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# The health impact of health care on families: a matched cohort study of hospice use by decedents and mortality outcomes in surviving, widowed spouses

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## Abstract

Alternative ways of caring for seriously ill patients might have implications not only for patients' own outcomes, but also, indirectly, for the health outcomes of their family members. Clinical observation suggests that patients who die "good deaths" may impose less stress on their spouses. Consequently, we sought to assess whether hospice use by a decedent is associated with decreased risk of death in surviving, bereaved spouses. We conducted a matched retrospective cohort study involving a population-based sample of 195,553 elderly couples in the USA. A total of 30,838 couples where the decedent used hospice care were matched using the propensity score method to 30,838 couples where the decedent did not use hospice care. Our principal outcome of interest was the duration of survival of bereaved widow/ers. After adjustment for other measured variables, 5.4% of bereaved wives died by 18 months after the death of their husband when their deceased husband did not use hospice and 4.9% died when their deceased husband did use hospice, yielding an odds ratio (OR) of 0.92 (95% CI: 0.84–0.99) in favor of hospice use. Similarly, whereas 13.7% of bereaved husbands died by 18 months when their deceased wife did not use hospice, 13.2% died when their deceased wife did use hospice, yielding an OR of 0.95 (95% CI: 0.84–1.06) in favor of hospice use. Our findings suggest a possible beneficial impact of hospice—as a particularly supportive type of end-of-life care—on the spouses of patients who succumb to their disease. Hospice care might attenuate the ordinarily increased mortality associated with becoming widowed. This effect is present in both men and women, but it is statistically significant and possibly larger in bereaved wives. The size of this effect is comparable to the reductions in the risk of death seen in a variety of other modifiable risk factors in women. Health care may have positive, group-level health "externalities": it may affect the health not only of patients but also of patients' family members.

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## Introduction

Having a spouse fall ill or die are common events that have powerful implications for the individuals involved and for society. Caring for a sick spouse can have

deleterious health consequences; this "caregiver burden" effect is especially severe among women (Barusch & Spaid, 1989; Pruchno & Resch, 1989). Having a spouse die can significantly increase a person's risk of death; this "widow/er effect" is especially pronounced in men (Parkes, Benjamin, & Fitzgerald, 1969; Hesling & Szklo, 1981; Schaefer, Quesenberry, & Soora, 1995; Young, Benjamin, & Wallis, 1963; Cox & Ford, 1964; Welin, Tibblin, & Svardsudd, 1985; Lillard & Waite, 1995). Both the caregiver and widow/er effects are probably related to the loss of beneficial social support from a

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marital partner who is ill compounded by the harmful impact of the stress of spousal illness in the run-up to death (House, Landis, & Umberson, 1988; Berkman & Syme, 1997; Thoits, 1995). While the precise mechanism of these effects is unclear, it seems plausible that the nature and extent of the health care given to the sick person might affect these phenomena; some types of health care might perhaps mitigate the deleterious health effects of caregiving or widowhood by virtue of being relatively supportive or stress reducing.

We hypothesized that the nature of the end-of-life care a decedent receives might be associated with the mortality risk of their surviving spouse. More specifically, we hypothesized that if a decedent were the recipient of hospice terminal care, their surviving spouse would be less likely to fall ill and die during bereavement. Our hypothesis was prompted in part by the clinical observation that patients who die “good deaths” often impose less stress on their families. Patients define a good death as being painless, anticipated, and not too burdensome on their family (Steinhauser et al., 2000a,b). Hospice terminal care is in fact directed at realizing such good deaths; it facilitates at-home death, (Moinpour & Polissar, 1989) optimizes pain and symptom relief, (Greer et al., 1986) and enhances patient and family satisfaction (Kane, Klein, Bernstein, Rothenberg, & Wales, 1985; Wallston, Burger, Smith, & Baugher, 1988; Dawson, 1991). In the US, beneficiaries of federal Medicare insurance (a national insurance program that captures over 96% of all people older than 65 in the US, and thus the great majority of people who die) may avail themselves of a primarily outpatient hospice benefit that provides many helpful services including nursing care, physician visits, homemaker assistance, social services, and bereavement counseling. The use of this type of home-based, supportive terminal care by approximately 15–20% of the elderly in the US (Christakis & Iwashyna, 2000; Iwashyna, Zhang, & Christakis, 2002) provides an ideal situation for evaluating whether a patient’s manner of death, in terms of the type of health care they receive, has health implications for their families. If it does, such an effect provides a window on understanding an issue of broader theoretical significance, namely, whether there are *health* “externalities” accruing to members of a patient’s social network that are specifically related to health care delivery.

## Methods

### *Source population and data files*

The subjects analyzed here are drawn from the Care after the Onset of Serious Illness (COSI) data set which we have built from Medicare claims (Christakis,

Iwashyna, & Zhang, 2002). The use of Medicare claims for such epidemiological purposes is described elsewhere, (Mitchell et al., 1994; Lauderdale, Furner, Miles, & Goldberg, 1993) but it is noteworthy that the use of such data allows virtually complete population-based samples to be developed for analysis. COSI contains clinical, demographic, and other information about a population-based cohort of 1,241,935 elderly patients. These patients were initially diagnosed in 1993 with one of 13 leading causes of death: cancer of the lung, colon, pancreas, urinary tract, liver or biliary tract, head or neck, or central nervous system, as well as leukemia or lymphoma, stroke, congestive heart failure, hip fracture, or myocardial infarction. We also identified these patients’ spouses, (Iwashyna, Zhang, Lauderdale, & Christakis, 1998, 2000) and we determined the same information about them as for the patients (e.g., their morbidities, age, etc.).

The development of the COSI cohort begins with 1993 hospitalization records in the so-called MedPAR file obtained from the Health Care Financing Administration (HCFA); the MedPAR file is a virtually complete register of all hospitalizations among the American elderly. For individuals who were hospitalized with any of the 13 conditions in 1993, we included in COSI only cases that were deemed incident by examining 3 years of prior claims for each patient and excluding cases with prior claims for the relevant condition (McBean, Warren, & Babish, 1994). All other diseases that patients had were noted and summarized with the Charlson comorbidity score; we implemented this score by using a technique involving a complex vector of indicator variables that has been shown to perform as well as patient self-reports of co-morbid conditions (Zhang, Iwashyna, & Christakis, 1999). All subjects under study, regardless of outcome, were uniformly evaluated for comorbidities using this method. Characteristics of the initial hospital were obtained from HCFA and the American Hospital Association (American Hospital Association, 1994).

With follow-up until December 31, 1997, we determined whether and when patients were enrolled in hospice care. Mortality follow-up for both patients and spouses was achieved with the highly accurate and complete Vital Status file, updated as of June 30, 1999 (i.e., 18 months beyond the last day of follow-up for health care use). As an indicator of patients’ economic status, we linked to the 1990 census and noted the median income of the patients’ ZIP postcode; this technique has been validated, (Krieger, 1992; Hofer, Wolfe, Tedeschi, McMahon, & Griffith, 1998) but also has limitations (Geronimus, Bound, & Neidert, 1996; Robinson, 1950). As another proxy for patients’ economic status, for each individual, we ascertained whether they were recipients of Medicaid (a state-funded health insurance scheme for the poor) (Clark & Hulbert,

1998). Finally, using a different data source, (Christakis & Iwashyna, 2000) we ascertained whether the patients resided in counties with high *per capita* hospice use (i.e., greater than four users in 1993 per 1000 persons older than 65), which divided the approximately 3000 US counties at the median; this variable was used only in our sensitivity analyses.

### *Subjects under study*

Here, we investigate the *spouses* of appropriate individuals in COSI. The appropriate individuals were those patients who died at some point during the period between their diagnosis in 1993 and December 31, 1997 and whose spouse was alive when they died. In total, there were 195,553 such individuals and, consequently, an identical number of bereaved spouses, that is, 155,638 widows and 39,915 widowers. This gender distribution reflects the diseases we have chosen to study (which disproportionately affect men) and the need that the patient be married at the time of death (men are more likely to predecease their wife). Regardless of when in the interval between January 1, 1993 and December 31, 1997 the patient died, we followed the spouse until June 30, 1999 to see if and when he or she died.

In short, we performed a matched cohort study nested within a larger, population-based epidemiological cohort study of seriously ill elderly patients. We focus on the surviving spouses of individuals who fell ill with one of the 13 serious conditions in 1993 and who died by the end of 1997, and we ask: what happened to the surviving spouses (i.e., how long did they live), depending on whether the decedent used hospice care? We have at least 18 months of follow-up for these bereaved spouses, and up to 78 months (depending on when the decedent died). We analyzed bereaved men and women separately because of the well-known differences in their force of mortality (US Census Bureau, 1997).

### *Developing the matched cohorts*

The dependent variable of interest is the duration of survival of bereaved individuals, and we wish to compare two groups: those with partners who died with hospice care and those with partners who died without hospice care. To minimize possible confounding, and to balance the two groups along multiple matching criteria, we employed Rosenbaum and Rubin's propensity score method (Rosenbaum & Rubin, 1983, 1984; Smith, 1997).

The complex decision to use hospice is made by patients, families, physicians and others. Thus, the selection of hospice could be confounded by factors that are also related to the mortality outcomes of

the surviving spouse. For example, patients with younger or healthier partners may be more likely to enroll in hospice, and such partners would also be less likely to die during bereavement. To control such possible bias, variables that can affect the decision to use hospice must be identified and measured. These variables may then be included in a logistic regression model that determines the probability of hospice use, a probability known as the "propensity score." Selection bias may then be reduced by matching probands ("cases") to comparison group members ("controls") according to their propensity scores, a method of matching that offers several statistical advantages (Smith, 1997).

We reviewed prior literature to identify variables that could influence the use of hospice care in the elderly (Christakis & Iwashyna, 2000; Iwashyna et al., 2002; Christakis & Escarce, 1996; Christakis & Iwashyna, 1998; Mor, Wachtel, & Kidder, 1985). Separately for men and women, we determined the propensity score for each patient based on attributes that the literature has suggested might influence this decision, including attributes of the decedents (age, race, Medicaid receipt, Census ZIP code income, diagnosis, co-morbidity score, and duration of illness), the surviving spouses (including age, race, co-morbidity score), and the hospital in which the decedents were initially hospitalized (technology availability, (Baker & Spetz, 1999) and teaching hospital status). These and other variables describing the sample are provided in Table 1. Exactly the same variables were used to determine (separately) the propensity scores for men and women. The adequacy of the propensity score in adjusting for the effect of covariates was checked by using a recommended method of testing for differences in covariates between subjects whose partner did or did not use hospice, after stratifying by quintiles of propensity for hospice use (data not shown) (Rosenbaum & Rubin, 1984).

Next, decedents who did not use hospice care were matched to decedents who did on the basis of gender and the propensity score. For example, for bereaved wives, we did the following: First, a couple with a male decedent was randomly selected from the 24,740 such couples where the decedent used hospice. Second, all 130,898 such couples where the male decedent did *not* use hospice were searched to find the couple who had the same propensity score (within 0.005 on a scale of 0–1). This procedure was continued until all possible proband/comparison group member ("case"/"control") pairs were identified. A parallel process was followed for bereaved husbands, i.e., couples with female decedents, among which there were 6176 hospice users. This procedure was successful in matching "cases" to "controls" for 24,721 of the female survivors (99.92%) and for 6117 of the male survivors (99.04%); see Fig. 1.

Table 1  
Characteristics of married couples

	Male decedents, bereaved wives				Female decedents, bereaved husbands			
	Used hospice	Did not use hospice	"Cases"	"Controls"	Used hospice	Did not use hospice	"Cases"	"Controls"
N	24,740	130,898	24,721	24,721	6176	33,739	6117	6117
<i>Characteristics of the bereaved spouse</i>								
Age at decedent's diagnosis (mean) <sup>a</sup>	73.3	74.5	73.3	73.2	77.2	78.7	77.2	77.1
Age at decedent's death (mean)	74.7	75.6	74.7	74.6	78.7	79.9	78.7	78.6
White race <sup>a</sup>	93.9%	92.5%	93.9%	94.1%	94.9%	92.8%	94.9%	94.8%
Medicaid recipient <sup>a</sup>	3.6%	6.4%	3.6%	3.5%	5.0%	10.7%	5.0%	4.9%
Median income of ZIP code (mean) <sup>a</sup>	\$ 31,027	\$ 29,835	\$ 31,025	\$ 31,205	\$ 32,057	\$ 29,708	\$ 31,960	\$ 31,920
Charlson co-morbidity score (mean) <sup>a</sup>	0.34	0.40	0.34	0.35	0.57	0.66	0.57	0.58
Dead by end of follow-up (June 30, 1999)	15.7%	20.0%	15.8%	16.5%	35.4%	42.4%	35.5%	36.1%
Dead 12 months after death of decedent	3.3%	4.1%	3.3%	3.7%	9.3%	10.9%	9.3%	9.6%
Dead 18 months after death of decedent	4.9%	6.2%	4.9%	5.4%	13.2%	15.7%	13.2%	13.7%
<i>Characteristics of the decedent</i>								
Age at Diagnosis (mean) <sup>a</sup>	76.1	77.5	76.1	76.1	75.4	77.0	75.4	75.4
White race <sup>a</sup>	93.2%	91.5%	93.2%	93.3%	94.6%	92.4%	94.6%	94.4%
<i>Primary diagnosis<sup>a</sup></i>								
Myocardial infarction	8.4%	19.8%	8.4%	7.7%	6.3%	18.3%	6.3%	5.7%
Congestive heart failure	11.8%	21.9%	11.8%	11.9%	11.3%	21.2%	11.4%	12.0%
Stroke	9.5%	19.0%	9.6%	9.4%	10.6%	21.3%	10.7%	9.8%
Hip fracture	4.4%	7.9%	4.4%	4.8%	9.4%	14.7%	9.5%	10.2%
CNS cancer	1.9%	0.6%	1.9%	2.0%	2.7%	0.8%	2.6%	2.9%
Head and neck cancer	2.3%	1.1%	2.3%	2.3%	1.4%	0.5%	1.4%	1.4%
Liver and biliary tract cancer	2.2%	1.0%	2.2%	2.3%	3.2%	0.9%	3.1%	3.2%
Colon cancer	13.3%	5.4%	13.3%	12.7%	15.5%	4.9%	15.2%	15.2%
Leukemia	2.7%	2.6%	2.7%	3.0%	2.3%	2.2%	2.4%	2.4%
Lung cancer	26.0%	11.6%	26.0%	26.1%	20.8%	7.7%	20.8%	20.6%
Lymphoma	5.3%	3.6%	5.3%	5.4%	6.7%	4.0%	6.7%	6.6%
Pancreatic cancer	4.4%	1.5%	4.4%	4.3%	6.3%	2.0%	6.2%	6.4%
Charlson co-morbidity score (mean) <sup>a</sup>	1.23	1.36	1.23	1.25	1.08	1.29	1.08	1.08
Survival from diagnosis to death, days (mean) <sup>a</sup>	530	420	529	534	520	416	514	515
<i>Characteristics of the initial hospital of the decedent</i>								
Technology index (mean) <sup>a</sup>	7.97	7.28	7.97	8.00	7.95	7.21	7.93	8.02
Teaching hospital <sup>a</sup>	14.0%	12.3%	14.0%	14.1%	14.8%	11.9%	14.6%	14.8%

<sup>a</sup>Included in the computation of the propensity score. However, in the case of race, a set of five indicators (white, black, Asian, Hispanic and other) was used in the computation, and in the case of Charlson co-morbidity, a complex vector of indicators as described elsewhere [27] was used (rather than a simple continuous measure of the Charlson score, as shown in this table).

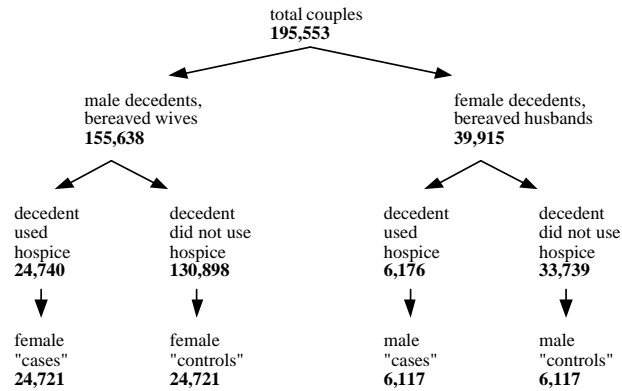


Fig. 1. Sample under study.

### Sensitivity analysis

Using the propensity score technique, we adjusted adequately for all factors included in the propensity regression. However, there could be important but unmeasured covariates that were not identified by our literature review (or that were unavailable in our data set). We therefore evaluated the sensitivity of our analysis to possible missing covariates in two ways. First, we identified the variables that were the most highly associated with the decision to use hospice (i.e., decedent's diagnosis, decedent's duration of illness, and the measures of financial status) and removed them from the propensity regression to determine the stability of the adjustment despite inducing an artificially inadequate model. If the findings of this model do not prove to be different, this could support the argument that any unmeasured factor would likely have to be even more important than these measured ones for it to be a source of serious bias, and it seems unlikely such a factor remains unknown. Second, we evaluated whether the association of decedent hospice use and spousal survival varied across markets with high and low hospice use. If the effect of interest does not vary across such markets where potentially "marginal" patients are recruited into hospice care, we could surmise that the effect of hospice use on spousal mortality may not be sensitive to the selection of patients into hospice, a selection perhaps related to unobserved factors.

### Statistical analysis

Kaplan–Meier survival curves were plotted. Survival outcomes of spouses at various cut points were assessed with logistic regression, both unadjusted for covariates and adjusted with the propensity score method. We used an 18-month cut-off for some descriptive results since we followed decedents until December 31, 1997, but spouses until 18 months later, i.e., June 30, 1999. We used

generalized estimating equation methods to account for the matching of subjects into pairs (Allison, 1999). The survival time of bereaved spouses was also evaluated using stratified Cox regression which accounts for the matching of individuals within pairs (i.e., a separate stratum for each pair)—after adjustment with propensity score matching alone, or after simultaneous adjustment with propensity score matching plus measured covariates (Allison, 1995). Analyses were conducted in SAS 8.1. This work was approved by our Human Studies Committee.

## Results

### Sample

Table 1 provides selected descriptive and outcome information for the bereaved individuals in our sample and includes traits of their deceased spouses. Of the 195,553 couples, a total of 30,916 (15.8%) of the decedents used hospice care before they died, consistent with national norms (Christakis & Iwashyna, 2000). The median time before the decedent's death that he or she spent in hospice was 22 days [IQR: 8–61], a number that also approximates national norms. Men spent a median of 22 days [IQR: 8–59] and women 25 days [IQR: 8–69]. During the entire follow-up period from 1993 to June 30, 1999, 30,081 (19.3%) of the bereaved wives overall and 16,488 (41.3%) of the bereaved husbands overall died. These mortality figures (over a variable follow-up for each bereaved spouse, anchored at the time of death of the initial decedent) correspond to the known mortality of the elderly (US Census Bureau, 1997).

The logistic regression model of propensity for hospice use had an area under the receiver operating curve of 0.763 for male survivors and 0.738 for female survivors, indicating good discrimination between couples with decedents who did and did not receive hospice

care. There was considerable, appropriate overlap in the propensity scores of the groups using and not using hospice (data not shown). As expected, given the use of the propensity score matching method, the attributes of the “cases” and their matched “controls” are extremely similar (Table 1).

#### *Patient hospice use and spousal mortality*

After appropriate controls using the propensity score method, bereaved wives of husbands who used hospice showed lower mortality than matched wives whose deceased husband had not used hospice. Whereas 5.4% of bereaved wives died by 18 months after the death of their husband when their deceased husband did not use hospice, 4.9% died when their husband did use hospice—an adjusted odds ratio (OR) of 0.92 (95% CI: 0.84–0.99) in favor of hospice use. Similarly, whereas 13.7% of bereaved husbands died by 18 months when their deceased wife did not use hospice, 13.2% died when their wife did use hospice—an OR of 0.95 (95% CI: 0.84–1.06) in favor of hospice. The relationship of hospice use in decedents with the mortality of their surviving spouses was similar when the analyses involved other arbitrary cut-points or when the analyses were restricted to couples in which the decedent had cancer (data not shown).

Fig. 2 shows survival curves for bereaved wives and husbands, depending on the hospice use status of their

dead spouse, over the whole follow-up period, for the matched cohorts. Separately among men and women, a stratified Cox model with survival after bereavement as the dependent variable and an indicator of hospice use by the decedent as the key independent variable revealed the following, after adjusting for all other covariates: wives of hospice users have statistically better mortality outcomes, with a hazard ratio of 0.91 (95% CI: 0.82–0.98); the much smaller sample of husbands of hospice users also shows that they have better mortality outcomes, but not in a statistically significant fashion, with a hazard ratio of 0.93 (95% CI: 0.84–1.02).

#### *Sensitivity analysis*

In any epidemiological study, confounding is a crucial concern. In order to be a confounder, an unobserved variable must be associated with both the treatment (here, decedent hospice use) and the outcome (here, spousal survival). In order to test the degree to which our results might be susceptible to such a (unobserved) confounder, we repeated our analysis and intentionally mis-specified the models, omitting in turn the three most powerful predictors of hospice use. When we omitted the patient’s diagnosis, the estimated benefit of hospice (in terms of the hazard ratio) changed by 3.2% compared to the Cox models shown; omitting income, the estimated benefit of hospice changed by 9.2%; and, omitting the time from diagnosis to death changed the benefit of

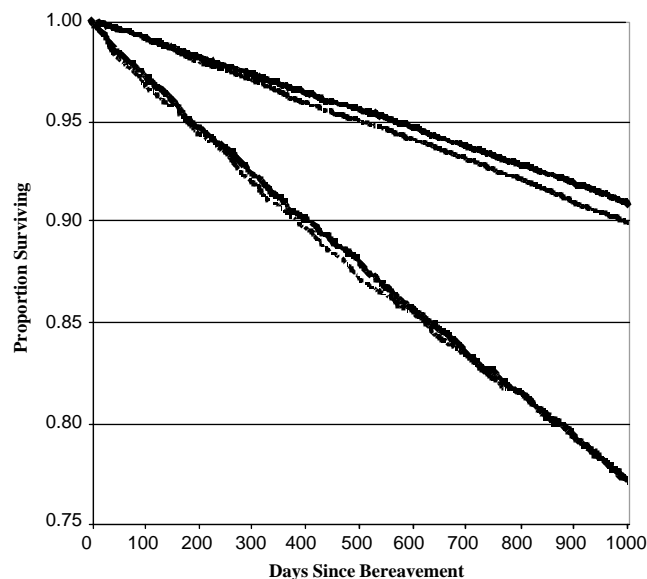


Fig. 2. Survival of bereaved wives and bereaved husbands according to hospice use status of the decedent. Legend: In each pair of curves (bereaved wives are the upper curves and bereaved husbands are the lower curves), the survival of spouses of decedents who used hospice care (as indicated by the bold line) is better than of decedents who did not use hospice care (as indicated by the thin line), though the association of decedent hospice use and bereavement mortality outcomes is only statistically significant for bereaved wives.

hospice by 8.4%. That is, the results are quite insensitive to intentionally omitting the most important variables (the full models are available from the authors on request). Thus, any residual confounding due to variables not captured in the data set would probably need to be more important than the patient's diagnosis, income, duration of illness, age, or co-morbidity in explaining both hospice use and spousal mortality in order to bias the measured effect of hospice in a meaningful way—which, though possible, seems unlikely. As an additional sensitivity analysis, we found no difference in the benefits of hospice for widow/ers depending on whether the decedent had died in a market with high or low hospice use, suggesting an association of hospice care with bereavement outcomes regardless of possibly unobserved factors influencing the selection of hospice.

## Discussion

Using a population-based sample of the elderly, we assessed the potentially beneficial impact of hospice—a supportive type of medical care that might be offered to dying patients—on the spouses of patients who died. We found that this type of care, even when used for a median of 3–4 weeks, may be associated with the subsequent health outcomes of bereaved spouses in that it reduces their risk of death. This impact is present in both men and women, but it is statistically significant, and possibly larger, in bereaved wives.

It is important to emphasize that these effects were seen despite the fact that hospice is not directly intended to benefit the health of surviving spouses; these mortality advantages appear to be a *side effect* of the nature of end-of-life care hospice patients receive. The size of this side effect is meaningful in both relative and absolute terms, especially considering that the main focus of hospice care is the patient and not their spouse, and especially considering that the outcome studied here is death. In women, hospice use by their deceased husbands reduced their short-term odds of death to 0.92. As a comparison, beta-blockade after M.I. reduces the short-term odds of death to 0.96 in a population with a roughly similar 10.5% rate of mortality (Freemantle, Cleland, Young, Mason, & Harrison, 1999). Indeed, the end-of-life care a woman's husband receives has an impact on the woman similar in magnitude to that of various other modifiable diet and exercise risk factors (Stampfer, Hu, Manson, Rimm, & Willett, 2000; Manson et al., 1999; Grodstein et al., 1997).

We used observational epidemiological methods to evaluate this association since a randomized controlled intervention trial probably could not be conducted to examine the effects we have been considering—for both

practical and ethical reasons. In the absence of such an RCT—where the *patients* are randomized to different treatments, but the outcome of interest is their *spouse's* mortality—observational studies may be our best source of clinical evidence (Abel & Koch, 1999; Concato, Shah, & Horwitz, 2000). Indeed, past efforts to study this issue in an RCT context have yielded inconclusive and underpowered results. Kane's study of a total of 96 survivors of hospice users found no difference in depression, anxiety, or missed workdays after 18 months; but it had a power of only 0.60 to detect a meaningful difference in depression and an impact on mortality was simply unevaluable (Kane, Klein, Bernstein, & Rothenberg, 1986). The National Hospice Study, which finished in 1985 and involved 1754 patients and their families, also found little difference between caregivers of patients who died in hospice and hospital; again, the evaluated outcomes were anxiety and depression 4 months after death (Greer et al., 1986). Beyond these two studies, several other small studies have suggested that hospice might be associated with a reduction in the adverse medical, psychological, and social consequences of bereavement (Kane et al., 1986; Cameron & Parkes, 1983; Parkes, 1979; Seale, 1991; Connor & McMaster, 1996). Overall, however, past studies of hospice have tended to lack the power to look at outcomes such as mortality.

Consequently, an impact of hospice on spousal mortality has not previously been documented. Our study contributes to the literature by studying a representative national cohort of patients, using a large and adequately powered sample, employing long follow-up, and focusing on the important outcome of death. The relationship we find between hospice use in decedents and lower mortality in bereaved survivors is consistent with past work on social support, stress, widowhood, and caregiving, and it is biologically plausible.

Extensive evidence has shown that, as a group, married persons have substantially lower mortality than the widowed or the never married, and it is theorized that marriage can affirmatively improve health in several ways (Waite & Gallagher, 2000; Lillard & Panis, 1996). Prior research has focused, however, not only on the benefits of the presence of a spouse, but also on the adverse consequences of the loss of a spouse in terms of the short-term rise in mortality immediately following such loss, that is, the "widow/er effect" (Parkes et al., 1969; Hesling & Szklo, 1981; Schaefer et al., 1995; Young et al., 1963; Cox & Ford, 1964; Welin et al., 1985; Lillard & Waite, 1995). The widow/er effect is consistent with broader findings on the role of social support and stress in mortality, a role possibly mediated by biological factors (e.g., immunity) and psychosocial factors (e.g., isolation) (House et al., 1988; Thoits, 1995; Chappell & Badger, 1989; Chipperfield & Havens, 2001; Connidis &

Davies, 1990). To cope with stress, individuals can use specific (cognitive or material) strategies and/or personal coping resources (such as internal fortitude or external social support). Social support is particularly important: it is positively associated with physical and mental health and can buffer the adverse health impacts of stressful life events and of chronic strains. With some limitations, substantial and persuasive work has documented the relevance of social support in attenuating morbidity and mortality, presumably through mitigating stress or increasing “host resistance.” (House et al., 1988; Berkman & Syme, 1997; Thoits, 1995; Seeman, 1996) In short, mortality in a spouse is clearly a stressful life event, one which itself also deprives the individual of one of their principal sources of social support. As a result of these two parallel effects, the individual should be at increased risk for subsequent mortality himself. In this light, our findings suggest that hospice care might both decrease the stressfulness of the death of the decedents and simultaneously provide some social support that potentially partially replaces the support lost due to the death of the spouse; these twin effects might be the mechanism involved in the mitigation by hospice of the short-term rise in mortality ordinarily associated with bereavement.

Our findings have a number of implications for clinical care, health policy, and social theory. First, they draw attention to the broad phenomenon of interest here, namely, that the health care offered to patients has familial effects. This fundamentally sociological conclusion serves as a reminder and validation of something physicians have always known: that their care involves and affects entire families. Others have noted the economic effects of end-of-life care on families, (Covinsky et al., 1994) but, as we show, there may be health effects as well.

Second, since the manner of caring for patients might have effects beyond the individual patient, our findings suggest an important clinical consideration for doctors caring for terminally ill patients or their partners. Physicians concerned about the impact of impending bereavement have another tool at their disposal beyond bereavement counseling or medication; namely, they can attend to the specific manner of death of the sick partner *before* it occurs. To do so may also carry out the physician’s primary duty to respect patients’ wishes because terminally ill patients consider it very important that they not burden their family members (Steinhauser et al., 2000a). Our results suggest that hospice care may offer a tool to patients and physicians that may soften the blow of the decedent’s death.

Third, our work has implications for the observation that caring for a sick spouse may result in illness. Past work has documented the adverse physical and mental health consequences of caregiving, (Shaw et al., 1997;

Schulz & Beach, 1999; Pruchno & Potashnik, 1989; Dunkin & Anderson-Hanley, 1998) especially for women (Barusch & Spaid, 1989; Pruchno & Resch, 1989). However, most prior research has focused specifically on caregivers of dementia patients and, moreover, the concept of caregiver “burden” has not been defined or measured consistently. In contrast, we focus on the bereaved partners of patients with diverse diseases and focus systematically on the unambiguous outcome of death. Hospice care may help relieve the adverse health consequences of caregiving to the terminally ill. As such, it suggests that health care interventions might be useful in ameliorating caregiver burden more generally.

Fourth, our work has implications for cost-effectiveness assessments. Others have argued that downstream costs accruing to individuals as a result of medical intervention should be taken into more comprehensive account when evaluating whether the benefits of the intervention outweigh the costs (Meltzer, 1997). Our work suggests that a broader perspective is indicated in an additional way: there may be collateral benefits of health care interventions upon the relatives of patients, and these benefits may enhance the cost-effectiveness of the intervention. Thus, in the present case, hospice care may have a variety of benefits not only for individual patients, but also for bereaved spouses, and this may increase the overall cost-effectiveness of hospice (Kidder, 1992).

Finally, our work has implications for social theory related to the first point mentioned above. That is, the particular example we explore here is illustrative of a much broader idea: namely, that health care given to one person can have health effects on others in their social network. Disease and its treatment is a collective phenomenon in a broad way indeed. One can imagine a number of examples of such effects: Treating depression in a parent can result in better health not only for the parent, but also greater likelihood that the parent will vaccinate his/her children or otherwise seek necessary health care on their behalf, thus extending the overall “health benefits” of the depression treatment. Replacing a broken hip in one spouse may make it easier for them to care for the other spouse, thus again compounding the health benefits of the hip surgery in measurable and important ways. Ordinarily, in economic terms, these effects would be considered to be “externalities” of the intervention. (Of course, externalities may be both positive, as in the present case, and negative.) However, the present case is interesting in at least two ways. First, these externalities are strictly speaking *health-related* and not monetary in nature. Second, and more important, we can see that these externalities can be internalized—since sick patients are concerned, often very deeply, about what happens to their loved ones. They do



not want to be a burden—even at the end of life (Steinhauser et al., 2000a, b). Thus, the sick patients themselves might chose one form of health care over another specifically because of the health benefits to others in their social network, thus internalizing, or capturing, these external benefits.

Our work has important limitations. First, we focus on only one endpoint observed during bereavement, namely death. Hospice use by the decedent might indeed be associated with other health consequences in bereaved spouses, such as decreased physical or mental morbidity or decreased health care use. However, it seems likely that any such effects would be even greater than the mortality effects we have described. Second, data were not available on the particular mix of services each couple received (e.g., the number of visits, bereavement services, etc.). Hospice care is clearly a heterogeneous intervention, especially in the US. Nevertheless, hospice clearly entails a substantially different type of care at the end of life compared to traditional terminal care, even if details vary from patient to patient. Further research will be required to isolate which parts of the hospice intervention are most beneficial with respect to spousal bereavement. Indeed, the effect sizes documented here represent the results of a heterogeneous “treatment” that has not been optimized toward the outcome studied; that is, hospices have not had research to guide them specifically in developing interventions to reduce spousal mortality. Third, given the observational nature of this epidemiological study, and the fact that the “treatment” here (hospice use) might possibly have been associated with unmeasured factors also associated with spousal mortality outcomes, caution is required in interpreting our results. However, our sensitivity analyses suggest that, in order to change the clinical significance of our work, such an unmeasured factor would need to have a more powerful effect on both the use of hospice and on subsequent mortality than was shown by any of the health, demographic, socio-economic, and provider variables that we did measure.

In sum, the analyses in this work are the first to use large-scale, quantitative techniques to examine the posited beneficial impact of hospice care for the relatives of the patient, a significant issue in the elderly given clinical and policy concern for caregiver burden and the adverse consequences of widowhood. Such an impact is in keeping with the idea that health is something that is produced jointly by families and the medical system, and is not merely the product of isolated doctor–patient dyads. More generally, this work illustrates that there may be important (perhaps, positive) externalities associated with the medical care that is delivered to individual patients. How we care for the terminally ill may have lasting health effects for their loved ones.

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