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Physicians' Decision-making Style and Psychosocial Outcomes Among Cancer Survivors

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Abstract

Objective—We evaluated pathways linking physicians' decision-making style with cancer survivors' health-related quality of life (HRQOL)

Methods—We analyzed survey data from 623 survivors diagnosed with leukemia, colorectal, or bladder cancer in Northern California, 2–5 years prior to the study. Of these, 395 reported making a medical decision in the past 12 months and were asked about their physician's decision-making style. We evaluated the association of physician style with proximal communication outcomes (trust, participation self-efficacy), intermediate cognitive outcomes (perceived control, uncertainty), and distal health outcomes (physical and mental HRQOL).

Results—Overall, 54% of survivors reported a sub-optimal decision-making style for their physician. With the exception of physical health, physician style was associated with all proximal, intermediate, and distal outcomes ($p < 0.01$). We identified two significant pathways by which a participatory physician style may be associated with survivors' mental health: 1) by increasing survivors' participation self-efficacy and thereby enhancing their perceptions of personal control

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($p < 0.01$); 2) by enhancing survivors' level of trust and thereby reducing their perceptions of uncertainty ($p < 0.05$).

Conclusion—A participatory physician style may improve survivors' mental health by a complex two step mechanism of improving survivors' proximal communication and intermediate cognitive outcomes.

Practice Implications—Physicians who adopt a participatory decision-making style are likely to facilitate patient empowerment and enhance patients' HRQOL.

Keywords

patient-physician communication; participatory decision-making style; cancer survivorship; health-related quality of life; patient outcomes; mediation analysis

1. Introduction

There are more than 10 million cancer survivors living in the U.S. alone [1]. These individuals, at various stages of their cancer journey, are likely to have faced several complex medical decisions related to cancer treatment, symptoms management, surveillance tests, and lifestyle changes, all with potential long-term implications for their health. In part due to the rise of the shared decision-making paradigm and increased consumerism in health care, patients are increasingly expressing a desire for greater involvement in making such decisions [2–7].

Given the reciprocal nature of communication, greater patient involvement is more likely to take place when physicians adopt more participatory decision-making styles [8,9]. However, while there has been extensive work assessing patient preferences for who should make the final decision [10–18], little attention has been paid to examining patient perceptions of their physician's efforts at involving them in the decision-making process. The few studies that have been conducted in this area have reported that a participatory physician style is associated with greater patient satisfaction [19], better patient self-management [20], increased likelihood of patients discussing use of complementary and alternative medicines [21], and lower rates of hospitalization and better health-related quality of life (HRQOL) [22]. These studies however have rarely focused on the oncology setting.

To fully understand the potential impact of physician style, it is important to explore how a participatory decision-making style might lead to improvements in patient health outcomes. In general, studies on patient-clinician communication have not systematically examined the relationship between communication and patient health outcomes [23]. In this study, we examined cancer survivors' perceptions of their physicians' decision-making style and explored the association of physician style with survivors' HRQOL. Based on a conceptual framework developed by Epstein and Street [24], we simultaneously evaluated several pathways by which physician style might be linked with survivors' HRQOL. Epstein and Street [24] suggest that while patient-clinician communication may in some instances exert a direct influence on patient health outcomes, in most situations, “a more complex series of mechanisms links communication to health outcomes.” They propose a two step mediation process where in communication is likely to result in improved distal health outcomes as a result of its association with more immediate/proximal communication outcomes as well as intermediate outcomes.

Figure 1 presents the conceptual model that we empirically tested in this study. Physicians' decision-making style was the main independent variable. Trust in the physician and survivors' self-efficacy for participating in decision-making were used as indicators of

proximal communication outcomes and survivors' perceptions of control and uncertainty were our intermediate cognitive outcomes. As shown in the figure, we examined both the direct association between physician style and survivors' HRQOL (see path A in Figure 1) as well as several mediated pathways that linked physician style with HRQOL (e.g., paths B–F–L; E–M; etc. in Figure 1).

We also explored whether the association between physicians' participatory decision-making style and survivor outcomes may vary with patient preferences for participation in decision-making. The expectancy-value framework proposed by Linder-Pelz [25] as well as a recent study by Xu [26] suggests that relationships between physician behaviors and patient outcomes may not be consistent across all patients and may vary with patient expectations and preferences. We speculated that the salience of a more participatory physician style may be greater for survivors who prefer more active roles in decision-making [9]. Specifically, we explored whether the association between a participatory physician style and survivor outcomes was stronger for those cancer survivors who either wanted to share decision-making control with their physician or who wanted primary responsibility for decision-making, compared to survivors who preferred to delegate decision-making to their physician.

To summarize, our study had the following goals:

1. Assess cancer survivors' reports of the extent to which their follow-up care physician engages in participatory decision-making and identify correlates of physicians' decision-making style;
2. Evaluate the association of physicians' decision-making style with multiple outcomes among cancer survivors:
 - a. self-efficacy for participating in decision-making, trust in physician (proximal);
 - b. perceptions of personal control and uncertainty (intermediate);
 - c. physical and mental components of HRQOL (distal).
3. Examine the mediating effect of proximal and intermediate outcomes on the relationship between physician style and survivors' distal health outcomes;
4. Explore whether the association between physician style and survivor outcomes varies with survivors' participation preferences.

2. Methods

2.1. Study Design

We analyzed patient survey data collected as part of the Assessment of Patient Experiences of Cancer Care study (APECC). APECC is a population-based study designed to assess adult cancer survivors' experiences with their follow-up cancer care. Survivors participating in APECC were diagnosed with either leukemia, colorectal, or bladder cancer 2–5 years prior to the study and were sampled from the Northern California Cancer Center's (NCCC) Surveillance Epidemiology and End Results (SEER) registry. Data collection took place between April 2003 and November 2004. Study procedures were approved by NCCC's Institutional Review Board.

Among the 1,572 survivors eligible to participate in APECC, 774 filled out the survey (response rate: 49.2%). Of the 774 respondents, 623 (80.5%) indicated that they had received cancer-related follow-up care in the past 12 months; 395 of these 623 survivors

reported making at least one medical decision about their cancer care in the past 12 months. Questions assessing physicians' decision-making style were asked of these 395 survivors who formed our analytical sample.

2.2. Measures

Key independent and dependent variables for the study were measured using existing standardized scales when available, in addition to some that were developed by the APECC study team (see appendix 1 for detailed wording of items for the scales we developed). All items on the APECC survey underwent cognitive testing with nine cancer survivors (with diversity in age, race, gender, and cancer type) to ensure that they were interpreted by potential respondents as intended.

2.2.1. Physicians' decision-making style—We developed a five item physicians' decision-making style scale (PDEMS) that measured survivors' perceptions of the extent to which their physician engaged in five key elements of the decision making process [5,28] such as discussing all options, encouraging patients to ask questions and express opinions (see appendix 1). Each item had three response options: yes, definitely; yes, somewhat; and no. Consistent with other studies that used similar response categories [29,30], a response of “yes, definitely” was considered to represent optimal communication. All items loaded on a single factor in a principal components analysis (PCA) which explained 71% of the item variance (item loadings ranged from 0.75–0.89). An overall physician style score was created by computing the mean of the individual item scores which was then linearly transformed on a 0–100 metric; Cronbach's α for the scale was 0.90.

2.2.2. Proximal communication outcomes—We developed a five item, decision-making participation self-efficacy scale (DEPS) that assessed survivors' confidence in engaging in different activities related to decision-making such as letting the physician know if they had questions about his/her recommendation, telling the physician what option they would prefer, etc. All items had five response options ranging from not at all confident to completely confident (see appendix 1). The items loaded on a single factor in a PCA which explained 71% of the item variance (item loadings ranged from 0.72–0.90). A self-efficacy scale score was created by computing the mean of the individual item scores which was then linearly transformed on a 0–100 metric; Cronbach's α was 0.89.

Cancer survivors' trust was measured by the commonly used 11-item Trust in Physician scale [30–32]. The items cover different elements of trust such as technical and interpersonal competency, agency, and confidentiality [33]. An overall trust score was created by computing the mean of the individual item scores which was then linearly transformed on a 0–100 metric; Cronbach's α was 0.90.

2.2.3. Intermediate cognitive outcomes—We measured personal control using a four item perceived personal control (PPC) scale that we had developed in an earlier study, adapting it from existing control scales [34]. Items assessed survivors' perceptions of personal control in four areas related to their cancer: emotional responses, physical side effects, the kind of follow-up care they received, and the course of their cancer. All items had five response options ranging from no control at all to complete control (see appendix 1). An overall perceived personal control score was created by computing the mean of the individual item scores which was then linearly transformed on a 0–100 metric; Cronbach's α was 0.71.

We measured perceived uncertainty among cancer survivors using a six item measure that was used in a study of breast cancer survivors [35,36]. Respondents were asked to state their

agreement or disagreement on a five-point strongly agree to strongly disagree scale to statements such as, “I would like to feel more certain about my health;” “I am bothered by the uncertainty about my health status;” and “When I think about my future health status, I feel some uneasiness.” An overall perceived uncertainty score was created by computing the mean of the individual item scores which was then linearly transformed on a 0–100 metric; Cronbach's α was 0.71. Unlike other outcomes, we scored the scale such that a higher score implied greater uncertainty (i.e., worse outcome).

While we considered perceived control and uncertainty as indicators of survivors' cognitive health appraisal, we do acknowledge that these variables are composed of both affective and cognitive dimensions.

2.2.4. Distal health outcomes—We measured cancer survivors' HRQOL using version 2 of the Short Form-36 (SF-36®) health survey, a standardized measure of HRQOL that has been used extensively in both general and disease-specific populations [37,38]. Items on the SF-36 result in 8 subscales; scores from these 8 subscales are used to calculate two summary health scores, the Physical Component Summary (PCS) and the Mental Component Summary (MCS). SF-36 scores on the subscales and the summary scales are standardized on a T-score metric based on 1999 U.S. general population norms with a mean of 50 (sd=10). PCS and MCS scores were used in our analyses as indicators of survivors' physical and mental health.

2.2.5. Patient role preferences—We used the control preferences scale (CPS) [10,12,14] to assess cancer survivors' preference for the role they wanted to play in medical decisions about their follow-up cancer care. The CPS asks respondents to choose from one of five options. Survivors who indicated that they would prefer to make decisions either with little or no input from their physician or after seriously considering their physician's opinion were classified as preferring patient control; those who preferred that they and their physician make decisions together were classified as preferring shared control; and survivors who preferred their physician to make decisions either after seriously considering their opinion or with little or no input from them were classified as preferring physician control.

2.3. Data Analyses

2.3.1. Sample description—We generated descriptive statistics to describe the study sample by several sociodemographic characteristics (age, race/ethnicity, education, income, gender, employment status, marital status, residence in a medically underserved area, and health insurance coverage), clinical characteristics (type of cancer, cancer recurrence, number of comorbid conditions, receipt of cancer treatment in the past 12 months, years since diagnosis, and perceived health status), and follow-up care related variables (physician specialty, physician gender, gender match between patient and physician, length of relationship, and number of visits in the past 12 months). We conducted bivariate chi-square and t tests to assess differences between survivors who reported a medical decision in the past 12 months and those who did not.

2.3.2. Correlates of physicians' decision-making style—We first conducted bivariate chi-square and t tests to assess the association between the several sociodemographic, clinical, and follow-care related variables described above and physicians' decision-making style. The physician style scale (PDEMS) had large ceiling effects (45.9%). Given this skewed distribution and also to facilitate interpretation, we dichotomized the scale scores such that respondents who reported optimal physician communication for each of the five PDEMS items were scored as having a physician with an optimal, participatory decision-making style (i.e., those at the ceiling) and the rest were

scored as suboptimal physician style. Next, we conducted backward stepwise logistic regression analysis to identify the set of variables uniquely associated with physician style (optimal, participatory v/s suboptimal).

2.3.3. Physicians' decision-making style and patient outcomes—Prior to examining potential pathways linking physicians' decision-making style with survivors' HRQOL, we conducted bivariate t-tests to assess the association of physician style with survivors' proximal, intermediate, and distal outcomes. To validate our findings based on the dichotomous physician style variable, we conducted a sensitivity analysis by creating a three-level physician style variable based on three distinct groups identified from the score distribution of the PDEMS scale (bottom 23%, middle 31%, top/ceiling 46%). Our analyses showed very similar associations between physician style and the various survivor outcomes for both the dichotomous and trichotomous physician style variables (data not shown).

Next, we conducted path analysis to test the two step mediation model shown in Figure 1 using the Mplus statistical software (version 5) with full information maximum likelihood estimation. We evaluated the statistical fit of the model to the data using multiple fit indices: the chi-square goodness-of-fit statistic, Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). Generally, a nonsignificant chi-square, CFI greater than 0.95, a RMSEA less than 0.06, and a SRMR less than 0.09 are considered to indicate good fit [39].

Path analysis builds upon individual regression analysis that can only examine one dependent variable at a time, by providing a more efficient method to test multiple mediating pathways simultaneously. In addition, path analysis estimates the magnitude and statistical significance of the indirect effect for each path connecting the independent and dependent variables, allowing for the examination of the total mediated effect as well as individual mediated effects. Finally, this approach allows for the direct comparison of models with and without direct effects enabling testing for partial versus full mediation.

To determine if patient preferences moderated the observed associations between physicians' decision-making style and survivor outcomes, we next conducted a multiple group path analysis. This allowed us to test if the path model coefficients obtained in the analysis of the two step mediation model differed between the three patient preference groups. A significant change in chi-square between a model that constrained path coefficients to be the same across the three preference groups and an unconstrained model would indicate that paths could not be constrained to be equal between groups and would suggest the presence of moderation by patient preference.

3. Results

3.1. Sample description

Table 1 describes the various characteristics of our sample. Survivors who reported making a medical decision in the past 12 months were significantly younger and more likely to be non-Hispanic white. They also reported greater rates of cancer recurrence, were more likely to have received cancer-related treatment in the past 12 months, and reported more frequent visits with their physician.

3.2. Physicians' decision-making style

The percentage of cancer survivors reporting sub-optimal communication on each of the five PDEMS items ranged from 21% to 49% (Table 2) with 21% reporting that their physician “did not or only somewhat” discuss available options in a way they could understand and

49% reporting that their physician “did not or only somewhat” encourage them to express their opinion about the option they would prefer. Overall, 54% of survivors reported a suboptimal decision-making style for their physician and 46% reported an optimal, participatory style. Bivariate analyses suggested that survivors who reported a suboptimal physician style were more likely to be younger ($p=0.06$), employed ($p=0.001$), and not a resident of a medically underserved area ($p=0.001$). Survivors who had a recurrence ($p<0.01$), had received cancer treatment in the past 12 months ($p=0.001$), and had seen their physician more than three times in the past 12 months ($p<0.05$) were more likely to report optimal, participatory physician styles. In the logistic regression model however, only employment status, living in an underserved area, and receipt of treatment in the past 12 months remained significant ($p<0.05$) (data not shown).

3.3. Physician style and survivor outcomes

3.3.1. Bivariate associations—With the exception of physical health (PCS), optimal, participatory physician style was associated with more positive outcomes (Table 3). Using Cohen's definition for effect sizes [40], the association between physician style and the proximal outcomes of self-efficacy and trust represented more than a medium effect (0.69, 0.73 respectively), the association between physician style and the intermediate outcomes of uncertainty and personal control represented a small to medium effect (0.28, 0.44 respectively), and finally the association of physician style with mental health (MCS) was slightly greater than a small effect (0.24).

3.3.2. Mediation analysis—Physicians' decision-making style was not associated with physical health, precluding the need for further mediation analyses. We hence estimated a path model to empirically test the conceptual model described in Figure 1 with mental health (MCS) as the outcome. To obtain adequate fit for the model linking physician style and mental health, it was necessary to add correlations between the two proximal outcomes (self-efficacy and trust) and between the two intermediate outcomes (uncertainty and control). We initially included all covariates in the model that were significantly associated with MCS in bivariate analyses (age, education, income, length of relationship, residence in a medically underserved area, number of comorbidities, and marital status). Only age and comorbidities were significantly associated with MCS in the multivariate model and were retained in further analyses. Age and comorbidities were allowed to freely correlate with all the variables in the conceptual model, but only statistically significant paths were retained. This model with all the direct and indirect effects shown in Figure 1 was a good fit for the data [$X^2(6)=10.65$, $p=0.10$; CFI=0.99; RMSEA=0.04; SRMR=0.04]. Table 4 shows the unstandardized regression coefficients for all the direct and indirect paths between physician style and mental health estimated from this model. Of note, only the indirect paths from physician style to mental health through patient self efficacy to control and through trust to uncertainty were statistically significant. Total variability in MCS explained was 32.3%.

Given that the direct paths linking physician style, self-efficacy, and trust with MCS were not statistically significant, we explored if removing them resulted in poorer model fit; we removed these paths one at a time and examined the change in chi-square. A significant change in chi-square would indicate that the direct path could not be constrained to zero and should hence be retained in the model (partial rather than full mediation). The change in chi-square was not statistically significant for any of the direct effects indicating that they could be dropped from the model and further establishing the primary importance of the indirect effects through patient self-efficacy, trust, control, and uncertainty. The model with no direct effects (shown in Figure 2) was a reasonable fit for the data [$X^2(11)=20.19$, $p=0.04$; CFI=0.98; RMSEA=0.05; SRMR=0.05]. Compared to the model with all of the direct

effects, this more parsimonious model fit the data equally well [$\Delta X^2(5)=9.54, p>0.05$]. Again, only the indirect paths through patient self-efficacy to control ($b=0.38, p<0.01$) and through trust to uncertainty ($b=0.38, p<0.05$) were statistically significant. While the individual paths from trust to control ($p<0.05$) and from self-efficacy to uncertainty ($p=0.06$) were significant or borderline significant respectively, the total indirect effects of paths linking physician style and mental health through trust to control or through self-efficacy to uncertainty were not significant (data not shown).

3.3.3. Moderation analysis—To determine if patient preference influenced the observed associations, we conducted a multiple group path analysis based on the fully constrained model shown in Figure 2, splitting the sample into the physician control ($n=85$), patient control ($n=72$), and shared control (236) decision preference groups. We considered these analyses to be exploratory because of the relatively small numbers of survivors in the physician and patient control groups. We first tested a model that allowed the paths among the model variables to differ between the three groups. The model was a good fit for the data [$X^2(33)=45.29, p=0.07$; CFI=0.98; RMSEA=0.05; SRMR=0.06]. We then constrained all the paths to be equal between groups and examined the change in chi-square to determine if doing so resulted in worse model fit. The fully constrained model was a marginally good fit for the data [$X^2(67)=97.48, p=0.009$; CFI=0.95; RMSEA=0.06; SRMR=0.16], but the change in chi-square was statistically significant [$\Delta X^2(34)=52.19, p=0.02$]. Further analyses revealed that allowing the correlation between self-efficacy and trust to vary in the physician control group improved model fit [$X^2(66)=86.50, p=0.05$; CFI=0.97; RMSEA=0.05; SRMR=0.11] and resulted in a non-significant change in chi-square [$\Delta X^2(33)=41.21, p=0.15$]. This indicates that although the association between self-efficacy and trust may differ among different patient preference groups, patient preference does not moderate the meditational model linking physicians' decision-making style and mental health.

4. Discussion and conclusion

4.1. Discussion

We developed a new physicians' decision-making style scale (PDEMS) that elicited patient feedback on five common elements of the decision-making process. Most of the prior studies on physicians' decision-making style have used a three item participatory decision-making style (PDM) scale developed by Kaplan et al. [19]. We elected to create a new scale because the three PDM items include one item with a hypothetical scenario and the other two focus on broad constructs of control and responsibility over treatment that do not provide sufficient emphasis on the decision-making process per se. Furthermore, the three items vary in response options and lack a fixed time frame or specific decision context to serve as reference for the respondents. We had a similar rationale for developing a new decision-making participation self-efficacy scale (DEPS). A 10-item perceived efficacy in patient-physician interaction scale (PEPPI) has been validated in previous studies [41]. However, the PEPPI assesses patients' confidence for participating in interactions with their physicians in general and not specifically within the context of medical decision-making. Since the PDM and PEPPI are currently the most commonly used measures in the literature, more research is needed comparing the PDEMS and DEPS scales developed in this study with the PDM and PEPPI scales so that researchers get a clearer sense of their relative merits across diverse applications.

More than 50% of survivors reported less than optimal physician behavior related to the decision-making process. Variability in patient reports of physicians' decision-making style was not explained by many of the tested sociodemographic, clinical, and follow-up care-related variables. Prior studies have shown that patients who knew their physician for a

longer duration were more likely to report a participatory physician style [22,42]. Length of relationship was perhaps not a significant factor in our analysis since there was not much variance in the variable (more than 80% of our sample knew their physician for at least two years). Several other non-significant variables in our study were found to be significantly associated with physician style in other studies including patient education [22,42,43], race/ethnicity [42], patient gender as well as gender match between patient and physician [42]. Difference in the measurement instruments used and/or the clinical context might partly explain our diverse results. We also did not measure several other factors, e.g., length of the visit, physician training in communication skills, and patient volume that have been found to be associated with a participatory physician style in other studies [19].

Physicians' participatory decision-making style was significantly associated with proximal communication, intermediate cognitive, and distal health outcomes. Survivors who reported an optimal, participatory physician style were more likely to be confident in playing an active role in decision-making. A positive association between physicians' participatory style and patient self-efficacy for interacting with physicians has also been reported in another recent study [44]. Participatory decision-making style was also associated with greater levels of patient trust. As suggested by Street et al. [23], physicians who involve patients in the decision-making process are more likely to enhance patient agency, a core element of trust in the physician [33].

Path analysis confirmed a two step mediation of the association between physician style and survivors' mental health. Specifically, two pathways were identified to significantly mediate this relationship. Our results suggest that a more participatory physician style maybe associated with better mental health by a) increasing survivors' participation self-efficacy and thereby enhancing survivors' perceptions of personal control, and by b) enhancing survivors' level of trust and thereby reducing their perceptions of uncertainty. Existing conceptual frameworks and theories of personal control [45,46] and uncertainty in illness [47,48] provide support for these findings. Existing studies have empirically demonstrated the significance of several individual paths in our mediation model [9], however, we know of no other study that has simultaneously examined a multi-step mediation effect of multiple potential pathways linking patient-clinician communication with patient health outcomes.

We did not find any evidence of moderation of the relationship between physician style and survivor outcomes by survivors' participation preferences. Our findings suggest that a participatory decision-making style on the part of physicians may have a positive impact on patient outcomes for all patients, even those who prefer to leave the final decision up to the physician. Given the relatively small numbers in some of the patient preference categories, there is however a need to replicate these findings in future studies with larger samples.

Our findings should be interpreted in the light of some important limitations. Perhaps the most important limitation is the cross-sectional nature of our data. Labeling our outcome variables as proximal, intermediate, and distal suggests a temporal causal order that is optimally tested in a longitudinal study. While we acknowledge that relationships identified in our study should not be assumed to be causal, the gradual decrease we observed in effect sizes of the association between physician style and proximal to intermediate to distal outcomes is consistent with what one might expect in longitudinal analyses.

Another limitation is that the PDEMS scale assessed cancer survivors' perceptions of physicians' decision-making style with reference to any cancer-related medical decision that was made in the past year, rather than for any one specific decision. We did not collect data on the specific decision(s) survivors used as a context for their responses. Despite being prompted with examples of the type of medical decisions they might consider (see appendix

1), more than a third of our sample reported not making any cancer-related decision in the past year. This suggests that survivors might vary in their perceptions about what constitutes a medical decision within the context of survivorship care. Furthermore, to the extent that physician style may vary with the type of decision at hand, the nature of the medical decision could be a source of unmeasured variation in patient responses. To correct for such effects of decision type, we are currently validating the PDEMS scale within the context of a single, specific medical decision in an ongoing study of treatment decision-making in early stage prostate cancer [49].

A final limitation is that we assessed physician style only by survivors' self-reports. Patient surveys provide valuable insights into patient experiences that may not be captured by other methods and the extent to which these experiences drive subsequent behavior and outcomes makes their contribution even more salient. However, given that patient perceptions of the decision-making process are not always consistent with observer codings of the actual communication between physicians and patients [50], our findings should be validated in future studies that use multiple methods for assessing physicians' decision-making style.

4.2. Conclusion

There is a paucity of empirical studies that systematically evaluate the mechanisms by which patient-clinician communication can influence improvements in patient health outcomes. The multiple pathway mediation model tested in this study lays the foundation for future longitudinal research on this issue. We encourage future studies to utilize analytical approaches based on path analyses and structural equation modeling that allow for the simultaneous evaluation of the significance of multiple causal pathways.

4.3. Practice Implications

This study suggests that physicians should make efforts to engage all their patients in the decision-making process by explaining options in an understandable manner and deliberating with patients on what option might be best for them. Opportunities should be provided to all patients to seek clarification, ask questions, and express opinions. Patients whose physicians adopt such a participatory decision-making style are likely to feel more empowered and experience more positive HRQOL outcomes.

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Appendix 1

Physicians' Decision-making Style (PDEMS) scale

In the last 12 months, were any medical decisions made about your follow-up cancer care?

Some examples of such decisions are:

- Deciding what follow-up medical tests to get to check for signs of cancer or other problems
- Changing how often you get follow-up medical tests
- Getting new medical treatment for your cancer
- Changing the dosage of or stopping any existing medical treatment

- Treating your symptoms or treatment-related side-effects

1 ☐ Yes 2 ☐ No → GO TO NEXT PAGE

When making such medical decisions, did your follow-up care doctor ...

(response options: 1. Yes, definitely; 2. Yes, somewhat; 3. No)

1. Discuss the available options with you in a way you could understand?
2. Encourage you to ask questions or express any concerns you had about the available options?
3. Encourage you to ask questions or express any concerns you had about his or her recommendation?
4. Encourage you to give your opinion about the available options?
5. Involve you as much as you wanted in the decision making process?

Decision-making Participation Self-efficacy (DEPS) scale

If at this time, you and your follow-up care doctor had to make any medical decisions about your follow-up cancer care, how confident are you that you would be able to...

(response options: 1. Not at all confident; 2. A little confident; 3. Somewhat confident; 4. Very confident; 5. Completely confident)

1. Take part in a detailed discussion with your doctor about the different available options
2. Let your doctor know if you had any concerns or questions about his or her recommendation
3. Tell your doctor about the option you would prefer
4. Work out any differences of opinion with your doctor, should they exist
5. Take responsibility for making the final decision

Perceived Personal Control (PPC) scale

To what extent do you feel you have control over...

(response options: 1. No control at all; 2. A little control; 3. Moderate amount of control; 4. A great deal of control; 5. Complete control)

1. Your emotional responses to your cancer (such as worrying, feeling anxious, feeling depressed)
2. The physical side effects of your cancer and its treatment (such as feeling pain, tiredness)
3. The kind of follow-up care you receive for your cancer
4. The course of your cancer (that is, whether your cancer will come back, get worse, or you will develop a different type of cancer)

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Figure 1.
Pathways linking physicians' decision-making style with cancer survivors' health-related quality of life

Figure 2.

Unstandardized regression coefficients from the final mediation model linking physicians' decision-making style with cancer survivors' mental health (MCS scores)

Footnote: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, § $p = 0.06$ Paths from age to MCS, trust, uncertainty, and control as well as paths from number of comorbidities to MCS and control are not shown, but were all statistically significant ($p < 0.05$). Correlations between self-efficacy and trust as well as between control and uncertainty are not shown but were included in the model.

Table 1

Sample description of survivors who received follow-up care in the past 12 months (N=623)

	Had a medical decision in past 12 months (N=395)	Did not have a medical decision in past 12 months (N=228)	P-value	Total (N=623)
<u>Sociodemographics</u>				
Age in years: Mean (SD)	61.7 (13.2)	64.2 (12.4)	0.019	62.6 (12.9)
Race/ethnicity (%)			0.023	
Non-Hispanic White	77.0	68.4		73.8
Minorities	23.0	31.6		26.2
Education (%)			0.886	
High school or less	21.1	20.6		20.9
Some college	31.2	31.6		31.4
College degree	21.1	18.9		20.3
Some graduate school/graduate degree	26.6	28.9		27.5
Annual household income (%)			0.138	
< \$20,000	14.1	12.7		13.6
\$20,000 – \$40,000	15.2	19.1		16.6
\$40,000 – \$60,000	13.3	18.6		15.2
\$60,000 – \$100,000	27.3	27.5		27.4
> \$100,000	30.1	22.1		27.2
Gender (%)			0.402	
Female	42.0	45.6		43.3
Male	58.0	54.4		56.7
Employment status (%)			0.498	
Working full/part time	40.5	37.7		39.5
Not working	59.5	62.3		60.5
Marital status (%)			1.000	
Married/living as married	71.6	71.5		71.5
Other	28.4	28.5		28.5
Living in a medically underserved area (%)			1.000	
Yes	33.2	32.9		33.1
No	66.8	67.1		66.9
Health insurance coverage (%)			0.078	
Private insurance	79.4	86.4		83.2
None/government insurance	20.6	13.6		16.8
<u>Clinical Characteristics</u>				
Years since diagnosis: Mean (SD)	3.5 (0.7)	3.5 (0.7)	0.696	3.5 (0.7)
Type of cancer (%)			0.099	
Bladder cancer	23.3	31.1		26.2
Colorectal cancer	61.8	55.7		59.6

	Had a medical decision in past 12 months (N=395)	Did not have a medical decision in past 12 months (N=228)	P-value	Total (N=623)
Leukemia	14.9	13.2		14.3
Had a cancer recurrence (%)			0.000	
Yes	22.6	10.5		18.2
No	77.4	89.5		81.8
Number of comorbidities (%)			0.293	
None	22.0	24.2		22.8
1	25.6	30.8		27.5
2	23.3	21.6		22.7
3 or more	29.1	23.3		27.0
Treatment in past 12 months (%)			0.000	
Yes	34.3	18.0		28.3
No	65.7	82.0		71.7
Perceived health status (%)			0.603	
Poor/fair	17.4	15.0		16.5
Good	36.5	35.0		35.9
Very good/excellent	46.1	50.0		47.5
<u>Follow-up care related variables</u>				
Length of relationship with doctor (%)			0.294	
Less than two years	21.0	17.2		19.6
Two years or more	79.0	82.8		80.4
Number of visits in past 12 months (%)			0.000	
Three visits or less	61.3	75.8		66.6
More than three visits	38.7	24.2		33.4
Physician specialty (%)			0.187	
Primary care	9.0	10.0		9.3
Oncologist/hematologist	55.4	47.7		52.6
Other specialists	35.6	42.3		38.0
Physician gender (%)			0.651	
Female	16.5	15.0		15.9
Male	83.5	85.0		84.1
Physician - patient gender match (%)			0.152	
Yes	60.3	54.2		58.0
No	39.7	45.8		42.0

Table 2

Score distribution of the physicians' decision-making style (PDEMS) scale*

Item	% Sub-optimal Style	% Optimal Style
1. Discussed options in a way patient understood	20.9	79.1
2. Encouraged questions about options	33.6	66.4
3. Encouraged questions about recommendations	37.8	62.2
4. Encouraged patient to express opinion	48.5	51.5
5. Involved patients as much as he/she wanted	28.2	71.8
Overall Physician Style	54.1	45.9

* Response of “Yes, definitely” was coded as optimal style, and a response of “No” or “Yes, somewhat” was coded as sub-optimal style. A response of “Yes definitely” to all five items resulted in an overall optimal participatory decision-making style.

Table 3
Bivariate associations between physicians' participatory decision-making style and patient outcomes

	Physician Style		Difference	Effect Size	P-value
	Sub-optimal	Optimal			
Proximal, Communication Outcomes					
Participation self-efficacy	79.1	91.6	12.5	0.69	<0.001
Trust in the physician	78.9	91.4	12.3	0.73	<0.001
Intermediate, Cognitive Outcomes					
Personal control	52.6	61.6	9.0	0.44	<0.001
Uncertainty *	55.7	48.9	-6.8	0.28	<0.01
Distal, Health outcomes (HRQOL)					
Physical component summary score (PCS)	46.9	45.1	-1.8	0.18	0.14
Mental component summary score (MCS)	48.1	50.5	2.4	0.24	0.01

* A higher score implies greater uncertainty

Table 4

Direct and indirect effects from physician style to mental health (MCS) estimated from the full path model shown in figure 1

Path from Physician Style to MCS	Unstandardized Parameter Estimate	Standard Error	P-value
Physician style (direct)	-.13	.90	0.89
Physician style → Self-efficacy	.60	.37	0.10
Physician style → Control	.29	.20	0.14
Physician style → Uncertainty	.11	.32	0.72
Physician style → Trust	.34	.37	0.37
Physician style → Trust → Control	.13	.08	0.14
Physician style → Self-efficacy → Control	.30	.12	0.01
Physician style → Trust → Uncertainty	.36	.15	0.02
Physician style → Self-efficacy → Uncertainty	.23	.13	0.09
Total effects	2.22	.94	0.02