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TREATMENT AT THE END OF LIFE

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ABSTRACT

To assess the consequences of advance medical directives -- which explicitly specify a patient's preferences for one or more specific types of medical treatment in the event of a loss of competence -- we analyze the medical care of elderly Medicare beneficiaries who died between 1985-1995. We compare the care of patients from states that adopted laws enhancing incentives for compliance with advance directives and laws requiring the appointment of a health care surrogate in the absence of an advance directive to the care of patients from states that did not. We report three key findings. First, laws enhancing incentives for compliance significantly reduce the probability of dying in an acute care hospital. Second, laws requiring the appointment of a surrogate significantly increase the probability of receiving acute care in the last month of life, but decrease the probability of receiving nonacute care. Third, neither type of law leads to any savings in medical expenditures.

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Introduction

The consequences of advance medical directives – which explicitly specify a patient’s preferences for one or more specific types of medical treatment in the event of a loss of competence, generally at the end of life (EOL) – have been extensively debated by physicians, philosophers, and social scientists. On one hand, proponents of advance directives argue that they address two important social problems. First, since substantial health care resources are consumed at the EOL, advance directives that specify preferences to forgo treatment have the potential to reduce health care costs. In 1990, the 6.6% of Medicare recipients who died accounted for 22% of program expenditures, a pattern that has changed little over time (Lubitz and Riley 1993).

Second, patient autonomy and well-being may also be enhanced by the use of advance directives. Although society has reached a consensus that treatment decisions should reflect patients’ informed preferences (e.g., Teno et al. 1994), this ideal is often not implemented in practice. Because patients for whom advance directives are relevant are incapacitated and because the common-law right of patients to refuse treatment is unclear (Redleaf et al. 1979), physicians traditionally have made such treatment decisions in consultation with the incapacitated patient’s family members. But because physicians’ and patient-surrogates’ perceptions of patients’ preferences are often inaccurate (Teno et al. 1995; Layde et al. 1995; Hare et al. 1992), substituted judgment in this context may result in medical treatment decisions that do not reflect patients’ wishes. This is especially important because treatment at the EOL may be of questionable value. For example, Altman (2001) reports that many cancer patients receive chemotherapy at the EOL, even if their type of cancer is known to be unresponsive to the

drugs.

On the other hand, a substantial body of work has found that advance directives do not deal effectively with these issues. Advance directives may be infrequently used by patients (Menikoff et al. 1992), and, when they are, not consistently followed by physicians (Covinsky et al. 2000). People may believe that their wishes will be carried out even in the absence of an advance directive. Physicians may believe that advance directives are medically unethical, if the preference of patients who are near death differ from those patients' preferences at the time they executed their advance directive (Byrne and Thompson 2000).

Yet, virtually all existing research focuses on the effect on an *individual's* care of *his or her* adoption of an advance directive, despite the fact that the enforceability of and the incentives for compliance with advance directives are largely determined by statutes that differ from state to state. In this paper, we explore how these state laws affect care at the EOL. We analyze the medical treatment received by a 20 percent random sample of elderly Medicare beneficiaries who died between 1985-1995. We compare the care of patients who died in states that adopted laws enhancing incentives for compliance with advance directives and laws requiring the appointment of a health care surrogate in the absence of an advance directive to the care of patients in states that did not. To investigate whether these laws affect patients differently depending on their cause of death or their educational attainment, we stratify our sample of Medicare beneficiaries by matching it with information from the US National Center for Health Statistics Public Use Multiple Cause of Death file.

This paper proceeds in five sections. Section I discusses previous investigations of the effects of advance directives. Although this research shows how advance directives affect

treatment *given* a system of law, it does not investigate how the laws that specify the incentives for compliance with advance directives affect EOL care. Section I concludes that differences in states' legal environments may explain some of the differences in findings in the existing literature. Section I also concludes that another body of law may affect treatment at the EOL: state health care surrogate laws, which impose default rules on surrogates' decision-making even in the absence of an advance directive. Section II presents our empirical models of how legal, market, and other factors determine EOL care. Section III describes our data in detail. Section IV presents our results, and Section V concludes.

I. The Effects of Advance Directives on Care at the EOL

Advance directives provide a formal, legal mechanism for a competent person to specify her preferences for medical treatment in case she becomes unable to make decisions. Federal and state law govern the extent to which advance directives constrain the decision-making processes of doctors and hospitals. In 1991, Congress adopted the Patient Self Determination Act, which requires that institutions inform patients that they can execute a formal advance directive (Teno et al. 1994). States have passed two types of laws governing treatment of the incapacitated. The first type of law specifies the conditions under which doctors and hospitals must follow advance directives and the punishment (if any) that they bear from failing to do so. The second type of law specifies how treatment decisions are made for incompetent patients in the absence of an advance directive.

The existing literature paints an equivocal picture of the consequences of advance directives. One arm of the literature uses surveys of physicians and patients to assess the effects

of advance directives. Although early work reports that both doctors and patients believe advance directives affect patient care (e.g., Klutch 1978, Redleaf et al. 1979), subsequent survey research questions this conclusion. In an analysis of interviews with 126 nursing home residents and their families, Danis et al. (1991) found that care was consistent with patients' previously expressed wishes 75 percent of the time; however, the presence of a written advance directive did not improve the consistency of care with patients' wishes. Based on a comparison of patients' actual advance directives to their detailed survey responses, Schneiderman et al. (1992b) suggest that this lack of efficacy may be due to the failure of instructions in standard-form advance directives to adequately communicate patient wishes to physicians.

A second arm uses observational data to compare the treatment decisions, health care expenditures, and health outcomes of severely ill patients who expressed a preference to forgo treatment to those of patients who did not. Studies using this method employ regression analysis to adjust for differences in health and socioeconomic characteristics across patients, calculating the effect of expressed patient preferences on treatments and outcomes, holding other factors constant. These studies also come to conflicting conclusions, with some work finding that expressed patient preferences in some forms can reduce treatment intensity (Teno et al. 1995) and hospital charges (Chambers et al. 1994, Weeks et al. 1994), and other work finding that advance directives have no impact on either treatments or outcomes, over and above the effect of more-informally-expressed patient preferences (Teno et al. 1994).

However, because observational data on health status is notoriously incomplete, unobserved differences across patients may lead the estimated effects of advance directives to either overstate or understate the true impact of patient preferences. A third set of studies seeks

to eliminate this potential bias through the use of randomized controlled trials (RCTs), in which patients randomized to a “treatment” group are offered the opportunity to execute an advance directive and patients randomized to the “control” group are not. Based on an RCT, Schneiderman et al. (1992a) find that the act of offering patients with a life-threatening illness the opportunity to execute an advance directive has no statistically significant effect on medical treatments, health care expenditures, or other psychosocial and health outcomes. Similarly, in the Study to Understand Prognoses and Preferences of Outcomes and Risks of Treatment (SUPPORT), neither providing additional information to patients and health care providers about prognosis and patient rights (SUPPORT 1995) nor increasing documentation of advance directives (Teno et al. 1997) reduced the use of intensive medical services near the end of life. In contrast, also using an RCT, Molloy et al. (2000) report that a comprehensive program to educate health care providers, patients, and family members about advance directives reduced health services utilization without affecting satisfaction or mortality.

Although RCTs estimate treatment effects without the bias to which nonexperimental studies are prone, they may not provide accurate guidance about the effects of feasible legal reforms on actual medical practice. For two reasons, RCTs that offer patients the opportunity to execute a directive could show no effect, even if laws governing advance directives affect medical practice. First, the RCT might have been conducted in a state with weak or nonexistent incentives for compliance. Second, laws enhancing incentives for compliance with advance directives may increase doctors propensity to respect the preferences of patients both with and without advance directives. Furthermore, there are no RCTs examining how other related laws, such as those governing health care surrogates’ treatment decisions, interact with the use of

advance directives to affect EOL care.

The failure of the literature to investigate how state laws affect EOL care is striking, since existing studies suggest that the incentives provided by laws are an important determinant of the effectiveness of advance directives. RCTs from states (such as California) that provide strong incentives compliance with patients' wishes observe that patients' preferences about intensive resuscitation measures were routinely elicited in detail before they lost decisionmaking capacity, regardless of whether the patient had actually executed an advance directive (Schneiderman et al. (1992a)). By comparison, North Carolina has a weaker living will law, and Danis et al. (1991) found that care was consistent with patients' previously expressed wishes in only 75 percent of cases.

II. Empirical Models

Our modeling strategy and data are similar to those used in Kessler and McClellan (2002). We model the effects of law changes as differences in time trends across states in the medical care of elderly Medicare decedents during the eleven-year period 1985-1995. We measure five medical care outcomes for patients at the EOL: the location of death (in or out of acute care hospital), whether the patient had an acute care hospital stay in the month before death, whether the patient had a nonacute care (mainly skilled nursing) stay in the month before death, the natural logarithm of acute care hospital expenditures in the last month of life conditional on having an acute care stay, and the natural logarithm of nonacute care expenditures in the last month of life conditional on having a nonacute care stay. We specify these outcomes as nonparametric functions of patient demographic characteristics; state-level legal, political, and

health-care market characteristics; and state- and time-fixed-effects.

While this strategy fundamentally involves differences-in-differences (DD) between reforming and nonreforming states to identify effects, we modify conventional DD estimation strategies in several ways. First, as noted above, our models include few restrictive parametric or distributional assumptions about functional forms. Second, we allow law reforms to have dynamic effects on treatment decisions. We separately estimate the effect of law reforms for individuals who died shortly after the adoption of an advance directive law versus long after adoption of a relevant law.

We use a panel-data framework with observations on successive cohorts of decedents. In state $s = 1 \dots S$ during year $t = 1 \dots T$, our observational units consist of individuals $I = 1 \dots N_{st}$ who died. Each patient has observable characteristics X_{ist} , including race, gender, and age, which we describe as a fully-interacted set of binary variables, as well as many unobservable characteristics that also influence their course of medical treatment. The individual receives treatment of R_{ist} in the month before death, where R denotes one of the five measures discussed above.

We define state laws affecting advance directives and health care surrogacy in effect at the time of each individual's death with four categorical variables. We classify each state as having adopted or not adopted one of two types of laws: laws enhancing physicians' and hospitals' incentives for compliance with advance directives, and laws requiring delegation of treatment decision-making in the absence of an advance directive. Some laws enhancing incentives for compliance simply state that advance treatment directives of an approved form are legally binding; others specify civil and/or criminal penalties for physician disregard of a valid

advance directive; others specify conditions under which a physician can refuse to comply with an advance directive; others provide a liability waiver for actions arising out of good-faith compliance with an advance directive. Laws requiring delegation of treatment decisions to a health care surrogate in the absence of an advance directive generally specify the conditions under which and the individuals from whom a physician or hospital must seek guidance for treatment of a dying patient. Table 1 specifies which states require delegation of treatment decisions (by the end of our study period, all states had adopted laws providing incentives for compliance with advance directives) and when each state adopted each type of law.

To distinguish long-term from short-term effects of law reforms, we estimate dynamic models that separate the effect of reforms soon after and long after their adoption. We define $L_{1st}=1$ if state s adopted a law enhancing incentives for compliance with advance directives between 1986 and 1995, but no more than two years before the patient's year t death (i.e., in year t through $t-2$), $L_{2st}=1$ if state s adopted such a law in year $t-3$ or before (three or more years before the patient's death), $L_{3st}=1$ if state s adopted a law requiring delegation of treatment decision-making to a specified health care surrogate between 1986 and 1995, but no more than two years before the patient's death, and $L_{4st}=1$ if state s adopted a law requiring delegation of treatment decision-making to a specified health care surrogate between 1986 and 1995 three or more years before the patient's death.

We first estimate linear models of the following form:

$$R_{ist} = \theta_t + \alpha_s + X_{ist}\beta + W_{st}\gamma + L_{st}\phi + M_{st}\delta + v_{ist} , \quad (1)$$

where θ_t is a time fixed-effect, α_s is a state fixed-effect, R_{ist} and X_{ist} are defined as above, W_{st} is a

vector of variables described in Kessler and McClellan (1996) which summarize the legal-political environment of the state over time,¹ $L_{st} = [L_{1st}, \dots, L_{4st}]$ is a 4-dimensional binary vector describing the existence of law reforms, M_{st} is a vector of other market environment controls,² and v_{ist} is an error term with $E(v_{ist} | X_{ist}, L_{st}, W_{st}, M_{st}) = 0$.

Because legal reforms may affect both the level and the growth rate of expenditures, we estimate different baseline time trends β_t for states adopting in 1985 or earlier each of the four types of law reforms that we study (since our models include state fixed effects, we can not estimate the effect of such reforms on the level of utilization). We allow the time trend in utilization and location of death to vary after versus before January 1, 1990 for decedents from states adopting laws enhancing incentives for compliance with advance directives in 1985 or earlier, and for decedents from states adopting health care surrogate laws in 1985 or earlier.

We also examine the effect of law reforms separately for certain subgroups of patients that reforms are likely to affect differently. First, we estimate the effect of laws separately for patients dying from cancer, because the risk of fatality and lack of acuity associated with many cancers mean that EOL care decisions are explicitly considered by such patients (e.g., Steinhauser et al. 2000). Second, we examine the differential impact of laws by patients' level of educational attainment. More educated patients may be more likely to have the resources that enable them to affect their EOL care. But even if they do, laws may have greater or lesser

¹W includes the contemporaneous and one-year-lagged political party of each state's governor, the majority political party of each house of each state's legislature, and contemporaneous and one-year-lagged interaction effects between these two variables.

² M_{st} includes controls for three binary variables capturing whether the state's managed care enrollment was above the 25th, 50th, or 75th percentile of enrollment rates (0.062, 0.114, and 0.166, respectively).

effects for more educated patients, depending on the effectiveness of laws as a substitute for or complement to patients' private efforts. Models that interact laws with patients' education are of the form:

$$\zeta_{ist} = \theta_t + \alpha_s + X_{ist}\beta + W_{st}\gamma + L_{st}\phi + M_{st}\delta + E_{ist}\sigma + (L_{st} * E_{ist})\rho + v_{ist} \quad (2)$$

where E_{ist} is a vector of two variables denoting the proportion of individuals in patient i 's demographic cell who graduated from high school or who had missing educational attainment (omitted group includes patients with less than high school education; see description below of how E_{ist} is constructed). In these models, we also allow the different baseline time trends 2_t for states adopting reforms in 1985 or earlier to vary by patients' educational attainment.

III. Data

The data used in our study come from three principal sources. First, we use comprehensive longitudinal Medicare claims data for a 20 percent random sample of the vast majority of elderly beneficiaries who died in the years 1985-1995 (death dates are based on death reports validated by the Social Security Administration). We exclude patients in Medicare HMOs (reliable individual-level treatment information on such individuals was not available until recently). Data on patient demographic characteristics were obtained from the Health Care Financing Administration's HISKEW enrollment files. Measures of both acute and nonacute hospital expenditures were obtained by adding up all hospital reimbursements (including copayments and deductibles not paid by Medicare) from insurance claims for all treatments in the month preceding each patient's death. These expenditures reflect variation in

actual resource use even under the DRG-based Medicare Prospective Payment System, since the provision of intensive treatments, very costly stays, transfers, and readmissions for acute care and nonacute care (“rehabilitation”) all lead to higher hospital expenditures. We use claims data to identify if patients’ date of death was during a Medicare acute hospital stay.

Second, we match to this data information on patients’ educational attainment and cause-of-death from the National Center for Health Statistics Public Use Multiple Cause of Death for ICD-9 file, which contains information from every death certificate recorded in the U.S., including the ICD-9 code(s) denoting underlying cause of death and any other (secondary) cause of death. The NCHS data also contains information on the decedent’s educational attainment (for 1986 and later; educational attainment is missing for all decedents for 1985) and demographic information including age at death, race, sex, year, month and day of death (day of week only after 1990), and state of birth. We use demographic information from the NCHS data to construct demographic cells for decedents that describe the distribution of possible actual causes of death and educational attainment for Medicare beneficiaries that share similar demographic characteristics, imputing the state of birth from the Medicare identifier. This enables us to identify the cause of death of 63% of our sample of Medicare decedents. Of the remaining 37%, we first seek to choose from the set of possible NCHS causes given the decedent’s demographics that cause that represents the plurality of inpatient expenditures in the two years prior to death. This enables us to identify the cause of death of an additional 8% of decedents. Of the remaining 29%, we seek to assign the cause that represents the plurality of inpatient expenditures in the two years prior to death. This enables us to identify the cause of death of an additional 24%. The remaining 5% have an unspecified cause. We define E_{1st} as the

proportion of individuals in patient i 's demographic cell who had less than high school education, who graduated from high school, or who had missing educational attainment. In other work (Shearer et al. 2002), we describe this matching process and our validation of it in greater detail.

Third, we match patient data with information on annual managed care enrollment rates by state from InterStudy Publications, a division of Decision Resources, Inc. Managed care enrollment excludes patients enrolled in preferred provider organizations (which are effectively a form of discounted FFS insurance); point-of-service plans that are not subject to state HMO regulation; and plans that are self-insured by employers, even if they are administered by a MCO. Enrollment rates were calculated by dividing the number of enrollees (exclusive of Medicare supplementary enrollees) by the population. We control for managed care enrollment because it may change over time and affect the treatment decisions of Medicare patients through spillover effects (e.g., Baker 1999).

Table 2 describes our random samples of elderly decedents from 1985, 1990 and 1995. Table 2 demonstrates some of the well-known trends in the medical care for the elderly over this period. Over the period, patients were increasingly less likely to die in an acute care hospital (or have an acute care hospital stay in the last month of life), but conditional on an stay, were treated much more intensively, such that acute care hospital expenditures conditional on a stay for patients in the last month of life grew in real terms at 2.8 ($=1.350^{1/11} - 1$) percent per year. Because reimbursement given treatment choice for Medicare patients did not increase over this period (McClellan 1997), these expenditure trends are attributable to increases in intensity of treatment. Provision of nonacute services through Medicare in the last month of life became

both much more common – more than doubling in frequency from 6.4 percent of decedents in 1985 to fully 15 percent of decedents in 1995 – and more intensive conditional on a nonacute stay. Table 2 also shows how the laws governing EOL care changed over the study period. In 1985, only 62.6 percent of decedents resided in a state that provided doctors and hospitals with explicit incentives to comply with advance directives, but by 1995, all states had adopted such a law. Over this period, states also adopted laws requiring delegation of treatment decision-making to specified parties in the absence of an advance directive: in 1985, only 23.4 percent of decedents resided in a state that required delegation, but by 1995, 53.3 percent of decedents were subject to such a law.

IV. Results

Table 3 presents estimates of parameters from equation (1), the effects of laws governing treatment at the end of life on the location of death and intensity of medical care in the last month of life. We present standard errors corrected for heteroscedasticity and for within state/time group correlation in v_{ist} . The top panel of the table shows that laws enhancing incentives for compliance with advance directives lead to statistically significant changes in patients' location of death. Decedents from states adopting laws 3 or more years prior to their death enhancing incentives for compliance are .76 percentage points less likely (significant at the 10 percent level) to die in an acute care hospital. On a 1995 base probability of dying in an acute setting of 32.8 percent (table 2), this amounts to a 2.3 percent decline. The effect of these laws on the probability of an acute care hospital stay in the month and year before death is smaller, consistent with the laws having the greatest impact on patients who are nearest to death. The

second column of the top panel of the table shows that laws enhancing compliance lead to a (statistically insignificant) .51 percentage point decline in the probability of an acute care hospital stay in the month before death; estimates not in table 3 show that such laws lead to a (statistically insignificant) .33 percentage point decline in the probability of an acute care hospital stay in the year before death. The long-run effect of these laws on the level of acute care expenditures in the last month of life conditional an acute care stay is positive but statistically insignificant.

The bottom panel of table 3 presents estimates of the effect of laws requiring delegation of treatment decision-making in the absence of an advance directive. Laws requiring delegation of treatment decision-making lead uniformly to more acute and fewer nonacute hospital services for decedents. Those who died in a state requiring delegation were 0.76 percentage points more likely to die in an acute care hospital, for decedents from states adopting such laws 3 or more years before their death. Laws requiring delegation also lead to increases in both the probability of an acute care hospital stay at any time in the last month of life and to increases in the magnitude of acute care expenditures, conditional on a hospital stay. In contrast, laws requiring delegation led to substantially less frequent nonacute stays -- in the long run, 1.76 percentage points fewer. Given that 25 percent of all decedents had a nonacute stay in the last year of life in 1995 (table 2), this effect is substantial. Table 3 shows that laws governing treatment at the EOL -- both those enhancing incentives for compliance with advance directives and those requiring delegation of treatment decision-making in the absence of an advance directive -- take time to reach their full effect. In general, the effect of such laws is larger and more precisely estimated for laws in place at least 3 years prior to the individual's death.

Both of the two types of laws that we study had a net positive impact on Medicare hospital expenditures. Laws enhancing incentives for compliance with advance directives lead to long-run increases in acute care expenditures in the last month of life of \$345 ($= (-.00506 + 0.0523*0.748)*1995$ average acute care expenditures of \$10,115 (table 2)) and long-run decreases in nonacute care expenditures of \$10 ($= (.00825 - .0425*0.25)*1995$ average nonacute care expenditures of \$4,007 (table 2)), for a net positive effect of \$335 per decedent. Laws requiring delegation of treatment decision-making lead to long-run increases in acute care expenditures of \$494 ($= (.00979 + .0522*0.748)*10,115$) and long-run decreases in nonacute care expenditures of \$115 ($= (-.0176 + .0446*.25)*4,007$), for a net positive effect of \$379 per decedent.

Table 4 presents estimates of parameters from equation (1) obtained only on patients who died from cancer. First, the table shows that the long-run effect of laws enhancing compliance with advance directives on the location of death is almost twice as large for cancer decedents as for the entire population of decedents -- a 1.38 percentage point reduction in the probability of dying in an acute care hospital as compared to a .76 percentage point reduction (table 3). The long-run effect of such laws on the probability of receiving nonacute care for cancer decedents is almost twice as large as well -- a 1.65 percentage point increase as compared to a .83 percentage point increase. However, the long-run effect of laws requiring delegation on the probability of dying in an acute care hospital is smaller in magnitude for cancer decedents, and statistically insignificant.

These effects lead both types of laws to have smaller (but still positive) net effects on Medicare expenditures for cancer decedents. Laws enhancing incentives for compliance with

advance directives lead to long-run increases in acute care expenditures of \$173 ($= (-.0106 + 0.0370*0.748)*1995$ average acute care expenditures of \$10,115) and in nonacute care expenditures of \$18 ($= (.0164 - .0446*0.25)*1995$ average nonacute care expenditures of \$4,007), for a net positive effect of \$191 per decedent. Laws requiring delegation of treatment decision-making lead to long-run increases in acute care expenditures of \$232 ($= (.00297 + .0267*0.748)*10,115$) and long-run decreases in nonacute care expenditures of \$90 ($= (-.0203 - .0086*.25)*4,007$), for a net positive effect of \$142 per decedent.

Table 5 presents estimates of equation (2), and shows that the effect of laws governing care at the EOL differ by decedents' level of educational attainment. On one hand, the effects of laws enhancing compliance with advance directives are greater for less educated patients. Patients with less than a high-school education from states adopting laws enhancing incentives are 1.88 percentage points less likely to die in an acute care hospital; this effect is half as large ($= -1.88 + .93$) and statistically insignificant for patients with a high school education or greater. On the other hand, the effects of laws requiring delegation of treatment decision-making in the absence of an advance directive are greater for more educated patients. Patients with a high-school education or greater from states adopting laws requiring delegation are .73 percentage points statistically significantly more likely to die in an acute care hospital than are their counterparts with less than a high-school education; the negative effect of laws requiring delegation on the probability of a nonacute stay in the last month of life is statistically significantly larger for more educated patients as well.

V. Conclusion

Can public policy play a constructive role in the management of health care at the EOL? At least in theory, state law specifies the process by which physicians and hospitals consider the input of patients (through patients' written advance directives) and their families or guardians (in the absence of an applicable advance directive) in treatment decision-making. Proponents of laws enhancing providers' incentives for compliance with patients' advance directives argue that the formal processes established by such laws improve patient autonomy and save money by reducing unwanted, unproductive EOL treatments. However, in practice, substantial clinical evidence suggests that laws may not be the only, or even the most important, determinant of care in this context. Important concerns over inappropriate limitation of care for dying patients further contributes to the theoretical ambiguity of the welfare consequences of laws guiding EOL care.

Yet, surprisingly little work has sought to evaluate the effects of such laws on patients' care. In this paper, we assess empirically the consequences of two types of laws – laws enhancing incentives for compliance with advance directives, and laws requiring the appointment of a health care surrogate – on care at the EOL. Based on an analysis of Medicare claims data, matched with Social Security death records, we estimate the effect of variation across states and over time in these laws on the location of patients' death and the care received at the EOL. To investigate whether such laws have different effects on different types of patients, we match information on cause of death and educational attainment from the National Center for Health Statistics Public Use Multiple Cause of Death for ICD-9 file.

We find that the laws that we study have a significant influence on patients' EOL care. First, laws enhancing incentives for compliance significantly reduce the probability of dying in

an acute care hospital. However, they do not lead to any net savings in medical expenditures. Although laws lead to a reduction in expenditures through a reduction in the probability of an acute care hospital stay, they also lead to a more-than-offsetting increase in expenditures conditional on an acute care stay. On net, such laws lead to a net average increase in total hospital expenditures in the last month of life of \$335, or about 2.4 percent of the 1995 average of \$14,122. Laws requiring delegation of treatment decisions in the absence of an advance directive significantly increase the probability of an acute care hospital stay and significantly decrease the probability of a nonacute care hospital stay in the last month of life. Laws requiring delegation also have a positive effect on average expenditures in the last month of life, of \$379 per decedent.

Second, we find that laws enhancing incentives for compliance lead to almost twice as large of a reduction in the probability of dying in an acute care hospital for patients dying from cancer, consistent the laws having a larger causal effect for patients for whom EOL care decisions are particularly important. In addition, we find the expenditure-increasing effect of the laws is smaller for cancer decedents than for the average decedent, largely because the laws have approximately half as large an effect on the volume of acute care hospital services that cancer decedents receive.

Third, we find that the effect of laws governing EOL treatment differ depending on a patient's educational attainment. The effects of laws enhancing compliance with advance directives are greater for less educated patients, but the effects of laws requiring delegation of treatment decision-making in the absence of an advance directive are greater for more educated patients.

These changes in patterns of care are consistent with some of the previous clinical literature on the effects of advance directives. Advance directives are not simply a device for the refusal of treatment. Although surveys find that treatment refusals are the most common preference expressed in an advance directive, they are not the only one: indeed, for some illnesses, surveyed patients' preferences were almost evenly split between a directive to supply and a directive to withhold intensive treatment (Emanuel 1991). Clinical studies have also suggested that surrogates systematically opt for more intensive treatment than patients prefer. Layde et al. (1995) find among seriously ill patients favoring resuscitation, only 16 percent of health care surrogates misconstrued patients' wishes, but that among patients who did not want to be resuscitated, 50 percent of surrogates misconstrued patients' wishes.

These results highlight several important remaining research questions. In particular, unless patients receive too little acute and too much nonacute care at the EOL, the results suggest that laws requiring delegation of treatment decision-making in the absence of an advance directive do not improve the alignment of EOL treatment with patient preferences -- particularly for more educated patients. This may be due to the fact that more educated patients have more educated surrogates, who are better able to convince medical care providers of the patient's perceived wishes. Further clinical or experimental investigation of programs to encourage communication between patients and their surrogates (e.g., Hare 1992), or of alternative health care surrogacy laws that provide incentives for surrogates to engage in such communication, has the potential to enhance patient autonomy and conserve health care resources.

Table 1: State Laws Governing Treatment at the End of Life

State	Law provides incentives for compliance with advance directive	Law requires delegation of decisions in absence of advance directive	State	Law provides incentives for compliance with advance directive	Law requires delegation of decisions in absence of advance directive
Alabama	1981		Montana	1985	1991
Alaska	1986		Nebraska	1992	
Arizona	1985	1992	Nevada	1977	1991
Arkansas	1977	1977	New Hampshire	1985	
California	1976		New Jersey	1992	
Colorado	1985	1992	New Mexico	1977	1984
Connecticut	1985	1985	New York	1988	1988
Delaware	1982		North Carolina	1977	1977
Florida	1984	1984	North Dakota	1989	
Georgia	1984	1990	Ohio	1991	1991
Hawaii	1986	1986	Oklahoma	1985	
Idaho	1977		Oregon	1977	1983
Illinois	1984	1991	Pennsylvania	1992	
Indiana	1985	1987	Rhode Island	1991	
Iowa	1985	1985	South Carolina	1986	
Kansas	1979		South Dakota	1991	
Kentucky	1990		Tennessee	1985	
Louisiana	1984	1984	Texas	1977	1977
Maine	1989	1989	Utah	1985	1985
Maryland	1985	1993	Vermont	1982	
Massachusetts	1990		Virginia	1983	1983
Michigan	1990		Washington	1979	
Minnesota	1989		West Virginia	1984	
Mississippi	1984		Wisconsin	1984	
Missouri	1985		Wyoming	1984	1984

Table 2: Descriptive Statistics

	1985	1990	1995	1985-95 change
Died in acute care hospital	43.8%	40.1%	32.8%	-11.0%
Acute hospital stay in month before death	59.6%	57.4%	52.6%	-7.0%
Nonacute hospital stay in month before death	6.4%	9.7%	15.0%	8.6%
Acute hospital expenditures in month before death	\$7,494	\$8,991	\$10,115	35.0%
	(5789)	(8543)	(11439)	
Nonacute hospital expenditures in month before death	\$1,687	\$2,498	\$4,007	137.5%
	(2188)	(2585)	(3940)	
Age	79.54	79.94	80.60	1.33%
	(8.113)	(8.178)	(8.195)	
Gender (female)	51.6%	53.3%	54.7%	3.1%
Race (black)	7.4%	8.0%	8.3%	0.9%
Rural residence	27.2%	27.8%	28.7%	1.5%
High school education or greater	(36.8%	48.8%	(
Education missing	(30.8%	16.1%	(
Law enhancing incentives for compliance with advance directives	62.6%	83.6%	100.0%	37.4%
Law requiring delegation of treatment decision making in absence of advance directive	23.4%	38.1%	53.3%	29.9%
State HMO enrollment rate	7.5%	12.5%	16.8%	9.3%
N	242551	253948	271683	12.01%

Change reported in percentage points for dichotomous variables; change reported in percent for continuous variables. Hospital expenditures in constant 1995 dollars. * - education missing for all observations for 1985.

**Table 3: Effect of Laws Governing Advance Directives on
Location of Death and Utilization of Health Care at the End of Life**

	Died in acute care hospital	Acute hospital stay in month before death	Nonacute stay in month before death	ln(acute hosp expends in month before death)	ln(nonacute expends in month before death)
<u>Effect of laws enhancing incentives for compliance with advance directives</u>					
death shortly after adoption	0.251 (0.273)	0.379 (0.256)	0.482 (0.440)	4.514 (2.516)	-5.106 (2.835)
death long after adoption	-0.764 (0.445)	-0.506 (0.389)	0.825 (0.614)	5.225 (3.340)	-4.254 (3.480)
<u>Effect of laws requiring delegation of treatment decision making in the absence of an advance directive</u>					
death shortly after adoption	0.294 (0.316)	0.806 (0.361)	-0.287 (0.311)	2.912 (2.625)	-2.285 (2.641)
death long after adoption	0.757 (0.427)	0.979 (0.442)	-1.758 (0.544)	5.215 (3.024)	-4.461 (3.746)
N	2780195	2780195	2780195	1580579	267474

Notes: Heteroscedasticity-consistent standard errors corrected for within state/time cell correlation in parentheses.

**Table 4: Effect of Laws Governing Advance Directives on
Location of Death and Utilization of Health Care at the End of Life, Deaths from Cancer**

	Died in acute care hospital	Acute hospital stay in month before death	Nonacute stay in month before death	ln(acute hosp expends in month before death)	ln(nonacute expends in month before death)
<u>Effect of laws enhancing incentives for compliance with advance directives</u>					
death shortly after adoption	0.180 (0.447)	0.425 (0.291)	1.110 (0.486)	3.129 (1.715)	-5.980 (3.496)
death long after adoption	-1.379 (0.696)	-1.065 (0.579)	1.645 (0.709)	3.702 (2.334)	-4.771 (4.425)
<u>Effect of laws requiring delegation of treatment decision making in the absence of an advance directive</u>					
death shortly after adoption	-0.126 (0.482)	0.313 (0.502)	-1.001 (0.391)	1.123 (1.966)	-1.131 (3.226)
death long after adoption	0.292 (0.610)	0.297 (0.560)	-2.026 (0.608)	2.673 (2.162)	-0.859 (4.483)
N	536872	536872	536872	324505	53022

Notes: Heteroscedasticity-consistent standard errors corrected for within state/time cell correlation in parentheses.

**Table 5: Effect of Laws Governing Advance Directives on
Location of Death and Utilization of Health Care at the End of Life, by Years of Education**

	Died in acute care hospital	Acute hospital stay in month before death	Nonacute stay in month before death	ln(acute hosp expends in month before death)	ln(nonacute expends in month before death)
<u>Effect of laws enhancing incentives for compliance with advance directives</u>					
death shortly after adoption	-1.141 (0.490)	-0.441 (0.411)	0.823 (0.549)	-0.191 (1.983)	-7.067 (3.667)
death long after adoption	-1.876 (0.650)	-0.979 (0.581)	0.937 (0.655)	1.436 (3.004)	-7.754 (3.765)
<u>Effect of laws requiring delegation of treatment decision making in the absence of an advance directive</u>					
death shortly after adoption	0.317 (0.412)	0.816 (0.480)	-0.504 (0.369)	-0.869 (1.923)	-4.257 (2.942)
death long after adoption	-0.118 (0.466)	0.334 (0.554)	-1.171 (0.532)	2.380 (3.005)	-5.520 (4.168)
<u>Differential Effect of Laws For Individuals With High School Education or Greater</u>					
<u>Differential effect of laws enhancing incentives for compliance with advance directives</u>					
death shortly after adoption	1.172 (0.607)	0.503 (0.492)	-0.900 (0.351)	1.324 (0.697)	-1.488 (2.233)
death long after adoption	0.932 (0.659)	0.237 (0.564)	-0.477 (0.377)	2.342 (0.673)	1.583 (2.386)
<u>Differential effect of laws requiring delegation of treatment decision making in the absence of advance directive</u>					
death shortly after adoption	0.096 (0.389)	-0.115 (0.367)	0.201 (0.317)	-0.829 (0.808)	2.591 (2.011)
death long after adoption	0.732 (0.404)	0.624 (0.408)	-0.649 (0.287)	1.060 (0.766)	-0.873 (2.023)
N	2780195	2780195	2780195	1580579	267474

Notes: Heteroscedasticity-consistent standard errors corrected for within state/time cell correlation in parentheses.

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