The Timing of Do-Not-Resuscitate Orders and Hospital Costs

K. Eric De Jonge, MD, Daniel P. Sulmasy, MD, PhD, Karen G. Gold, PhD, Andrew Epstein, BS, Michael G. Harper, MD, John M. Eisenberg, MD, Kevin A. Schulman, MD

The relation between the timing of do-not-resuscitate (DNR) orders and the cost of medical care is not well understood. This prospective observational study compares hospital costs and length of stay of 265 terminally ill patients with admission DNR orders, delayed DNR orders (occurring after 24 hours), or no DNR orders (full code). Patients whose orders remained full code throughout a hospital stay had similar lengths of stay, total hospital costs, and daily costs as patients with admission DNR orders. Patients with delayed DNR orders, by contrast, had a greater mortality, longer length of stay, and higher total costs than full code or admission DNR patients, but similar daily costs. The causes of delay in DNR orders and the associated higher costs are a matter for future research.

KEY WORDS: do-not-resuscitate (DNR) orders; health care costs; terminal illness.

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C current knowledge about the influence of do-not-resuscitate (DNR) orders on health care costs is inconclusive.¹⁻⁴ Although 27% to 30% of all Medicare expenses occur in the last year of life,⁵ we do not know how much of this care, if any, is unnecessary.^{6,7} One review cast doubt on whether we could reduce costs by limiting end-of-life care, arguing that most such expenses are unavoidable.⁸ Others argue, however, that setting explicit limits on high-tech care of the dying is a good first step toward containing costs of marginally beneficial care.⁹ Most studies of the resource implications of DNR orders have been retrospective, identifying patients by a known outcome of death or DNR orders, and therefore subject to selection bias.^{3,4,10} This study prospectively compares the hospital costs of terminally ill patients who have admission DNR orders, delayed DNR orders (those occurring after 24 hours), and full code status.

Received from the Division of Geriatric Medicine and Gerontology, Johns Hopkins University School of Medicine, Baltimore, Md. (KED, MGH); Department of Bioethics, New York University, New York, NY (DPS); Division of Cancer Prevention and Control (KGG, AE), and Clinical Economics Research Unit (KAS), Georgetown University Medical Center, Washington, DC; and Agency for Health Care Policy and Research, Rockville, Md (JME).

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Address correspondence and reprint requests to Dr. De Jonge: Johns Hopkins Geriatrics Center, 5505 Hopkins Bayview Circle, Baltimore, MD 21224.

METHODS

Settings and Subjects

This study identified patients with four diagnoses that have a high expected 1-year mortality (30%–60%)¹¹⁻¹⁴: AIDS patients with a T4 cell count of less than 50 cells/mm³; patients with unresectable lung cancer; patients with severe chronic congestive heart failure (CHF); and nursing home patients with dementia and malnutrition (malnutrition defined as serum albumin <3.5 mg/dL).

Study Design and Measurements

The study protocol was approved by institutional review boards at each hospital. A DNR order was defined as a written order that a patient not receive cardiopulmonary resuscitation or intubation. Data included diagnosis, DNR status during the hospital stay, age, gender, race, type of attending physician (generalist or specialist), hospital site, insurance type, APACHE III score on admission,¹⁵ and hospital survival. Economic variables included length of stay, total physician and hospital costs, and daily costs. For each physician fee, a resource-based relative value scale value was multiplied by a Medicare conversion factor to arrive at actual costs.¹⁶ At the university hospital, a cost-accounting office provided a summary of daily hospital costs. At the community hospital, each charge was multiplied by a charge-to-cost ratio. Addition of physician and hospital costs produced the total cost for each day.

Data Analysis

The unit of analysis was a single hospital stay. Univariate logistic regression examined differences in patient characteristics. Univariate linear regression examined differences in length-of-stay and costs. Multivariate linear regression compared costs of the three groups, using the admission DNR patients as the baseline group and adjusting for diagnosis, initial APACHE III score, gender, race, insurance status, attending physician type, and hospital site. An intention-to-treat bivariate analysis used a simple *t* test to compare admission DNR patients with all patients who started with full code status (full code and delayed DNR patients).

RESULTS

Two-hundred sixty-five individual patients were enrolled with a total of 319 admissions. One-hundred sixty

admissions were full code, 112 admissions had admission DNR orders, and 47 admissions had delayed DNR orders. Table 1 shows patient characteristics of the three groups. We observed a higher hospital mortality rate in the delayed DNR patients of 42% (19 of 45), compared with 2% (3 of 127) for full code patients, and 24% (22 of 93) for admission DNR patients ($p < .001$).

Length of Stay and Hospital Costs

Multivariate analysis found that admission DNR patients did not differ from full code patients in total costs, daily costs, or length of stay (Table 2). Neither admission DNR nor full code patients differed from delayed DNR patients in daily costs, but admissions of delayed DNR patients did incur a longer length-of-stay ($p = .0001$) and higher total costs ($p = .0002$) than did the admissions of full code or admission DNR patients (Table 2).

A bivariate "intention-to-treat analysis" (admission DNR as the "treatment") noted that admission DNR patients had a shorter length of stay (9.5 vs 12.8 days, $p < .0001$), lower total hospital costs (\$6,861 vs \$9,334, $p < .01$) and equivalent daily costs (\$712 vs \$709, $p > .9$) compared with all patients who were admitted without DNR orders (with full code and delayed DNR patients).

Table 1. Patient Characteristics

Characteristic	Full Code (n = 127)	Admission DNR (n = 93)	Delayed DNR (n = 45)	p Value
Mean age, years	56.2	64.2	57.0	.02*
APACHE III score (all admissions)	47.7 (n = 160)	63.5 (n = 112)	62.2 (n = 47)	.0001*
Female, %	42	50	40	.43†
White, %	44	55	48	.25†
Insurance, %				
Private	51	48	36	.33†
Medicare	23	32	31	
Medicaid/none	26	19	33	
Diagnosis, %				
AIDS	40	36	44	.001†
Lung cancer	17	11	16	
Severe CHF	29	9	16	
NHDM‡	14	44	24	
Attending physician, %				
Generalist	44	57	62	.05†
Specialist	56	43	38	
Hospital site, %				
University	78	63	76	.05†
Community	22	37	24	

*Univariate logistic regression.

† χ^2 analysis.

‡NHDM indicates nursing home patients with dementia and malnutrition.

DISCUSSION

There is much debate over what causes the high medical costs at the end of life. One author noted that the costs of intensive care were inversely proportional to the chances of survival,¹⁷ while others noted that higher use of intensive care resources was associated with a greater prognostic uncertainty.⁷ This study documents that patients with delayed DNR orders (written after 24 hours) had more costly hospital stays and higher mortality compared with admission DNR and full code patients. This suggests that delayed DNR orders are instituted when patients are more likely to die and are associated with higher total hospital costs. The higher mortality and longer length of stay of patients with delayed DNR orders suggests that these delayed DNR orders may serve more as a marker than a cause of higher costs and poor outcomes. If delayed DNR orders serve as a medical "last rites," applied as a patient is dying, then their actual impact on economic outcomes is likely to be small, and the observed cost differences are probably due more to the clinical deterioration and longer hospitalization than to the delayed DNR order itself. The higher mortality and higher costs observed in delayed DNR patients also highlights the problem of selection bias when comparing outcomes of DNR and non-DNR patient subgroups.

The equivalent costs of admission DNR and full code patients seem to suggest that early DNR orders do not affect resource utilization. However, an intention-to-treat analysis did find that admission DNR patients had a shorter length of stay and lower total costs than all patients who started the hospital stay without DNR orders (full code and delayed DNR patients). The substantial selection bias, reflected by wide differences in mortality among the three DNR groups, means that only a randomized comparison, which is not ethically feasible, could prove that earlier DNR orders actually reduce costs.

Table 2. Association of Do-Not-Resuscitate Orders with Mean Length of Stay and Hospital Costs

Variable	Admission DNR (n = 112)	Full Code (n = 160)	Delayed DNR (n = 47)	p Value*
Length of stay, days	9.5	11.2	18.5	.0001
Total costs, \$	6,861	8,101	13,531	.0002
Daily costs (all days), \$	685	712	791	.16
Daily costs (days 1–3), \$	859	884	943	.61
Daily costs (last 2 days), \$	400	425	439	.94

*p Values are from a multivariate analysis that used admission DNR patients as baseline group for comparison to delayed DNR patients. The hospital stays of admission DNR patients and full code patients did not differ statistically for any economic outcome.

Our study has several limitations. First, the nonrandom design makes it difficult to control for selection bias between different DNR groups. Second, we only studied hospital costs; an important future strategy would follow patients longitudinally to observe the effect of outpatient DNR status on overall health resource use.

Our study identifies two types of DNR orders with different economic outcomes: those present on admission that are probably established on an outpatient basis, and delayed DNR orders, which seem to serve more as a medical "last rites" and are associated with higher mortality and greater total costs. Future research needs to examine causes of delay in DNR orders and how different types of DNR orders affect clinical and economic outcomes across the continuum of care.

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