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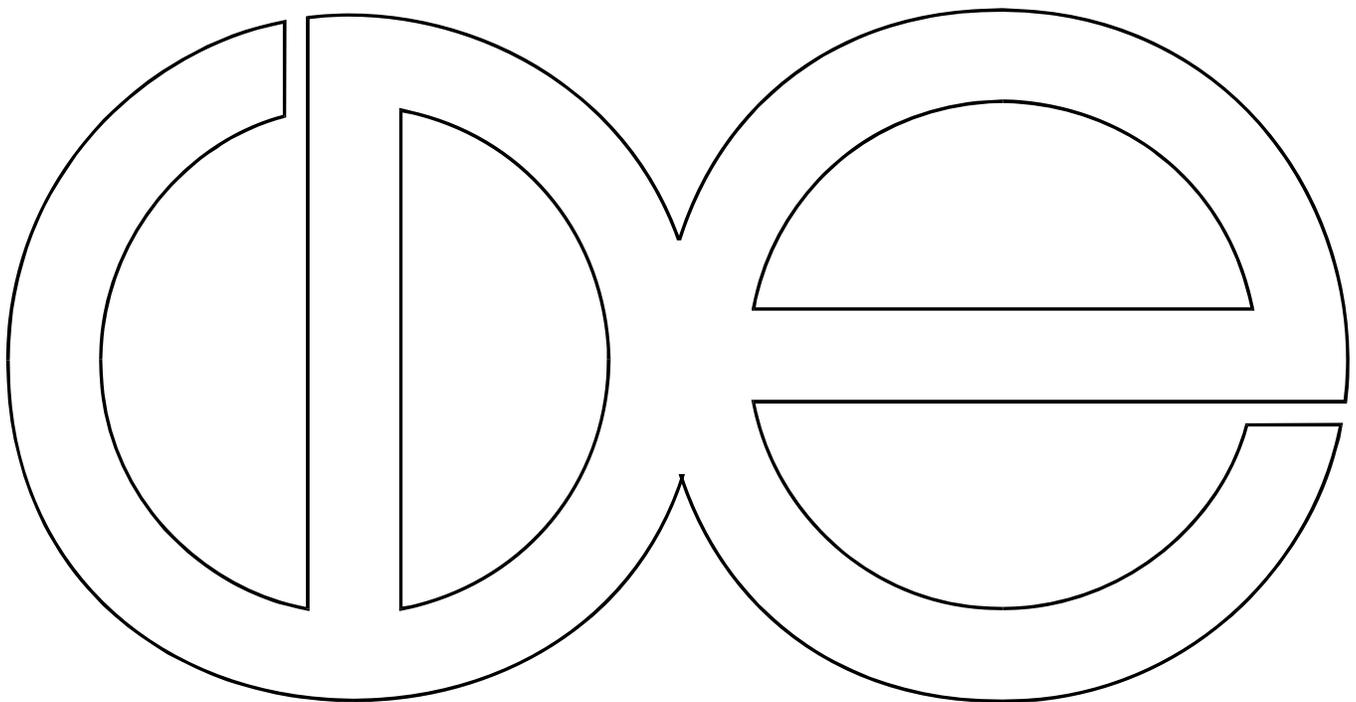
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Spouses' Effectiveness as End-of-Life Health Care Surrogates: Accuracy, Uncertainty, and Errors of Overtreatment or Undertreatment

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Acknowledgments

Abstract

Purpose. We document the extent to which older adults accurately report their spouses' end-of-life treatment preferences, in the hypothetical scenarios of terminal illness with severe physical pain, and terminal illness with severe cognitive impairment. We investigate the extent to which accurate reports, inaccurate reports (i.e., errors of under- or over-treatment) and uncertain reports (responses of "do not know") are associated with the spouse's advance care planning and the surrogate's involvement in the planning.

Design and Methods. We used data from married couples who participated in the Wisconsin Longitudinal Study in 2004. These 2,750 couples were in their mid 60s and in relatively good health. We conducted multinomial logistic regressions.

Results. Surrogates were accurate in the majority of cases, made errors in 12 to 22% of cases, and were uncertain in 11 to 16% of cases. Errors of overtreatment and undertreatment were equally prevalent. For both scenarios, discussing preferences was associated with lower odds of an uncertain surrogate response.

Implications. We suggest ways that health care practitioners could facilitate family-level conversations in order to ensure that patients' preferences are accurately represented in end-of-life care settings.

Keywords: Death and dying, medical decision-making, advance care planning, marriage, couple-level data

Spouses' Effectiveness as End-of-Life Health Care Surrogates:

Accuracy, Uncertainty, and Errors of Overtreatment or Undertreatment

In the past three decades, health care policies in the United States have been designed with the explicit goal of preserving the autonomy of dying patients. Patients have the opportunity to guide the health care they receive even if they ultimately become incapacitated (i.e., unable to convey their preferences for care). The Patient Self-Determination Act (PSDA, 1990) requires federally funded health care providers to give patients information about advance care planning, or legal arrangements that establish care preferences prior to the time of incapacitation. Advance care planning involves executing a living will which states one's preferences for specific treatment, general goals, and values, and/or appointing a durable power of attorney for health care (DPAHC) to act as a surrogate decision-maker in the event of incapacitation. If a patient becomes incapacitated without appointing a DPAHC, then the next-of-kin becomes surrogate in most states (American Medical Directors Association, 2003). A surrogate typically selects a course of treatment using the standard of *substituted judgment*; that is, the surrogate makes the decision that he or she believes the dying person would make if competent to do so. Under the alternate standard, the standard of *best interests*, the surrogate chooses the treatment he or she feels is in the best interests of all concerned. Bioethicists favor the former standard (President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, 1983).

Despite patients' right to self-determination, many incapacitated dying persons do not receive the care that they want. Patients often are undertreated (not administered desired treatment) or overtreated (administered undesired treatment). Common chronic symptoms such as pain tend to be undertreated (e.g., Field & Cassel, 1997); half of all persons who die in the

hospital experience moderate or severe pain during their final three days of life (SUPPORT,

1995). Inequalities exist—non-Hispanic white patients are more likely to receive appropriate

pain relief than are African American and Hispanic patients (Green et al., 2003). By contrast,

acute conditions and terminal chronic illnesses tend to be overtreated. For example, an estimated

one-third of nursing home patients in the final stages of dementia are given feeding tubes,

although the practice typically does not prolong the length or improve the quality of patients'

lives (Mitchell, Teno, Roy, Kabumoto, & Mor, 2003). Sometimes a single patient is both

overtreated and undertreated (Field & Cassel, 1997).

When a patient or surrogate cannot reach a decision about care, treatment is usually

continued (President's Commission for the Study of Ethical Problems in Medicine and

Biomedical and Behavioral Research, 1983). This policy is intended to protect both patients and

their care providers, but may lead to unnecessary cost and distress. Medical care that has been

deemed futile accounts for an estimated four percent of Medicare expenditures (Emanuel et al.,

2002). Interpersonal and emotional costs also are high; end-of-life care is frequently a source of

conflict among family members of dying patients (Kramer, Boelk, & Auer, 2006).

Given the financial and personal costs of overtreatment and undertreatment, why do

patients often receive end-of-life care that is discrepant with their personal preferences?

Following passage of the PSDA, health care providers actively encouraged the use of advance

care planning, on the assumption that such planning would ultimately result in lower rates of

overtreatment and undertreatment (e.g., Aitken, 1999). But over the past decade, the limitations

of advance care planning have been widely documented (e.g., Drought & Koenig, 2002). Among

the most critical is that the information necessary to establish a course of treatment is often not

conveyed in the living will. Living wills frequently include vague word choices rather than

concrete plans. For example, if a patient says that she does not want "heroic" measures taken to save her, someone must determine what the patient would consider to be a heroic measure. A DPAHC can attempt to interpret, but research on substituted judgment consistently reveals that surrogates are no better than chance at choosing the treatments patients desire (Shalowitz, Garrett-Mayer, & Wendler, 2006). Surrogates' preferences for their own treatment are more powerful influences on surrogate decision-making than are the actual patients' preferences (e.g., Moorman, Hauser, & Carr, 2007; Pruchno, Lemay, Feild, & Levinsky, 2005). Cognitive theorists argue that these processes of assumed similarity or projection bias are virtually unavoidable (Cronbach, 1955; Kenny & Acitelli, 2001; Loewenstein, 2005), leading DPAHCs to make recommendations for care that reflect their own – though not necessarily the patient's – preferences.

Recognizing the limits of living wills and DPAHCs, health care providers now try to improve communication so that surrogates better understand patient preferences (e.g., Gutheil & Heyman, 2005). This emphasis on communication is consistent with the desires of patients: one study revealed that nearly one-third of patients preferred a discussion with loved ones to legal planning, and 57% thought that both should be done (Hawkins, Ditto, Danks, & Smucker, 2005). However, research on the effectiveness of discussions is equivocal. Some studies document that discussions are effective in conveying patient preferences to the surrogate (Coppolino & Ackerson, 2001; Sulmasy et al., 1998), while others find that such conversations do not significantly improve surrogate knowledge (e.g., Ditto, et al., 2001; Matheis-Kraft & Roberto, 1997). Libbus and Russell (1995) found that in a large minority of dyads, patients and surrogates disagreed about fundamental issues such as whether a conversation actually occurred, or whether the patient had executed a living will.

The inconsistent findings revealed in studies of surrogate performance may reflect methodological issues, including small sample sizes, small proportions of patients reporting that they have done any end-of-life planning, and design limitations (e.g., surrogates chosen by convenience rather than by DPAHC/next-of-kin status). Further, most studies have focused on predicting accuracy versus inaccuracy, and have failed to make the important distinction between errors of over- and under-treatment. The outcome of uncertainty is also absent from prior studies; our study goal is to identify the correlates of these three distinctive yet overlooked outcomes.

In this study, we focus on a large sample of older married couples in order to examine the extent to which discussions, living will completion, and DPAHC appointment affect the accuracy of surrogates' assessments of their spouses' preferences.[1] Further, we differentiate between planning that directly engages one's surrogate (e.g., appointing him or her as DPAHC) versus planning that involves other persons (e.g., having a discussion with a daughter). We evaluate the extent to which the effect of planning on surrogate (in)accuracy persists after we control for surrogates' own treatment preferences (Carr & Moorman, 2007), and for demographic, religious and experiential factors that have been shown elsewhere to be associated with accuracy (Sulmasy, et al., 1998). If our findings reveal that a specific kind of planning is associated with surrogate accuracy or error, then health care providers can develop practices that encourage or discourage that aspect of planning.

Design and Methods

Sample

The Wisconsin Longitudinal Study (WLS) is a long-term study that began with a random sample of 10,317 men and women who graduated from Wisconsin high schools in 1957. Nearly all were born in 1939. Graduates participated in surveys at ages 18 (1957), 36 (1975), 54 (1993),

and 65 (2004). Of the 9,025 graduates who survived until 2004, 7,265 (80.5%) participated in a telephone survey at that time. Of these, 5,681 (78.2%) were currently married; 3,890 spouses of graduates (68.5%) also completed telephone surveys. Graduates (but not spouses) also completed a mail survey in 2004.

Topical modules were administered to randomly selected subsamples to reduce the overall length of the survey; in 2004, a 70% subsample of graduates received a module on end-of-life planning. If a graduate received this module, so did his or her spouse. Our analysis focuses on the 2,750 married couples in which both partners completed the module.

The WLS does not represent all strata of the U.S. population. All primary sample members graduated from high school, as did nearly all of their spouses. Nearly all graduates are non-Hispanic whites. Despite these limitations, our sample is broadly representative of older married Americans. In 2003, 72.6% and 74.5% of married American men and women aged 55-64, respectively, were non-Hispanic white and had completed at least a high school education (U.S. Census Bureau, 2003).

Dependent Variables

We assessed preferences using items adapted from a 1999 Detroit Area Study module ("Health Care and End-of-Life Decisions"). Spouses were asked: "Suppose you had a serious illness today with very low chances of survival. First, what if you were mentally intact, but in severe and constant physical pain? Second, what if you had minimal physical pain, but had limited ability to speak, walk, or recognize others?" Two parallel items assessed the graduate's knowledge of his or her spouse's preferences (i.e., "Suppose *your spouse* had a serious illness…"). Although graduates reported on spouses' preferences, spouses were not asked to report the graduates' preferences. For all items, the response options were "Continue all

treatment so I could survive (staying alive is most important to me no matter what)" and "Stop all treatment to prolong my life (for me, quality of life is more important than length of life)." Some participants volunteered the response, "I don't know."

We constructed our measures of surrogate accuracy by crosstabulating the spouse's preference and the graduate's report of the spouse's preference in each scenario (i.e., pain and cognitive impairment). Each outcome measure has four categories: if both spouse and graduate reported that the spouse would prefer to continue treatment or to stop treatment in the scenario, the graduate was classified as *accurate/congruent*. If the spouse preferred to stop treatment but the graduate thought that the spouse preferred to continue treatment, the graduate was classified as having made an *error of overtreatment*. If the spouse preferred to continue treatment but the graduate thought that the spouse preferred to stop treatment, the graduate was classified as having made an *error of undertreatment*. If either or both partners indicated "I don't know," the graduate was classified as an *uncertain* responder.[2]

Independent Variables: Spouse's End-of-Life Planning

Discussion. Spouses were asked "Have you made plans about the types of medical treatment you want or don't want if you become seriously ill in the future?" If they responded "yes," they were asked if they had discussed their plans with anyone. Spouses could mention up to three persons or groups of people (e.g., "my children") with whom they had discussions. We constructed two dummy variables, one indicating that the spouse "*discussed with graduate,*" and the other indicating that the spouse "*discussed with person other than graduate.*" These categories are mutually exclusive; a person who named their spouse also may have named others, yet we coded that person as "discussed with graduate" only. The reference category includes spouses who did not hold discussions.

DPAHC. Spouses were asked "Have you made any legal arrangements for someone to make decisions about your medical care if you become unable to make those decisions yourself? This is sometimes called a Durable Power of Attorney for Health Care." If a spouse had appointed a DPAHC, he or she named the one person who had legal responsibility for the role. We constructed two dummy variables, one indicating that "*graduate is DPAHC*" and another indicating that "*someone other than the graduate is DPAHC.*"[3] The omitted category includes spouses who had not appointed a DPAHC.

Living will. Spouses were asked "Do you have a living will or advance directive? These are written instructions about the type of medical treatment you would want to receive if you were unconscious or somehow unable to communicate." If a spouse responded positively, he or she reported who (if anyone) had a copy. We constructed two mutually exclusive dummy variables, one representing "*graduate has spouse's living will*" and another representing "*someone other than the graduate has spouse's living will.*" The omitted category comprised spouses who had not completed a living will.[4]

Control Variables

Graduate gender. A dichotomous indicator represented *women* versus *men* (omitted category).

Graduate educational attainment. Education is measured as a high school education only (omitted category), 13-15 years (*some college*), and 16 years or more of education (*college graduate/graduate studies*).

Religious affiliation. A random 80% subsample of graduates was asked about their religious affiliation. (For participants not included in the subsample, we used reports of religious affiliation from the 1993 wave or -- if missing data in 1993 -- the 1975 wave.) Categories

included: *mainline Protestant*, *conservative Protestant*, *no formal religion*, *other* (e.g., Jewish), and *Catholic* (omitted category).

Projected spouse life expectancy. Graduates were asked, "What are the chances that your spouse will live for another 20 years?" The scale was anchored by 0 (*no chance at all*) and 10 (*absolutely certain*). This item was in the mail survey.

Spouse's life-threatening illness. Spouses were asked: "Has a doctor told you that you have/had: cancer or a malignant tumor, not including minor skin cancers? A heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems? A stroke?" We constructed a dichotomous variable indicating that the participant *had at least one serious illness* or *did not have a serious illness* (omitted category). Although the WLS assessed multiple health conditions, we focused on the leading causes of death among older Americans (Gorina, Hoyert, Lentzner, & Goulding, 2006).

Death avoidance. We evaluated the graduate's death avoidant attitudes with two items from the Death Attitude Profile-Revised (Wong, Reker, & Gesser, 1994): "I avoid thinking about death altogether," and "Whenever the thought of death enters my mind, I try to push it away." Response categories ranged from 1 (*strongly disagree*) to 6 (*strongly agree*). Scale scores equal the average of responses, where higher scores reflect greater death avoidance (α = .70). These items were in the mail survey.

Experience with death. We evaluated whether the graduate experienced the death of a parent in the past ten years. Bereaved persons were asked about the level of pain the deceased experienced during the last week of his or her life. We constructed dichotomous variables indicating that a graduate *experienced a moderately/severely painful death, experienced a painless/slightly painful death,* or *did not experience a death* (omitted category).

Graduate treatment preferences. Graduates were asked to report on their own preferences for end-of-life treatment, using the pain and cognitive impairment scenarios described above. We constructed a dichotomous variable for each scenario, indicating persons who would want to *stop all life-prolonging treatments* versus those who *did not know/ preferred to continue all treatment* (omitted category).[5]

Analytic Strategy

First, we conducted one-way analyses of variance (ANOVAs) with post-hoc Tukey tests to evaluate significant differences in the means of the independent variables among the subgroups of graduates (i.e., accurate, overtreatment, undertreatment, and uncertain). Second, we estimated multinomial logistic regressions for each scenario to identify the correlates of accurate assessments (reference category) versus errors of overtreatment, errors of undertreatment, and uncertain responses. Model 1 showed the effects of spouse's end-of-life planning behaviors. Model 2 was further adjusted for graduate sociodemographic characteristics, religious affiliation, and death attitudes, cognitions, and experiences.

We intended to include a third model which further adjusted for graduate treatment preferences. However, these models could not be estimated appropriately because graduates almost always chose for their spouses the same treatment that they chose for themselves. Crosstabulations of the dependent variables with the graduate's own treatment preference revealed very strong associations (cognitive impairment: $\chi^2 = 914.38$, $df = 3$, $p < .001$; pain: $\chi^2 = 727.29$, $df = 3$, $p < .001$). Several cell counts were fewer than 50; one cell contained fewer than 5 cases. In multivariate analyses, the maximum of the likelihood for the coefficient associated with graduate treatment preferences approached infinity. We did not include graduate treatment preferences in our multivariate analyses. We tested for omitted variable bias by

estimating a third multinomial logistic regression model (available upon request) to examine the influence of graduate treatment preferences on the direction and statistical significance of the spousal planning coefficients. The effects of surrogate preferences on accuracy were largely independent of the effects of spousal planning on accuracy; we note exceptions below.

A modest number of cases were missing data on the independent and control variables, primarily those from the mail survey.[6] We conducted multiple imputation by chained equations (Royston, 2005). Our multivariate models are the result of averaging findings from across the multiple imputations (King, Tomz, & Wittenberg, 2000). Results from analyses employing listwise deletion did not differ from those presented here and are available upon request.

Results

Sample characteristics are presented in Table 1. Most graduates were aged 65 in 2004. The average ages of the graduates' wives and husbands were 61.5 years ($SD = 4.2$ years) and 66.9 years ($SD = 3.9$ years), respectively.

Spouses' end-of-life planning practices, by surrogate accuracy, are presented in Table 2. In the cognitive impairment scenario, 77% of reports were accurate, 7% were errors of overtreatment, 5% were errors of undertreatment, and 11% reflected uncertainty. In the pain scenario, 62% of reports were accurate, 11% were errors of overtreatment, 11% were errors of undertreatment, and 16% reflected uncertainty.

The ANOVA analyses revealed a number of significant differences across the four treatment assessment categories. The results for the cognitive impairment scenario (Table 2, top panel) showed that when a spouse involved the graduate in any form of planning — discussion, DPAHC, or living will—the graduate was more likely to accurately name the spouse's preference than to be uncertain. Graduates whose spouses gave a living will to another person

also were more likely to be accurate than uncertain. The results for the pain scenario (Table 2, bottom panel) showed that when the spouse had a discussion with anyone or appointed a DPAHC, the graduate was more likely to accurately name the spouse's preference than to be uncertain. As in the cognitive impairment scenario, graduates whose spouses gave a living will to another person were more likely to be accurate than uncertain.

[Tables 1 and 2 about here.]

Multivariate Analysis: Cognitive Impairment

Multivariate analyses are presented in Table 3.[7] The multivariate results show that graduates whose spouses held discussions – regardless of whether they were with the graduate or with another person – were significantly less likely than those whose spouses had no discussions to report that they "didn't know" their spouses' preferences. Neither having a living will nor a DPAHC was a significant predictor of surrogate accuracy. These patterns persisted when demographics, religious affiliation, and death attitudes and encounters were controlled (Model 2), and were independent of surrogate treatment preferences (not shown).

[Table 3 about here.]

Multivariate Analysis: Pain

The results in Table 4 reveal that graduates whose spouses had discussed their end-of-life preferences with either the graduate or another person were more likely to accurately report the spouse's preference than to be uncertain. Graduates whose spouses had appointed them as DPAHC were more likely to be accurate than uncertain, and graduates whose spouses had appointed someone else as DPAHC were more likely to be accurate than to make an error of overtreatment. When controls were added to the equation (Model 2), graduate DPAHC appointments were no longer significantly associated with accuracy, but all other findings

remained the same. In the model testing for omitted variable bias (not shown), graduates whose spouses appointed someone else as DPAHC were not significantly more likely to accurately name their spouses' preferences than to make an error of overtreatment, and graduates whose spouses had appointed them as DPAHC were significantly more likely to be accurate than uncertain.

[Table 4 about here.]

Discussion

We investigated the correlates of surrogates' errors of overtreatment, errors of undertreatment, and uncertainty when reporting a spouse's end-of-life treatment preferences in a sample of 2,750 white married couples in their mid 60s. We considered preferences for continuing or stopping life-prolonging treatment in two hypothetical scenarios, one involving terminal illness with cognitive impairment and the other involving terminal illness with pain. We evaluated whether discussions, living wills, and DPAHC appointments were associated with surrogate accuracy, and whether these patterns varied based on whether the surrogate or another person participated in the preparations. We find that discussions with either surrogate or another person are associated with greater odds that the surrogate is certain about the spouse's treatment preferences in both the pain and cognitive impairment scenarios. These findings suggest that discussions are a potentially effective means for combating surrogate uncertainty in the clinical decision-making context.

We do not find that discussions reduce the odds of making an error, but we do find that discussions are associated with lower odds of uncertainty. Our findings have implications for practice: when a patient or surrogate cannot decide on a course of treatment, all treatment typically continues. This practice can result in conflict between health care providers and

families (Breen, Abernethy, Abbott, & Tulsky, 2001) and is costly – the average family of a Medicare beneficiary in his or her last year of life pays $8,000 out-of-pocket (Hogan, Lunney, Gabel, & Lynn, 2001). Despite its clinical importance, uncertainty has not been examined as a distinct response in prior studies. Our results highlight the importance of documenting the sources of uncertainty as well as sources of error in the decision-making context.

The uncertain party can be either a surrogate or a spouse who is unable to articulate his/her own preferences. Discussions with persons other than the surrogate may reduce uncertainty because they allow spouses to clarify their thoughts. Discussions with the surrogate may reduce uncertainty because they provide the surrogate with the opportunity to become aware of the similarities and differences between the spouse's values and their own (Loewenstein, 2005). Discussions may also be memorable because of their emotional climate—conversations can result in a "covenant" between surrogate and spouse that may be viewed as a renewal of the vow to care for one another (Doukas & Hardwig, 2003).

Although we do not find evidence in our multivariate analyses that living wills and DPAHC appointments enhance surrogate understanding of treatment preferences, the non-significant effects partly reflect high levels of overlap (high zero-order correlations) among the end-of-life planning measures. For instance, of those persons who gave the graduate a living will and/or appointed him or her DPAHC, three-quarters also held a discussion with the graduate. Our bivariate analyses reveal that living wills and DPAHCs are generally associated with lower uncertainty. If writing a living will and giving the document to someone or appointing a DPAHC facilitates discussions, then these plans may be important contributors to surrogate accuracy.

Limitations

Our study has several limitations. First, WLS participants were relatively young and healthy. Their responses to hypothetical end-of-life scenarios may not accurately represent how surrogates would behave at the actual decision-making moment or what spouses would want at end-of-life. As patients become sicker, they tend to reject life-prolonging treatment in favor of measures that enhance quality of life (e.g., Ditto, Jacobson, Smucker, Danks, & Fagerlin, 2006; Fried et al., 2007).

Second, the WLS did not ask participants about specific illness scenarios (e.g., cancer), or treatment options (e.g., artificial nutrition and hydration). Rather, it focused on general preferences for care under broad circumstances (pain and cognitive impairment). Our study may *understate* the degree of inaccuracy or uncertainty in surrogate assessments. More precise scenarios would require a fuller understanding of the underlying health condition and possible courses of treatment, and thus may pose more difficulty to spouses trying to accurately gauge their own and one another's preferences (Thorevska et al., 2005).

Finally, we studied one cohort of non-Hispanic white high school graduates. Our results should not be generalized broadly to other populations. For example, Kwak and Haley (2005) document ethnic differences in the ways older Americans conceive of end-of-life decision-making and surrogacy.

Practice Implications

Most married people who appoint a DPAHC choose their spouse (Carr & Khodyakov, 2007). In cases where a married patient has not appointed a DPAHC, the state may rely on the patient's spouse as a default surrogate (American Medical Directors Association, 2003). Despite widespread reliance on spouses, our results show that surrogates are accurate in just 62 and 77 percent of cases, in pain and cognitive impairment scenarios, respectively. These percentages are

no better than chance. This pattern is problematic because nearly 80% of spouses who held end-of-life discussions with a surrogate feel that the surrogate understands their preferences "extremely well." Health care providers should work to identify patients who do not know their own preferences for care, and surrogates who do not know their spouses' preferences. Interventions that foster discussion could help both parties understand their preferences.

The content of discussions may be more important than the occurrence of discussions, however. A critical topic is the patient's belief about how important it is that his or her preferences are heeded directly (substituted judgment), versus how important it is that surrogates make the decision that they feel is best for all parties involved (best interests). Although three-quarters of spouses in the WLS want their wishes to be strictly followed, a significant minority of patients prefers that others make health care decisions for them (Puchalski et al., 2000; Sulmasy et al., in press). In cases where patients want their wishes followed strictly, family members should have discussions – facilitated by health care providers – where precise information about the patient's treatment preferences is conveyed. In the latter case, conversations should focus on broad values and attitudes, so that surrogates can make decisions they feel will best serve the patient and family.

In sum, our study contributes to the mounting literature on end-of-life planning by showing that current mechanisms—DPAHC, living will, and to a lesser extent, discussions unmediated by professionals—contribute modestly to surrogates' ability to accurately represent their spouses' preferences for end-of-life care. Discussions show the most promise as a planning tool. We hope our findings encourage others to identify additional family-level planning practices that are effective in increasing both patient and surrogate knowledge and comprehension of appropriate courses of care at the end-of-life.

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Footnotes

[1] Our sample includes surrogates who are high school graduates, and their spouses, who are not "patients" but rather relatively healthy, community-dwelling individuals. When referring to our participants in the remainder of this paper, we call the partner who reported on the treatment preferences of his/her spouse "surrogate," or "graduate," and the partner who reported only on his/her own treatment preferences "spouse."

[2] If the spouse responded "I don't know," the graduate could not make an accurate substituted judgment. Even if spouse and surrogate both responded "I don't know," this outcome cannot be considered accurate since "I don't know" is not a valid decision in a clinical situation. We retained cases in which the spouse was the source of the uncertain response for two reasons: a) health care providers encounter such cases, and b) the results of analyses in which we removed spouse-uncertain cases did not differ from the results presented here. The spouse was uncertain in 40.9% and 44.4% of cases in the cognitive impairment scenario and the pain scenario, respectively.

[3] In these cases, the graduate will not be called upon to make decisions should the spouse become incapacitated. We retain the cases to shed light on DPAHC choices and surrogate behavior—are these graduates particularly prone to err?

[4] The omitted category also includes 53 spouses who reported completing a living will, yet did not give a copy to anyone. We reason that a living will that has not been distributed cannot contribute to surrogate accuracy.

[5] People who respond "I don't know" are not significantly different from people who report "continue all treatment" in terms of socioeconomic status, health, end-of-life planning, or prior experiences with loved ones' deaths (Carr & Moorman, 2007).

[6] In our sample, 212 graduates (7.7%) completed the telephone survey but not the mail survey.

[7] Coefficients for control variables are not presented, as many of these changed significantly when graduate treatment preferences were included in the model. Changes occurred because the control variables are correlates of graduate treatment preferences (Carr & Moorman, 2007).

Table 1

Characteristics of Married Respondents to the Wisconsin Longitudinal Survey Module on End-of-

*Life Preparations, 2004 (*N = 2,750)

	Mean (*SD*)
Sociodemographic Characteristics	
Female	.47 --
Education: 13-15 years	.16 --
Education: 16+ years	.31 --
Religious Affiliation	
Mainline Protestant	.48 --
Conservative Protestant	.05 --
Other religious affiliation	.03 --
No religious affiliation	.08 --
Death-Related Attitudes, Cognitions, and Experiences	
Chances spouse will live another 20 years (1 *no chance* through 10 *absolutely certain*)	6.27 (2.67)
Spouse has life-threatening illness	.27 --
Death avoidance (1 *not avoidant* through 6 *avoidant*)	3.12 (1.22)
Parent/spouse died in past 10 yrs, no/little pain	.15 --
Parent/spouse died in past 10 yrs, moderate/severe pain	.10 --
Own Treatment Preferences	
Graduate prefers to stop treatment for self, cognitive impairment	.88 --
Graduate prefers to stop treatment for self, pain	.73 --

Note. Statistics are reported prior to multiple imputation. Means and standard deviations are

presented for continuous measures; proportions are shown for categorical measures.

Table 2 *One-Way Analyses of Variance and Post-Hoc Mean Comparisons, Accuracy of Spousal Surrogates by Spouse End-of-Life Planning (N = 2,750)*

	Accurate[a]	Overtreatment[b]	Don't Know[c]	Undertreatment[d]	*F*-statistic (*df* = 3)	Significant subgroup differences
			Cognitive Impairment			
Had discussion with surrogate	.52	.49	.41	.52	3.71**	ac
Had discussion with other	.25	.23	.19	.20	2.40	
Surrogate is DPAHC	.31	.26	.22	.26	4.60**	ac
Other is DPAHC	.28	.21	.22	.28	2.50	
Gave surrogate living will	.26	.21	.16	.23	5.69***	ac
Gave other living will	.35	.27	.28	.26	4.66**	ac
N; %	2030; 77	171; 7	301; 11	134; 5		
			Pain			
Had discussion with surrogate	.52	.47	.43	.51	4.73**	ac
Had discussion with other	.26	.23	.19	.23	3.66*	ac
Surrogate is DPAHC	.31	.26	.24	.32	3.86**	ac
Other is DPAHC	.29	.22	.22	.25	4.46**	ac
Gave surrogate living will	.26	.21	.21	.26	2.28	
Gave other living will	.36	.30	.26	.34	4.80**	ac
N; %	1639; 62	284; 11	419; 16	288; 11		

Notes: Statistics are reported prior to multiple imputation. Proportions are shown. Significant subgroup differences are denoted as *ab*: accurate vs. overtreatment; *ac*: accurate vs. don't know; *ad*: accurate vs. undertreatment; *bc*: overtreatment vs. don't know; *bd*: overtreatment vs. undertreatment; *cd*: don't know vs. undertreatment.   *$p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Table 3

Multinomial Logistic Regression of Accuracy of Spousal Surrogates on Spouse's End-of-Life Planning, Cognitive Impairment Scenario (N = 2,636)

	Model 1			Model 2		
	Overtreatment	Don't Know (vs. Accurate)	Undertreatment	Overtreatment	Don't Know (vs. Accurate)	Undertreatment
	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)
Had discussion with surrogate	0.94 (0.63-1.40)	0.57*** (0.43-0.78)	1.01 (0.64-1.59)	0.91 (0.61-1.37)	0.56*** (0.42-0.76)	1.01 (0.64-1.60)
Had discussion with other	1.06 (0.65-1.72)	0.52*** (0.35-0.76)	0.86 (0.49-1.52)	0.99 (0.60-1.63)	0.50*** (0.33-0.73)	0.82 (0.46-1.46)
Surrogate is DPAHC	0.76 (0.45-1.30)	0.75 (0.49-1.15)	0.94 (0.50-1.76)	0.81 (0.47-1.39)	0.77 (0.50-1.18)	0.92 (0.49-1.72)
Other is DPAHC	0.66 (0.38-1.15)	0.82 (0.54-1.23)	1.41 (0.77-2.59)	0.68 (0.38-1.20)	0.81 (0.53-1.23)	1.34 (0.73-2.46)
Gave surrogate living will	0.79 (0.45-1.38)	0.74 (0.47-1.15)	0.77 (0.41-1.46)	0.81 (0.46-1.42)	0.75 (0.48-1.17)	0.79 (0.42-1.49)
Gave other living will	0.76 (0.45-1.28)	0.89 (0.60-1.32)	0.56 (0.30-1.04)	0.77 (0.45-1.33)	0.92 (0.62-1.37)	0.57 (0.31-1.07)
χ^2; *df*		61.52; 18			129.08; 54	
N	171	301	134	171	301	134

Note. Model 2 controls for surrogate gender, educational attainment, religious affiliation, projection of spouse life expectancy, death avoidance, experience with the death of a parent or spouse, and spouse life-threatening illness.

$* p \leq .05$, $** p \leq .01$, $*** p \leq .001$

Table 4

Multinomial Logistic Regression of Accuracy of Spousal Surrogates on Spouse's End-of-Life Planning, Pain Scenario (N = 2,630)

	Model 1			Model 2		
	Overtreatment	Don't Know (vs. Accurate)	Undertreatment	Overtreatment	Don't Know (vs. Accurate)	Undertreatment
	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)	Odds Ratio (95% C.I.)
Had discussion with surrogate	0.73 (0.53-1.01)	0.51*** (0.39-0.66)	0.82 (0.58-1.14)	0.72 (0.52-1.00)	0.50*** (0.38-0.65)	0.79 (0.56-1.11)
Had discussion with other	0.80 (0.54-1.19)	0.47*** (0.34-0.67)	0.80 (0.54-1.20)	0.81 (0.54-1.21)	0.47*** (0.33-0.66)	0.76 (0.51-1.15)
Surrogate is DPAHC	0.73 (0.47-1.12)	0.68* (0.46-0.99)	0.98 (0.63-1.51)	0.73 (0.47-1.13)	0.68 (0.47-1.00)	0.97 (0.62-1.51)
Other is DPAHC	0.61* (0.40-0.95)	0.71 (0.49-1.04)	0.82 (0.53-1.27)	0.61* (0.39-0.95)	0.70 (0.48-1.02)	0.82 (0.52-1.28)
Gave surrogate living will	0.97 (0.61-1.54)	1.10 (0.75-1.63)	1.07 (0.68-1.69)	0.94 (0.59-1.50)	1.11 (0.75-1.64)	1.07 (0.68-1.70)
Gave other living will	1.03 (0.69-1.56)	0.94 (0.65-1.34)	1.07 (0.70-1.63)	1.00 (0.66-1.50)	0.96 (0.67-1.38)	1.09 (0.71-1.67)
$\chi^2; df$		72.36; 18			124.58; 54	
N	284	419	288	284	419	288

Note. Model 2 controls for surrogate gender, educational attainment, religious affiliation, projection of spouse life expectancy, death avoidance, experience with the death of a parent or spouse, and spouse life-threatening illness.

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$