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Impact of Do-not-resuscitation Orders on Quality of Care Performance Measures in Patients Hospitalized with Acute Heart Failure

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Abstract

Background—Heart failure (HF) is one of the leading causes of morbidity and mortality among Americans. Despite increased interest in end-of-life care, the implications of DNR orders in acutely ill patients with HF remain unclear. The goals of this observational study were to describe the use of do-not-resuscitate (DNR) orders and their impact on treatment approaches in residents of a large New England metropolitan area hospitalized with acute heart failure.

Methods—Use of HF performance measures, including assessment of left ventricular function, use of angiotensin receptor blocking agents, anticoagulation, smoking cessation counseling, and utilization of non-pharmacologic strategies, was examined through review of the medical records of 4,537 metropolitan Worcester (MA) residents admitted to 11 Central Massachusetts hospitals with acute HF in 1995 and 2000 according to the presence of DNR orders.

Results—Patients with DNR orders were less likely to have had their left ventricular function assessed (31 % vs. 43%) as well as receive renin-angiotensin system blockade (49% vs. 57%), anticoagulation (65% vs. 78%), or nonpharmacologic interventions (87% vs. 92%) as compared to patients without DNR orders. Patients with DNR orders were significantly less likely to have received any quality assurance measure for acute HF (adjusted hazard ratio, 0.63; 95% CI, 0.40, 0.99) than patients without DNR orders.

Conclusions—The use of quality assurance measures in acute HF is markedly lower in patients with DNR orders. The implications of DNR orders need to be further clarified in the treatment of patients with acute HF.

Keywords

End of life care; do-not-resuscitate orders; performance measures; acute heart failure

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Introduction

End-of-life care is an important part of general patient care. Discussions about end-of-life wishes have empowered patients and their families to become more involved in their own care¹. Documentation of Do-Not-Resuscitate (DNR) orders, as part of end-of-life care, often includes information about prognosis after an attempted resuscitation and change of care plans among patients who are severely ill or with terminal illnesses. The interpretation of what a DNR order means, however, may vary considerably between physicians². While DNR orders typically specify the withholding of cardiopulmonary resuscitation, the implications of these orders can be broadly interpreted and may change the overall course of treatment². Previous studies have suggested that although nursing care often remains the same after patients or their families sign a DNR order, the utilization of other more aggressive medical interventions often decrease^{3, 4}.

Heart failure (HF) is a chronic condition with frequent acute exacerbations. This increasingly prevalent clinical syndrome is associated with a poor long-term prognosis and typically occurs in elderly patients with other comorbidities⁵. Expert task forces from the American College of Cardiology (ACC) and the American Heart Association (AHA) have created evidence-based guidelines for the care of patients with HF^{6, 7}. Physicians taking care of these high-risk patients are encouraged to discuss end-of-life care with patients and their families near the end stages of this disease process⁶. Performance measures in patients with HF have been recently developed for purposes of enhancing patient associated outcomes⁷. Five performance measures were chosen for quality control in the hospital treatment of patients with HF. These measures included left ventricular function assessment, use of angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARB), smoking cessation counseling, anticoagulation if atrial fibrillation is present, and nonpharmacologic counseling⁷. Adherence to these performance measures was found to improve quality of care and patient outcomes⁸.

The objectives of the present observational study were to examine the magnitude, patient characteristics, and impact of DNR orders in patients hospitalized with clinical findings of decompensated HF. A secondary study objective was to examine the relation between receipt of DNR orders and prescribing of various treatment modalities and quality of care measures during an acute hospitalization for HF. Data from the population-based Worcester Heart Failure Study were utilized for purposes of the present investigation^{5, 9}.

Methods

The Worcester Heart Failure Study is an ongoing observational study that is examining the clinical epidemiology of acute HF in residents of the Worcester, MA, metropolitan area (2000 census estimate = 478,000) hospitalized for possible HF at all 11 greater Worcester medical centers during 1995 and 2000. Details of this project are described elsewhere^{5, 9}. In brief, the medical records of patients with primary and/or secondary discharge diagnoses consistent with the possible presence of HF were reviewed in a standardized manner for purposes of identifying patients with a new or recurrent episode of acute HF^{5, 9}. The primary International Classification of Diseases (ICD)-9 code reviewed for the identification of cases of acute HF was ICD-9 code 428. In addition, the medical records of patients with discharge diagnoses of hypertensive heart and renal disease, acute cor pulmonale, cardiomyopathy, pulmonary congestion, acute lung edema, and respiratory abnormalities were reviewed by trained study physicians and nurses for purposes of identifying additional possible cases of acute HF. Confirmation of the diagnosis of HF by our trained nurse and physician abstractors, based on use of the Framingham criteria, included the presence of 2 major criteria or 1 major and 2 minor criteria^{10–12}. Examples of the major criteria included paroxysmal nocturnal dyspnea and neck

vein distention while examples of the minor criteria included bilateral ankle edema and nocturnal cough^{10–12}.

The medical records of greater Worcester residents hospitalized with independently confirmed HF at all Worcester metropolitan area medical centers in 1995 and 2000 were abstracted for demographic, clinical, and treatment data. This included information about patient's age, sex, prior medical history, development of clinical complications during hospitalization, therapies received, and provision of nonpharmacologic counseling (e.g., smoking cessation, reduction of salt intake, increased physical activity). The presence of kidney disease was defined based on the estimated glomerular filtration rate using the first serum creatinine finding recorded during the index hospitalization¹³. Data on the use of DNR orders were collected through the review of hospital medical records and physician's progress notes.

Documentation of each of the ACC/AHA quality assurance measures was obtained based on the review of the hospital charts of patients admitted with HF to all Central Massachusetts medical centers. These measures included assessment of left ventricular function by echocardiogram or left heart catheterization, use of ACE inhibitors or ARB's, smoking cessation counseling, use of anticoagulation therapy in patients with atrial fibrillation or atrial flutter, and the prescribing of nonpharmacologic recommendations including reduced intake of dietary fat and salt, limitation of fluid intake, increased physical activity, and monitoring of daily weight⁷. This study was approved by the Committee for the Protection of Human Subjects at participating study hospitals and at the University of Massachusetts Medical School.

Data analysis

Differences in the demographic and clinical characteristics of patients with and without a DNR order were examined through the use of chi-square tests and t tests for discrete and continuous variables, respectively. Differences in the receipt of any of the quality of care measures, or the individual assurance measures, between patients with and without a DNR order were examined through the use of logistic regression modeling controlling for several potential confounding demographic and clinical factors, with stepwise selection. A secondary analysis was performed using a propensity score analysis. The propensity score utilized the covariates available to us, based on the review of information contained in hospital medical records, to determine the likelihood of receiving a DNR order. The propensity score analysis allows control for residual confounding in examining the association between having received a DNR order and compliance with performance of HF related investigations and receipt of various therapies.

Results

Characteristics of the Study Population

The study sample consisted of 4,537 patients who were hospitalized with confirmed HF at all greater Worcester hospitals in 1995 and 2000 for whom DNR status could be ascertained. The mean age of the study sample was 76 years, 57% of hospitalized patients were women, and 94% were Caucasian. Approximately 30% of patients had a DNR order placed in their hospital chart at any time during the acute hospitalization.

Characteristics of Patients With DNR Orders

Patients with DNR orders were more likely to be older, women, and have more comorbid conditions present than patients in whom DNR orders were not written for (Table 1). Patients with DNR orders were significantly more likely to have a longer length of hospital stay, and develop pneumonia, stroke, or die during hospitalization, than patients without DNR orders.

Use of Heart Failure Quality Assurance Measures

With the exclusion of anticoagulation therapy and smoking cessation counseling, approximately 29% of all patients with symptoms of acute HF received one appropriate investigation, treatment, or counseling for the enhanced management of this clinical syndrome, whereas 43% received any two quality of care performance measures. Only 5.4% of all patients failed to receive any quality assurance measure. Approximately 22% of the total study sample received all quality assurance performance measures

We examined the relation between receipt of DNR orders and various HF quality assurance related measures in the total study sample and separately after excluding patients who died during hospitalization since these patients may have died too soon after hospitalization to have received these therapeutic measures (Table 2).

In comparison to patients who did not have DNR orders noted in their charts, those with DNR orders were less likely to receive more than one quality performance measure. Specifically, they were less likely to have their cardiac function assessed, be prescribed ACE inhibitors or ARB's, and nonpharmacologic strategies, than those without DNR orders. Additionally, patients with DNR orders were less likely to have received anticoagulation when they had concurrent atrial fibrillation diagnosed (Tables 2 and 3), although this difference was not statistically significant after multivariable adjustment. Among the different nonpharmacologic strategies examined, patients with DNR orders were less likely to receive information about fluid restriction, dietary advice, alcohol reduction, or importance of regular physical activity than their counterparts without DNR orders (Table 2).

Propensity analysis

Propensity score analyses were performed in the total study sample and separately in hospital survivors in an attempt to adjust for residual confounding in examining the association between documentation of a DNR order and receipt of HF quality assurance measures (Table 4). These analyses confirmed that patients with a DNR order were less likely to have received diagnostic and treatment therapies for HF according to the ACC/AHA quality measure guidelines in comparison to patients who did not have a DNR order.

Characteristics of patients with DNR orders who received quality assurance measures

In a secondary analysis restricted to patients with DNR orders, those who received quality assurance measures were demographically similar to those who did not receive the quality performance measures. A greater proportion of patients that did not receive any quality of care measure died in hospital or within 30 days of hospital admission as well as had a prior history of cancer in comparison to those who received at least one of the quality assurance measures examined (Table 5).

Discussion

The results of the present study, carried out in residents from a large New England metropolitan area hospitalized with clinical findings of acute HF, suggest that less than one third of patients with clinical findings of acute HF have a DNR order placed in their charts. Importantly, these patients were less likely to have had their left ventricular function measured, or have been treated with appropriate angiotensin receptor blockade during their index hospitalization, as compared to patients without a DNR order.

Our study provides important insights into the processes of care in patients with acute HF and potential implications of DNR orders in patients with this increasingly prevalent clinical syndrome. A key finding of our study was that, while not optimal, the majority of patients with

or without a DNR order received at least 1 treatment strategy appropriate for the management of acute HF. However, the proportion of patients that received all indicated performance measures was low. In particular, the rate of documented smoking cessation counseling was low and was identified as an area that will need improvement in the more effective management of patients hospitalized for HF.

Implications of a DNR order

The creation of DNR orders is an important part of the management of end-of-life care among patients with HF and their family members⁶. In general, the goal of having a DNR order is to respect patient autonomy, reduce harm done to patients, and decrease the use of futile and costly medical care¹⁴. Since a DNR order specifies patient wishes for cardiopulmonary resuscitation, it differs from advanced directives that are created to include patient preferences for other therapeutic options as well as end-of-life care. Therefore, the theoretical effect of a DNR order should be limited to life-sustaining measures and resuscitation only. However, having a DNR order may potentially lead to different investigations and possibly alter the course of treatment in patients with decompensated HF. After controlling for variables that reflect the case mix of our patient population, DNR orders appear to be an important factor in affecting the choice of investigation and therapy in the inpatient care of greater Worcester residents hospitalized with acute HF. Receiving a DNR order may play a role in directing the general care of patients, as opposed to being a specific preference towards cardiopulmonary resuscitation.

Inconsistency of DNR orders interpretation

The differential treatment of patients with and without DNR orders found in the present study has been previously described^{15, 16}. Prior studies have shown that cardiac patients with DNR orders were less aggressively treated during hospitalization for an acute coronary syndrome as compared to patients without a DNR order¹⁵ and that nursing home residents with DNR orders were less likely to be hospitalized when they developed pneumonia¹⁶. This is of concern as DNR orders should not dictate or alter the course of treatment. One potential reason why a DNR order may lead to changes in treatment strategies is due to physician interpretation of DNR orders. Prior studies have demonstrated that physicians have been found to interpret the DNR orders differently and often change their management approaches based on these orders, especially in the intensive care setting^{17, 18}. This broad interpretation of what constitutes a DNR order may lead to inadequate or delayed treatment of potentially curable illnesses among patients with chronic health conditions.

Another potential impact of the inconsistent interpretation of DNR orders is physician hesitancy in initiating end-of-life discussions. In particular, providers may be concerned that patients with DNR orders would not receive appropriate or adequate medical treatment. Patients and their families may also be reluctant to withhold cardiopulmonary resuscitation due to concerns that the treatment for other illnesses may be compromised after having a label of DNR attached to their medical records. In these circumstances, patients' wishes for dignified end-of-life care may be compromised.

Based on our findings, we recommend that discussions about resuscitation be included in the setting of advanced care directives to include a comprehensive array of end-of-life issues and care, so that HF treatment and investigations can be directed, taking into account patient preferences and disease severity. This would limit an overemphasis on, and inconsistent interpretation of, DNR orders.

Appropriateness of less aggressive treatment approaches among patients with a DNR order

The appropriateness of receiving fewer quality assurance measures among patients with DNR orders is debatable. These orders theoretically serve to improve the dignity of death among terminally ill patients while improving the utilization of limited medical resources to more appropriate use¹⁹. While patients with a DNR order may not receive as many investigations or treatments as other patients without these orders, this does not necessarily mean worse quality of care for these patients. Prior studies have noted that patients with DNR orders receive more nursing bedside time³ and that the quality of care in patients with and without DNR orders, as reflected by nursing time and patient satisfaction, was essentially similar²⁰. In our study, the seemingly less aggressive treatment of patients with acute HF and DNR orders may represent the appropriate level of care for these high risk patients. Our study showed that a large proportion of patients with DNR orders who did not receive any quality assurance measures had a history of terminal illness or died in hospital. The recommended quality assurance measures may be overly aggressive for this subgroup of patients and may even be considered an inappropriate use of finite resources. Although the performance assurance guidelines were developed for all patients with HF, creating newer quality of care markers and guidelines taking into account the values and preferences of patients may be more appropriate and consistent with patient's wishes and desires.

Study strengths and limitations

The strengths of our observational study include the use of a large community-based sample of patients hospitalized with clinical findings of acute HF from a large and representative New England community. It is also the first study that has evaluated the impact of DNR orders in the treatment of patients with acute HF while using rigorous analytic techniques to control for the influence of other potential confounding factors. One of the study's weaknesses was that our study was initiated prior to the publication of the AHA/ACC guidelines. However, the diagnostic and treatment strategies recommended in the clinical performance measures, such as left ventricular function measurement and ACE inhibitor use, had been in practice widely. Importantly, the timing of the clinical performance measure guidelines should not alter the treatment of study patients with or without DNR orders. Other limitations of this non-randomized descriptive study include our inability to assess perceptions about the quality of care from the patient's perspective. This is because we lacked information about patient's desires and goals of care, given the retrospective nature of this study and its primary reliance on the quality and extent of information recorded in hospital charts. For example, some patients may have a DNR order written as part of the transition to palliative end-of-life care, and the observed disparities in care may be a reflection of patient preferences to forego further interventions. Expressed in a different manner, the factors that might have led a patient to request not to be resuscitated if they developed cardiac arrest might have also prompted the patient to forego the receipt of other diagnostic tests (e.g., assessment of left ventricular function), effective treatment approaches (e.g., receipt of ACE inhibitors or beta blockers), or carry out positive lifestyle changes, such as increase their levels of physical activity or stop smoking, that may be perceived as not enhancing their quality or duration of life. These same factors may also effect physicians' decisions on the appropriate extent and type of care to provide to these patients. In addition, the value of the propensity score analysis is limited by the lack of information available about patient's preferences for the intensity and quality of cardiac care, which would contribute to residual confounding of our propensity model. Additionally, our analysis was limited by the inability to adjust for disease severity due to the considerable lack of information on patients' New York Heart Association class and their left ventricular ejection fraction findings during the present admission. We did, however,

statistically adjust for a number of different demographic, medical history, and clinical factors in our regression modeling approaches, that may partially reflect severity of HF, as well as prognosis after HF, in examining factors associated with the likelihood of receiving a DNR order. However, these limitations serve as fodder for future studies on end-of-life care among patients with chronic and acute manifestations of underlying HF.

Summary and conclusions

The treatment of patients with HF continues to improve with technological advances and development and increased application of new treatment strategies. At the present time, recommendations for quality assurance measures provide a high standard of care and excellent treatment for all patients with acute HF. However, patients with HF continue to have a poor long-term prognosis and end-of-life discussions remain an important aspect of the management of these high-risk patients. Physicians and patients alike should be aware of the significance of having a DNR order and its potential implications that may modify the course of treatment. Future studies should focus on patient perspectives on the use of quality assurance measures and overall satisfaction of quality of care of their illness in the setting of having specific end-of-life directives.

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Table 1Characteristics of patients with acute heart failure according to the presence of a do not resuscitate order*

Characteristic	DNR Order (+) (n=1,341)	No DNR Order (-) (n=3,193)	P-value
Age (mean, yrs)	81.4	73.4	<0.001
Male (%)	35.9	46.2	<0.001
White race (%)	97.2	92.9	<0.001
Length of hospital stay (mean, days)	6.9	5.5	<0.001
Current smoker (%)	5.8	11.0	<0.001
<i>Medical history (%)</i>			
Atrial fibrillation	41.7	32.4	<0.001
Cancer	25.6	16.8	<0.001
Chronic Obstructive Pulmonary Disease	37.3	33.8	0.02
Coronary heart disease	57.2	56.6	0.7
Diabetes	34.9	41.9	<0.001
Heart failure	79.4	72.5	<0.001
Hypertension	62.2	66.4	<0.01
Kidney disease	68.6	63.0	<0.001
Stroke	19.8	12.4	<0.001
<i>Hospital complications (%)</i>			
Deep vein thrombosis	0.6	0.5	0.6
Pneumonia	19.7	10.4	<0.001
Stroke	0.9	0.3	0.01
Died in hospital	19.5	1.5	<0.001
Alive at 30 days after hospital admission	63.3	94.2	<0.001

Table 2
Use of heart failure quality assurance measures according to the presence of a do not resuscitate order

Heart failure quality assurance measures (%)	Total Sample		Hospital Survivors		P-value
	DNR Order (+) (n=1,341)	No DNR Order (-) (n=3,193)	DNR Order (+) (n=1,081)	No DNR Order (-) (n=3,148)	
Assessment of left ventricular function	31.2	42.9	31.5	42.8	<0.001
ACE inhibitor or ARB use	45.6	56.9	48.8	57.2	<0.001
Smoking cessation counseling *	3.86	12.3	5.0	12.1	0.1
Anticoagulation **	63.9	77.6	64.5	77.7	<0.001
Nonpharmacologic counseling †	82.1	91.8	87.4	92.1	<0.001
Received any of the following of these above measures ***					
Any 1	36.5	26.2	36.5	26.1	
Any 2	38.6	45.3	41.5	45.5	<0.001
All 3	15.1	25.0	16.1	25.0	
Nonpharmacologic counseling †					
Fluid restriction	19.8	21.9	20.7	22.0	NS
Salt restriction	69.5	84.8	75.5	85.2	<0.001
Increasing physical activity	39.1	42.7	42.1	42.7	NS
Fat reduction	44.6	63.4	48.6	63.8	<0.001
Alcohol reduction	0.1	1.0	0.1	1.0	<0.01
Received any of the above of these nonpharmacologic measures					
Any 1	23.9	16.2	23.7	16.0	
Any 2	31.0	38.0	34.0	38.2	<0.001
Any 3 or more	27.2	37.7	29.7	37.9	

Abbreviations: ARB, angiotensin receptor blocker; ACE, angiotensin converting enzyme

* A total of 428 patients documented current cigarette smoking at time of hospital admission

** A total of 1165 patients had documented atrial fibrillation

*** Excluding anticoagulation and smoking cessation counseling

Table 3

Receipt of a DNR order and quality assurance measures among hospital survivors

	Unadjusted Hazards Rate	95% CI	Hazard Rate (multivariate)*	95% CI
Having any of the quality assurance measures	0.52	0.37,0.72	0.63	0.40,0.99
Assessment of left ventricular function	0.62	0.53,0.71	0.60	0.49,0.75
ARB or ACE inhibitor use	0.72	0.62,0.82	0.71	0.58, 0.86
Smoking cessation counseling	0.38	0.12,1.28	0.25	0.03,2.08
Anticoagulation	0.52	0.39,0.69	0.68	0.45,1.04
Nonpharmacologic counseling	0.60	0.48,0.75	0.63	0.46,0.86

Abbreviations: DNR, do not resuscitate; ARB, angiotensin receptor blocker; ACE, angiotensin converting enzyme

* Adjusted for age, sex, renal function on admission, prior history of diabetes, cancer, chronic obstructive pulmonary disease, cardiomyopathy, atrial fibrillation, angina, coronary heart disease, left ventricular hypertrophy, hypertension or stroke, and in-hospital development of cardiac arrest or pneumonia, and hospital procedures including percutaneous coronary interventions, coronary artery bypass graft surgery, and automatic defibrillator placement.

Table 4Propensity analysis: presence of DNR orders and receipt of quality assurance measures

	Total Sample		Hospital survivors	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Having any of the quality assurance measures	0.34	0.26,0.46	0.55	0.39,0.78
Assessment of left ventricular function	0.61	0.53,0.70	0.63	0.54–0.73
ARB or ACE inhibitor use	0.68	0.60,0.78	0.76	0.66–0.88
Smoking cessation counseling	0.29	0.09,0.98	0.43	0.13,1.46
Anticoagulation	0.53	0.40,0.70	0.56	0.43–0.79
Nonpharmacologic counseling	0.42	0.34,–0.51	0.61	0.48,0.77

Abbreviations: DNR, do-not-resuscitate; ARB, angiotensin receptor blocker; ACE, angiotensin converting enzyme

Table 5
Characteristics of patients with DNR orders who received selected quality assurance measures[†]

Characteristic	Any 1 (N=490)	Any 2 (N=517)	Any 3 or More (N=202)	None (N=132)
Age (mean, yrs)	81.5	81.4	81.5	80.9
Male (%)	35.1	34.4	35.2	46.2
White race (%)	98.4	97.3	93.6	97.8
Length of stay (mean, days) *	6.5	7.0	8.3	5.7
Current smoker (%)	6.8	4.6	5.0	8.3
Medical history (%)				
Atrial fibrillation	41.6	47.1	33.2	34.1
Cancer *	25.7	21.6	29.7	34.1
COPD	39.0	36.3	35.2	37.9
Coronary heart disease *	54.3	67.6	49.5	39.4
Diabetes	35.5	35.9	37.1	25.0
Heart failure *	80.4	83.2	75.7	66.7
Hypertension	58.6	67.2	64.9	51.2
Kidney disease	71.2	68.9	67.3	59.1
Stroke	20.4	21.8	16.3	15.2
Hospital complications (%)				
Deep vein thrombosis	0.8	0.4	1.0	0
Pneumonia	21.6	18.8	22.6	12.1
Stroke	0.8	1.0	1.0	0.8
Died in hospital *	19.6	13.3	13.9	51.5
Alive at 30 days after hospital admission	59.2	72.2	73.1	28.8

Abbreviations: DNR, do-not-resuscitate; COPD, chronic obstructive pulmonary disease

[†] Assessment of left ventricular function, angiotensin receptor blockade or angiotensin converting enzyme inhibitor use, and prescribing of nonpharmacologic recommendations.

* Variables found to be significant with p value < 0.05