillance/surgery/external beam radiation). Treatment received was confirmed via medical record abstraction. *Match between treatment recommended and received* was generated by coding each recommendation as either matching or not matching the treatment that the patient ultimately received.

### *Covariates/Moderators*

*Demographic and clinical characteristics.* In the baseline survey, we assessed self-reported race/ethnicity, years of education, household income, employment status, marital status, and date of birth from which age at diagnosis was calculated. To test the relation between quality of the physician–patient relationship and influence of treatment recommendations above and beyond clinical information likely to inform treatment recommendations and patient treatment choice, we controlled for D'Amico risk scores, a widely used system for categorizing PCa disease risk (Lughezzani et al. 2010). To calculate the scores, we abstracted clinical stage, pretreatment biopsy Gleason score, and pretreatment PSA from participants' medical records. Low-risk PCa was defined as clinical stage PSA  $\leq$ 10 ng/ml, Gleason score  $\leq$ 6, and American Joint Commission of Cancer Staging (AJCC) less than cT2b (D'Amico et al. 1998). Intermediate-risk PCa was defined as PSA >10 and  $\leq$ 20 ng/ml or Gleason 7 disease or AJCC cT2b. High-risk disease was defined as PSA >20 ng/ml or Gleason 8–10 disease or AJCC cT2c or higher (D'Amico et al. 1998). D'Amico risk score was also used as a moderator. We also controlled for *recruiting site*.

The type of *physician who made a given recommendation* was included as a covariate in multivariable models. This could be one of five physicians: the first urologist who diagnosed the cancer, a second urologist who provided a second opinion, a first radiation oncologist who would have been seen as part of a multidisciplinary team or for a second opinion, a second radiation oncologist, or the patient's primary care provider, if he or she made a treatment recommendation.

### *Data Analysis*

The unit of analysis for the main multivariable analyses was the physician–patient dyad (participants could report on up to five physicians), rather than

the participant. We estimated the relationship between quality of the relationship with the physician and recommendation influence across all physician-patient dyads. To test whether quality of the relationship with the physician could contribute to men with low-risk disease receiving aggressive treatment, we tested a three-way interaction between quality of the relationship, cancer risk, and type of treatment recommended. We expected there to be a stronger relationship between quality of the physician relationship and influence of the treatment recommendation for men with low-risk disease advised to choose aggressive treatment compared to other participants. We tested for main effects and effects of this three-way interaction on both perceived recommendation influence and match between treatment recommended and treatment received. We used generalized estimating equations (GEE) models to account for nonindependence of predictors and outcomes (Liang and Zeger 1993). Gaussian family was specified for the continuous outcome (relationship quality); negative binomial family was specified for the ordinal outcome (influence of recommendation) and binomial family for the binary outcome (match between treatment recommended and received). An exchangeable correlation structure was specified along with robust standard errors. For all multivariable models, we used robust standard errors so that if the nature of the correlation structure was not correctly specified, the standard errors would still be valid.

We controlled for age at diagnosis, education, race/ethnicity, employment status, marital status, recommending physician type (specialty and order), and site where participants were recruited in all multivariable models. We controlled for D'Amico risk and type of recommendation received unless the variables were moderators. Insurance status was not included as a covariate because only three participants were without health care coverage and income was not included because 15.1 percent had missing data for the variable and it was correlated with education ( $r = 0.41, p < .001$ ).

## RESULTS

### *Descriptive Analyses*

Demographic and clinical characteristics of the sample are found in Table 1. The sample was mostly white, married, and well educated. Household incomes were high; 54.3 percent had a household income of \$100,000 or greater. The most common treatment received was surgery (51.1 percent) followed by active surveillance (26.2 percent) and external beam radiation (22.7 percent). Among 2,216 recommendations, 19.6 percent were for active

Table 1: Participant Characteristics ( $N = 1,166$ )

| <i>Characteristic</i> | <i>N</i> | <i>% or Mean (SD)</i> |
|-----------------------|----------|-----------------------|
| D'Amico risk          |          |                       |
| Low                   | 433      | 37.14                 |
| Intermediate          | 554      | 47.51                 |
| High                  | 179      | 15.35                 |
| PSA at diagnosis      |          |                       |
| <10                   | 1,014    | 86.96                 |
| 10 to <20             | 111      | 9.52                  |
| ≥20                   | 41       | 3.52                  |
| Income                |          |                       |
| <25,000               | 58       | 5.86                  |
| 25,000–49,999         | 107      | 10.81                 |
| 50,000–74,999         | 142      | 14.34                 |
| 75,000–99,999         | 145      | 14.65                 |
| ≥100,000              | 538      | 54.34                 |
| Race/ethnicity        |          |                       |
| Non-Hispanic white    | 995      | 85.33                 |
| Non-Hispanic black    | 111      | 9.52                  |
| Hispanic              | 60       | 5.15                  |
| Age at diagnosis      |          | 62.81 (SD = 8.03)     |
| Employed              | 704      | 60.38                 |
| Education             |          |                       |
| <12 years             | 36       | 3.09                  |
| 12 years              | 199      | 17.07                 |
| 13–16 years           | 515      | 44.17                 |
| 17 to ≥20 years       | 416      | 35.68                 |
| Married/cohabitating  | 990      | 84.91                 |
| Treatment received    |          |                       |
| Active surveillance   | 305      | 26.16                 |
| Radiation             | 265      | 22.73                 |
| Surgery               | 596      | 51.11                 |
| Site                  |          |                       |
| 1                     | 454      | 38.94                 |
| 2                     | 280      | 24.01                 |
| 3                     | 89       | 7.63                  |
| 4                     | 196      | 16.81                 |
| 5                     | 147      | 12.61                 |

*Notes.* For income, percentages were calculated based on valid data.

surveillance, 32.3 percent were for radiation and 48.1 percent were for surgery; 77.4 percent of the time participants chose a recommended treatment.

#### *Factors Associated with Physician–Patient Relationship Quality*

When all covariates were entered in a model predicting perceived quality of the physician–patient relationship (Table 2), having intermediate rather than

Table 2: Predictors of Physician–Patient Relationship Quality

|                      | (N = 1,165)            |
|----------------------|------------------------|
|                      | B (95% CI)             |
| D'Amico risk         |                        |
| Intermediate         | 0.10* (0.01, 0.18)     |
| High                 | 0.04 (-0.08, 0.15)     |
| Physician type       |                        |
| Urologist 2          | 0.35** (0.28, 0.42)    |
| Rad Oncologist 1     | -0.02 (-0.09, 0.05)    |
| Rad Oncologist 2     | 0.28** (0.17, 0.40)    |
| Primary care         | 0.65** (0.56, 0.74)    |
| Recommendation       |                        |
| Radiation            | -0.51** (-0.63, -0.40) |
| Surgery              | -0.25** (-0.36, -0.15) |
| Race/ethnicity       |                        |
| Non-Hispanic black   | 0.00 (-0.14, 0.15)     |
| Hispanic             | -0.08 (-0.26, 0.09)    |
| Age at diagnosis     | 0.01* (0.00, 0.01)     |
| Employed             | -0.01 (-0.10, 0.07)    |
| Years of education   | 0.01 (-0.00, 0.02)     |
| Married/cohabitating | 0.08 (-0.02, 0.18)     |

*Notes.* Referent groups were low-risk disease, urologist 1, recommendation for active surveillance, non-Hispanic white, not employed, and not married; \* $p < .05$ , \*\* $p < .001$ . Facility at which participants were recruited was included in all of the models; however, output for this variable was not included as comparisons between sites are arbitrary.

low-risk disease and older age were associated with higher quality relationships. Table 2 also shows that, compared to the diagnosing urologist, participants reported better relationships with the second urologist, second radiation oncologist, and primary care physician, but not the first radiation oncologist. Receiving recommendations for radiation and surgery compared to active surveillance was associated with reporting lower quality relationships.

### Main Effects for Recommendation Influence

As predicted, reporting a better relationship with a physician was associated with greater perceived influence of the physician's treatment recommendation (RR = 1.05, 95 percent CI = 1.04–1.05,  $p < .001$ ) (Table 3, Model 1). It was also associated with a greater likelihood that the treatment recommended was the treatment chosen (OR = 2.92, 95 percent CI = 2.39, 3.58,  $p < .001$ ) (Table 3, Model 2). Of note, the three constructs combined to create the quality composite variable (trust in physician, closeness with physician, shared decision-making style of physician) were each associated with greater

Table 3: Predictors of Influence of Physician Recommendations

|                      | <i>Model 1: Perceived Influence of Recommendation<br/>(N = 1,163)<br/>RR (95% CI)</i> | <i>Model 2: Match between Treatment Recommended and Received<br/>(N = 1,164)<br/>OR (95% CI)</i> |
|----------------------|---|--|
| Relationship quality | 1.05*** (1.04, 1.05)  | 2.92*** (2.39, 3.58)   |
| D'Amico risk         |   |  |
| Intermediate         | 1.01** (1.00, 1.02)   | 2.32*** (1.64, 3.30)   |
| High                 | 1.02* (1.00, 1.03)  | 4.33*** (2.64, 7.10)   |
| Physician type       |   |  |
| Urologist 2          | 1.03*** (1.02, 1.03)  | 1.86** (1.31, 2.65)  |
| Rad Oncologist 1     | 1.01** (1.00, 1.02)   | 1.27* (1.00, 1.60)   |
| Rad Oncologist 2     | 1.03*** (1.02, 1.04)  | 2.24* (1.19, 4.18)   |
| Primary Care         | 0.98** (0.97, 0.99)   | 0.90 (0.54, 1.48)  |
| Recommendation       |   |  |
| Radiation            | 0.95*** (0.94, 0.96)  | 0.09*** (0.05, 0.17)   |
| Surgery              | 0.97*** (0.96, 0.98)  | 0.85 (0.45, 1.62)  |
| Race/ethnicity       |   |  |
| Non-Hispanic black   | 1.01 (1.00, 1.02)   | 1.25 (0.71, 2.19)  |
| Hispanic             | 1.03** (1.01, 1.05)   | 2.24* (1.00, 4.99)   |
| Age at diagnosis     | 1.00 (1.00, 1.00)   | 1.03 (1.00, 1.05)  |
| Employed             | 1.00 (0.99, 1.01)   | 0.82 (0.58, 1.15)  |
| Years of education   | 1.00 (1.00, 1.00)   | 0.98 (0.93, 1.03)  |
| Married/cohabitating | 1.00 (1.00, 1.01)   | 1.15 (0.77, 1.73)  |

*Notes.* Referent groups were low-risk disease, urologist 1, recommendation for active surveillance, non-Hispanic white, not employed, and not married; \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Facility at which participants were recruited was included in all of the models; however, output for this variable was not included as comparisons between sites are arbitrary.

perceived influence of treatment recommendations and likelihood of match between treatment recommended and received ( $p < .001$ ; results not shown in tables).

There were a number of other factors associated with perceived influence of recommendations (Table 3). Recommendations for radiation and surgery were perceived as less influential than recommendations for active surveillance. Physician recommendations were perceived as more influential by participants with intermediate- or high-risk disease than participants with low-risk disease. Second opinions were perceived as more influential than recommendations from participants' first (diagnosing) urologists, and recommendations from primary care physicians were less influential than those from their first urologists. Hispanics, but not blacks, reported that physician recommendations were more influential compared to whites. The pattern of results was nearly the same when the outcome was matched between treatment recommended and received, with two exceptions. When the recommendation

was active surveillance rather than surgery, the likelihood that the treatment received matched the treatment recommended did not differ and when the recommendation from a primary care provider rather than the first urologist, the likelihood of match did not differ.

We were interested in exploring whether more positive physician–patient relationships play a role in encouraging adherence to physician recommendations for aggressive treatment provided to men with low-risk disease. To examine this possibility, we tested whether there was a three-way interaction between relationship quality, disease aggressiveness, and type of treatment recommended. There was a significant three-way interaction and a pattern of results that partially supported our hypothesis. Among men with low-risk disease, but not intermediate-risk disease, the association between relationship quality and perceived influence of recommendations was significantly stronger for surgery (1.03, 95 percent CI = 1.00, 1.05,  $p = .02$ ) and radiation (1.02, 95 percent CI = 1.00, 1.05,  $p = .05$ ) than active surveillance. This was also true at the trend level for match between recommended and received treatment ( $OR = 2.79$ , 95 percent CI = 0.86, 9.03,  $p = .09$ ). In other words, quality of the relationship plays a larger role in the influence of physician recommendations when physicians recommended aggressive therapy to men with low-risk disease, for whom definitive treatment may not be necessary, than when recommending aggressive therapy to men with intermediate disease who are more likely to benefit. However, it was also the case that the association between quality of the relationship and influence of the recommendation was stronger for men with high-risk disease receiving a recommendation for surgery ( $RR = 1.05$ , 95 percent CI = 1.01, 1.10,  $p = .02$ ) and radiation ( $RR = 1.07$ , 95 percent CI = 1.02, 1.12,  $p = .009$ ) than for their counterparts receiving a recommendation for active surveillance. The pattern was similar for match between recommended and received treatment in men with high-risk disease recommended radiation rather than active surveillance ( $OR = 6.18$ , 95 percent CI = 1.43, 26.62,  $p = .02$ ). These results should be interpreted with caution as only 27 men with high-risk disease received recommendations for active surveillance.

## DISCUSSION

Quality of the relationship with the physician was associated with both greater perceived influence of physician treatment recommendations and whether patients chose a treatment that was recommended. Results confirm how

important patients' relationships with their physicians are to whether they adopt recommended treatments. For example, a one-point increase in the quality of the relationship was associated with nearly a threefold increase in the odds of adopting the recommended treatment. Findings contribute to the growing body of evidence that patient centeredness and quality of physician-patient communication are essential for treatment adherence (Anhang Price et al. 2014) and do so in male cancer patients who have been somewhat less studied with respect to this issue.

Relationship quality was a composite of the extent to which participants perceived that their physician shared decision making with them, the extent to which patients trusted their physician, and their closeness with their physician. These constructs were correlated and all three were associated with perceived influence of treatment recommendations and match between treatment recommended and received. Sharing decisional control over treatment decision making is the core of patient-centered communication and a patient's trust in his or her physician is a key outcome (Epstein and Street 2007; Barry and Edgman-Levitin 2012). It is also possible that recommendations from physicians who share decisional control are more influential because they are more consistent with patients' values. Patient closeness with their physician has been examined less frequently, but it is a logical outcome of patient-centered care where physicians respond empathetically to their patients' concerns and suffering. Closeness captures warmth and friendliness, which are predictive of patient attitudes and outcomes, including trust and satisfaction (Hall et al. 2002; Cousin, Schmid Mast, and Jaunin-Stalder 2013). Our results validate efforts to improve the patient centeredness of physician communication and care that has been ongoing for some time (Laine and Davidoff 1996; Epstein and Street 2007). In most instances, patients are likely to benefit and have better outcomes; however, our results also shed light on a potential unintended consequence of patient centeredness. We found that the association between quality of the relationship and influence of the recommendation is stronger when physicians recommended definitive treatment than when physicians recommended active surveillance. In other words, it takes a closer relationship for men to accept a recommendation for aggressive treatment when they have low-risk disease. For men with intermediate disease, the strength of the association between quality of the relationship and influence of the recommendation does not vary as a function of type of treatment recommended. Sometimes physicians may recommend unnecessary treatment and to the extent that patients are close to, trusting of, and feel that their physicians share decision-making control, they may be more likely to be overtreated.

The influence of the quality of the physician–patient relationship on uptake of treatment recommendations is likely found in most clinical contexts, but it may vary in strength depending on the balance of benefits and barriers to following treatment recommendations. When there are few or one treatment option, or consequences of not being treated are serious, the quality of a physician–patient relationship may have less influence on adoption of recommendations than when there are multiple treatment choices, the treatment is aggressive, or there are few short-term consequences to treatment uptake. For example, relationship quality may have more impact on adherence among patients taking medications such as blood pressure medicines or statins, for whom short-term consequences of nonadherence may not be observable, or when there are multiple clinically viable options such as choosing between a clinical trial and standard treatment.

The impact of a high-quality physician–patient relationship may not be universally positive, such as when patients are recommended unnecessary diagnostic tests and treatments or treatments that are inconsistent with the patients' values and preferences. For those concerned about overtreatment, it is heartening that main effects indicate that recommendations for radiation and surgery were less influential than recommendations for active surveillance and that relationships were better among those receiving recommendations for active surveillance compared to radiation or surgery. However, in patients with low-risk disease, recommendations for more aggressive treatment, in particular radiation, are just as influential when patients are especially close to and trusting of their physician; vigilance may be needed to prevent overtreatment in these cases.

As with any study, ours had limitations. Our sample was not representative and had relatively high socioeconomic status. Results may not hold for those with lower socioeconomic status, although education was not associated with perceived relationship quality or influence and income was only weakly associated with perceived influence of recommendations. Our sample's representativeness was further diminished because attrition was greater among men with high-risk disease, men who were unmarried, and minority men. In making retrospective judgments about the influence of their physicians' recommendations, patients who felt more positively about their physicians may have rated these physicians' recommendations as more influential, inflating associations between quality of their relationship with the physician and ratings of influence of the recommendations. Furthermore, perceived influence of the recommendation and quality of the physician–patient relationship were

assessed at the same time limiting our ability to be certain about the causal direction of the relationship.

There is consistent evidence that PCa has been overtreated (Loeb et al. 2014) and similar issues are found in other conditions. It has been estimated that residents of the United States receive only about 55 percent of guideline care and about 10 percent of care is unnecessary or harmful (McGlynn et al. 2003). A nuanced understanding of the role of the physician–patient relationship in promoting adherence to physician recommendations will help focus health care system change on supporting trusting and patient-centered physician–patient relationships, while also avoiding facilitating overtreatment. Current trends in health care that involve both promoting patient-centered care and better informing patients about the costs and benefits of treatment options may be in line with achieving this aim (Shafir and Rosenthal 2012).

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.