The Influence of Medical and Legal Authorities on Deaths Facilitated by Physicians

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This study investigated whether two widely publicized cases of deaths facilitated by physicians were followed by significant peaks in mortality. In March, 1991, Timothy Quill, MD, published a controversial editorial describing the physician-assisted suicide (PAS) of his 45-year-old, female leukemia patient. In a landmark decision in December 1990, the Missouri Supreme Court allowed removal of life support for Nancy Cruzan, a comatose accident victim. Correcting for trends and seasonal fluctuations, the authors examined: (1) U.S. leukemia mortality in the period centered on Quill's editorial, and (2) mortality from accident/coma combinations in the period centered on the Missouri Supreme Court's decision on Cruzan. Female leukemia deaths rose 11.3% above the expected rate ($p < .01$) just after Quill's article was published. The more closely the decedent matched Quill's patient, the greater the peak, with the largest peak (33.9%) evident for female leukemia patients in their 40s, who were long-term residents of smaller communities ($p < .05$). Five possible explanations for the findings were assessed, leading to the conclusion that Quill's editorial elicited an increase in mortality. The involvement of physicians in this increase is supported by analysis of the Cruzan case. This showed a mortality peak of 57% for accident/coma patients following the court decision.

Prolonging life has traditionally been a primary goal for physicians. Recently, some physicians have debated whether a secondary medical goal is ever appropriate—to facilitate death, for example, through withdrawal of life-support, active euthanasia, or assisted suicide (Battin, 1994). This debate has recently focused on physician-assisted suicide (PAS), a topic that has been discussed with increasing frequency by physicians (Angell, 1997; Bachman et al., 1996; Back, Wallace, Sparks, & Pearlman, 1996; Foley, 1997; Lee et al., 1996; Quill, 1991; Slome, Mitchell, Charlebois, Benevedes, & Abrams, 1997), nurses (Asch, 1996), lawyers (Kleinberg & Mochizuki, 1997; Miller, Brody, & Quill, 1996; Steinfeld, 1997; Sunstein, 1997), clergy ("Is there a right," 1997; "O'Connor assails," 1996), and the laity (Methvin, 1997; "Death rights," 1997). The U.S. Congress has considered banning the use of federal funds for PAS ("Move in Congress," 1996); many state courts are deciding on the legal standing of PAS; and the U.S. Supreme Court, which has recently ruled on this legal issue, is likely to revisit the topic. In short,
there is considerable uncertainty about the ethical standing of physician-facilitated deaths.

In conditions of uncertainty, people often look to authorities for guidance (Deutsch & Gerard, 1955; Festinger, 1954). In the case of physician-facilitated deaths, a doctor’s behavior is likely to be guided both by medical and by legal authorities. We examined mortality following two landmark cases—one medical and one legal—which declared that physician-facilitated mortality is in some circumstances acceptable.

The medical case consisted of a New England Journal of Medicine editorial by Dr. Timothy Quill (1991), in which he reported prescribing a lethal dose of barbiturates for a patient who requested PAS. Quill’s example was widely and immediately publicized by the news media, including the New York Times, Los Angeles Times, U.S. News and World Report, and several national television news programs (ABC Evening News, March 7, 1991; Altman, 1991; Bernstein, 1991; CBS Evening News, March 7, 1991; Roan, 1991). A peak in PAS following Quill’s editorial would be consistent with epidemiological studies on suicide (Phillips & Carstensen, 1986; Phillips, Lesyna, & Paight, 1992; Schmidtke & Häfner, 1988; Sonneck, Etzersdorfer & Nagel-Kuess, 1994) and classic laboratory studies on social influence (Asch, 1951; Berkowitz & Geen, 1966). These suggest that an example of deviant behavior encourages others to engage in that behavior, and thus increases its frequency.


Both the Quill and Cruzan cases involve what we have termed “physician-facilitated death,” but the type of involvement is very different in the two cases. In the first, the physician, in response to his patient’s request, provided the means by which she could commit suicide. In the second, at the request of her family, a comatose patient’s life-support was withdrawn. These two types of physician involvement, both of which generated very substantial attention, uncertainty, and debate, represent two of the ways in which physicians can be involved in right-to-die issues. For an extended discussion of various types of physician involvement in this area, see Battin (1994).

We adopt ecological techniques to investigate whether after the Quill editorial and after the Missouri decision on Cruzan there were immediate, short-term increases in mortality that could have been facilitated by physicians. In addition, we seek to determine whether such increases were concentrated in the persons most likely to be affected—those similar to the patients publicized in the editorial and the court decision. This investigation might throw some light on the degree to which physician-facilitated mortality could increase if various state courts (and perhaps the U.S. Supreme Court) were to lower the barriers to PAS.

Our methodological approach has both strengths and weaknesses. The strengths include the ability to perform unobtrusive analyses of an ethically and legally sensitive topic on which many patients and physicians might not be willing to speak openly or truthfully. In addition, this approach allows examination of large geographic areas—in our case, the entire country. Among the weaknesses of this approach is the inability to provide detailed, direct evidence linking Quill’s editorial or the Missouri decision to a particular physician’s facilitation of the death of a patient. An alternative methodological approach, based on case studies of physicians and their patients, could yield more detailed, direct evidence on medical behavior. However, it is difficult to conduct such case studies retrospectively (to the time of
Quill and Cruzan), to collect data for large areas, and to ensure that such data are unbiased by the desire to avoid legal and ethical repercussions.

METHODS

We examined three electronic databases: (1) The national Mortality Detail File (U.S. Department of Health and Human Services, 1979–1991) from 1979 (the inception of the 9th revision of the International Classification of Diseases) to 1991 (when Quill described the PAS of his patient). This mortality database gives information only on the underlying, that is, primary, cause of death. (2) The national Multiple Cause of Death file (U.S. Department of Health and Human Services, 1983–1991). In contrast to more commonly examined mortality databases (Phillips, Ruth, & Wagner, 1993), the Multiple Cause of Death file gives information on both the primary cause of death and on contributory causes. This database was examined from 1983 (when complete and continuous records become available) to 1991. (3) The California Mortality File, 1979–1991 (California Health and Welfare Agency, 1979–1991). This state database provides the exact date of death, whereas the national databases indicate only the month of death.

Quill’s editorial appeared on March 7, 1991. To determine whether mortality increased after this editorial (and its associated publicity), we compared the observed number of deaths in March of 1991 with the number expected in that month, under the null hypothesis that Quill’s article had no effect on mortality. We estimated this expected number from a regression line fitted to mortality in each March, from 1979 to 1990, and then used this regression line to predict the level of mortality in March 1991. The mean squared error of prediction for a new observation was also estimated from the regression analysis; the square root of this quantity is the standard error for a new observation (which is different from the standard error for an estimated parameter such as a mean, slope, or intercept). The regression analysis controls for seasonal fluctuations, holidays, and time trends. Similar regression analyses were used to determine whether mortality is unusually high (or low) in the other months before and after Quill’s article. A parallel procedure was used to analyze mortality before and after the Missouri Court’s decision on Cruzan.

In regression analysis, tests for statistical significance can be distorted by heteroscedasticity and autocorrelation of the residuals. Using standard diagnostic techniques (Kirby, 1993), we found no evidence of such artifacts. In addition, we used robust regression analyses (Hamilton, 1996) to check the results of the conventional regression analyses described earlier. The two techniques yielded almost identical regression estimates.

These regression techniques were applied to leukemia (International Classification Disease (ICD) Codes 204–208); cancer (ICD 140–208); and solid and liquid poisons likely to be used by medical staff, whether categorized as accident, suicide, homicide, or undetermined. The poisoning categories examined were: ICD E850–858—“Accidental poisoning by drugs, medicaments, and biologicals”; E935—“Adverse effects of analgesics, antipyretics, and antirheumatics”; E950—“Suicide by solid or liquid substances”; E9620—“Poisoning homicide with drugs and medicaments”; E980—“Poisoning by solid or liquid substances, undetermined whether accidentally or purposefully inflicted.” If an overdose of barbiturates or other medications were to be officially acknowledged as the cause of death, then that death would be classified in one of the preceding categories. We also examined other causes of death (e.g., HIV infections) that are sometimes associated with physician-as-

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1When heteroscedasticity is present in a bivariate analysis, the variance of one variate is not the same for all fixed values of the other. When autocorrelation is present, the residual for one value of X is not independent of the residual for other values of X.
assisted suicide (Slome et al., 1997). For the Cruzan case, we examined comas (ICD 7800) and accidents (ICD E800–849; E860–869; E880–929).

RESULTS

In March 1991, there were 11.3% more female leukemia deaths than would be expected under the null hypothesis (Figure 1; p < .01; t test, 10 df). Observed mortality levels in nearby months were not significantly different from expected. Male leukemia mortality was no higher than expected in March and did not differ significantly from expected in any of the months under study. Hence, subsequent analyses are restricted to females.

If some of the excess female leukemia deaths in March 1991 are in fact PAS, then this excess should be stronger in populations where patients and their physicians are more likely to have close, long-term relationships. The importance of such relationships was advocated and exemplified by Quill (1991). Close, long-term patient–physician relationships cannot be directly discerned from the information on the death certificate. However, such relationships are probably less common among short-term residents of large communities (with populations over 500,000) and more common among long-term residents of smaller communities. While this expectation holds only in the probabilistic sense, one would nonetheless expect that long-term residents of smaller communities should show the largest peak in March leukemia deaths. This prediction is tested with the data in Figure 2. The March 1991 peak in female leukemia deaths is not evident at all for persons living in large communities, but is entirely concentrated in
residents of smaller communities ($p < .01$). Populations in the latter communities were further subdivided into long-term residents (those who were born, lived, and died in the same state), and others. The March peak is present only in long-term residents of smaller communities ($p < .01$).

The more the decedent resembles Quill’s patient, the larger the March peak (Figure 3). There is no significant peak for cancers in general (1.1% excess mortality; $p > .10$). Such a peak does exist for leukemia (11.3%; $p < .01$), is larger in smaller communities (12.9%; $p < .01$), and is larger still among long-term residents of those communities (21.7%; $p < .01$). As might be expected from the literature on imitative suicide, there is a particularly large peak for decedents of about the same age as Quill’s patient (45), though this conclusion is based on a small number of cases. Leu-
Figure 3. Size of the March peak (with 95% confidence interval) in U.S. female mortality in groups of decedents of increasing similarity to Timothy Quill’s patient. The observed number of deaths in each category is displayed in parentheses. Error bars are estimated from the regression analysis described in the text.

Leukemia patients who are long-term residents of smaller communities and in their 40s show the largest effect of all (33.9%; $p < .05$). After correction for the nonindependence of these five categories, the Spearman rank correlation between degree of resemblance and size of peak is .9 ($p = .037; n = 5$).

As further evidence of the highly specific nature of the peak in March 1991, we note that there is no clear evidence of such a peak for other diseases commonly thought to be associated with PAS.$^3$ There is a slight drop ($-4.6%; p > .3$) in March deaths from degenerative neurological diseases (ICD 330–359) and a nonsignificant rise (12.8%; $p > .2$) for HIV deaths (ICD 042–044). However, the results for HIV should be regarded as preliminary.

$^3$This correction was accomplished by excluding data for a subset before analyzing the more general group. For example, to calculate the Spearman rank correlation, we first excluded leukemia patients from the more general “cancer” category before calculating excess mortality for cancer. Similarly, we excluded those from smaller communities from the more general “leukemia” category before calculating excess mortality for leukemia.
and inexact, because HIV was not an ICD category until 1987. Hence the expected number of HIV deaths in March of 1991 must be estimated from only 4 years (1987–1990).

**Possible Explanations for the Leukemia Peak in March 1991**

Our data are consistent with the hypothesis that the March peak was elicited by Quill's editorial and the ensuing publicity. But before we can place any confidence in this explanation, we need to evaluate alternative explanations for the findings.

1. **The effect of March 1991.** Perhaps all mortality (not just leukemia) peaked in March 1991. If so, the leukemia peak need not be attributed to Quill's editorial, but to a worsening of medical care or to unusual seasonal conditions in March 1991. This hypothesis is not supported by the evidence: The number of deaths from all causes in March 1991 (93,772) was in fact slightly smaller (−3.3%) than the expected number (96,991.7), estimated from the regression analysis ($p > .3$).

2. **The effect of random fluctuation.** Under the null hypothesis of random fluctuation in mortality, a March peak as large as that observed should occur less than 1% of the time. The observed association between the size of this peak and the similarity of decedents to Quill's patient should occur less than 4% of the time. The joint occurrence of these two independent findings should be exceptionally rare—less than once in 2,500 (1% × 4%). Hence, the null hypothesis of random fluctuation is implausible.

3. **The effect of classification practices.** By making leukemia salient, Quill's article conceivably prompted some death registrars to list leukemia as the primary rather than as a contributory cause of death. If so, there should be a drop in deaths where leukemia is listed as a contributory cause, offsetting the observed increase in cases where leukemia was listed as the primary cause. This prediction is not supported by the evidence from the Multiple Cause of Death file. In March 1991, the observed number of deaths with leukemia as the contributory cause (188) is not significantly different from the number expected (194.79; $p > .5$).

4. **A possible leukemia peak before Quill's article.** If the March peak began before March 7th, when Quill's editorial was published, one could not plausibly attribute the March peak to his influence. In the U.S. database under study, the death date is specified by month only, and thus cannot be used to determine whether the March peak began before the 7th. However, such a determination is possible with the California database, which records the exact date of death.

Using the California database, we compared the proportion of March female leukemia deaths occurring between March 8th and March 31st in 1991 with the equivalent proportion in the control years (1979–1990). If March 1991 leukemia mortality was just as high before Quill's editorial as it was afterwards, then these two proportions should be about the same. In 1991, 60 of the 71 March female leukemia deaths (84.5%) occurred in the period March 8–31, versus 560 of the 731 deaths (76.6%) in the controls. The proportion in 1991 is higher than in the control period, and the excess is marginally significant, $p = .08$, Fisher exact test, one-tailed (Siegel & Castellan, 1988). Thus, the California data, though sparse, are consistent with the hypothesis that the March peak followed Quill's editorial. However, the California findings should not be regarded as definitive, because they are only marginally significant.

5. **Suicides with and without physician assistance.** There are at least two processes by which Quill's editorial might have elicited the March peak: (1) a rise in physician-assisted suicides, or (2) an increase in the deaths of leukemia patients acting on their own, either directly through suicide, or indirectly through refusal of further life-sustaining treatment. Two pieces of evidence suggest that the March peak is not produced entirely by patients acting on their own. First, the mortality peak is concentrated in groups of decedents who are particularly likely to have had long-term relationships with
their physicians. This finding is consistent with physician involvement, although it is inferential and is susceptible to alternative interpretations.

Second, if Quill’s editorial had indeed elicited a rise in suicides not involving physician assistance, one might have expected a rise in deaths explicitly classified as suicides in March 1991: At least some of the physicians whose patients had committed suicide on their own would have listed these deaths as suicides. However, no such peak in suicides exists: The number of female suicides in March 1991 is slightly less than expected for certificates with any mention of suicide, and also for certificates listing both suicide and leukemia.

In addition to these two pieces of evidence, mortality after the Cruzan decision also suggests that the mortality excess following Quill’s editorial did not result entirely from patients’ behavior. Thus, the ecological evidence suggests that some medical involvement seems likely.

**Mortality Following the Missouri Supreme Court Decision on Nancy Cruzan**

We examined the increase in mortality after another publicized case (Cruzan v. Director, Missouri Department of Health)—a case in which the increase could not be attributed to patients acting on their own. In 1983, Nancy Cruzan lapsed into a permanent coma as a result of an accident. On December 14, 1990, the Missouri Supreme Court ruled that life support for Cruzan could be terminated. This was done, and Cruzan died on December 26th. We investigated whether there was a December 1990 mortality peak following this case in the same way that there was a March 1991 peak following Quill’s editorial. Because Cruzan was involved in an accident which resulted in a coma, we examined decedents whose death certificates listed both coma and accident as contributory causes. We examined transportation accidents as well as those resulting from such causes as falls and fires. We excluded death certificates listing medical accidents (such as surgical misadventures) because we were interested in cases of comas caused by accidents, rather than accidents suffered by those already comatose. By limiting the analysis to accident/coma patients, we were able to rule out the possibility that their deaths resulted from patient suicides.

As with the Quill analyses, we used regression techniques to estimate the expected number of deaths for each of the 6 months surrounding December 1990 and compared these to the observed numbers. In December, there was a 57% excess in decedents with accident and coma listed on the death certificate, with 43 such decedents observed versus 27.4 expected (p < .05). The excess mortality is not confined to Missouri, with a 61% excess evident when Missouri decedents are excluded from the analyses (p < .05). There was no significant excess in mortality in any of the other months under study.

The Missouri Court decision occurred in the middle of December, while Cruzan’s death occurred at the end of that month. The presence of a mortality peak in December 1990 and the absence of such a peak in January 1991 (for which mortality was 5% below expected) suggest that it was the court decision, rather than Cruzan’s death, which may have elicited the December peak.⁵

**DISCUSSION**

Female leukemia deaths peaked (11.3% above expected) when Quill’s editorial was published and publicized. The peak was largest for decedents who resembled the case described in the editorial. The more closely the decedent matched Quill’s pa-

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⁴While we can conclude that there is a statistically significant rise in accident/coma mortality after the Cruzan decision, the small number (n = 1) of relevant Missouri cases prevents meaningful comparison of the size of the putative “Cruzan effect” inside and outside Missouri.

⁵The daily number of accident/coma deaths in December is unknown, because U.S. Data Files do not give exact death dates, and the California Mortality File does not list multiple causes of death.
tient, the greater the peak, with the largest peak (33.9%) evident for female leukemia patients in their 40s who were long-term residents of smaller communities. Accident/coma deaths peaked (57% above expected) following the Missouri Supreme Court decision to allow removal of life support for Nancy Cruzan. This mortality peak cannot be attributed to patients acting on their own, because the patients were comatose. The Quill and Cruzan analyses reveal short-term mortality peaks, with no residual effects observable beyond 1 month following the initial publicity. These short-term effects are consistent with earlier findings on the effects of publicized suicide stories (Phillips & Carstensen, 1986; Phillips, Lesyna, & Paigh, 1992; Schmidtke & Hafner, 1988).

It seems likely that Quill’s editorial and the Cruzan decision elicited the ensuing mortality peaks, given the specificity and timing of these peaks, and given the widespread publicity devoted to the editorial and court decision. It should be emphasized, however, that this conclusion is based on ecological data and not on case studies of physicians and their patients.

The mortality peak following Quill’s editorial suggests that a high-status medical journal can influence the behavior of physicians with terminally ill patients. Similarly, the mortality peak following the Missouri decision suggests that a court decision can affect the behavior of physicians. It is noteworthy that mortality increased nationwide after the Cruzan decision, even though that decision was limited to Missouri, stressed the importance of advanced directives, and required a clear and convincing evidentiary standard. Both legal and medical authorities appear to have played significant permission-giving roles in conditions of ethical uncertainty. The best available explanation for the mortality peaks is that they were elicited by two major opinion-shaping mechanisms in our society: courts and editorials.

If state or federal courts sided with the opinions expressed in Quill’s editorial, what would happen to mortality levels? If the publication of a single medical editorial did in fact change the short-term behaviors of physicians and their patients to the extent observed, then legalization of assisted suicide might well have even larger and more widespread effects. Quill’s editorial appeared in a prestigious journal, but it ran counter to prevailing legal guidelines. If state legislatures or courts were to remove some legal barriers to PAS, the increase in mortality might be even greater than that apparently elicited by Quill’s example, because state actions of this sort would reinforce Quill’s position and would carry legal authority. Our evidence suggests that any mortality increase following a state’s lowering of legal barriers would not be confined to that state but might be evident throughout the nation.

It would be valuable to determine whether findings like those of this study could be replicated in other countries (e.g., Australia or the Netherlands) that have instituted legislative or judicial changes in policy on euthanasia or assisted suicide. Zalman and Stack (1996) found no evidence that two publicized court decisions on the right to die affected the suicide rate in the Netherlands. These authors focused on suicides, rather than on physician-facilitated deaths, because they wished to discover whether lowering legal barriers to euthanasia and PAS might generally lower barriers to suicide. Zalman and Stack caution that results from one country might not generalize to another, further supporting the value of cross-national studies of the effects on PAS of legislative and judicial changes.

It is not our purpose to assess the ethics of any future increase in mortality following certain types of government actions. Our findings suggest that there is significant pent-up demand for medical help in dying. The existence of such demand can be taken either as evidence of a legitimate need for governmental support of PAS, or as evidence of the potential dangers of such support. The morality of PAS, or, more generally, of physician-facilitated death, is not a scientific but a social issue, which will continue to be debated by politicians, patients, physicians, nurses, lawyers, clergy, ethicists, and the general public.
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