

Advance Directives Among Hospitalized Patients With Heart Failure



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CME Objective for This Article: After reading this article, the reader should understand: 1) the frequency of documented advance directives among

patients hospitalized for heart failure at a large academic institution; and 2) factors independently associated with documentation of advance directives at a large academic institution.

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Advance Directives Among Hospitalized Patients With Heart Failure

ABSTRACT

OBJECTIVES The purpose of this study was to assess the frequency and correlates of documented advance directives (ADs) among patients hospitalized for heart failure (HF).

BACKGROUND Discussing ADs with patients with HF is critical for identifying treatment goals consistent with patients' values and preferences and for facilitating health care team communication.

METHODS We retrospectively identified electronic medical records of adult patients admitted to 2 large tertiary care hospitals with either the primary or secondary discharge diagnosis of HF from September 2008 to August 2013 to assess the presence of ADs in electronic medical records. We performed analyses including HF as either the primary or secondary admission diagnosis and HF as the primary admission diagnosis only. Multivariable models were constructed to investigate independent predictors of documented ADs.

RESULTS Data included 44,768 admissions from 24,291 individual patients over 5 years. Mean age of patients at admission was 64.8 ± 15.9 years; 47.9% of these patients were female, 51.8% were black. The median length of stay for all admissions was 5 (3 to 10) days; 12.7% of patients had documented ADs. Older age, female sex, white race, higher socioeconomic status, higher risk for adverse in-hospital outcomes, length of stay ≥ 5 days, hospice discharge, palliative care consultation, and a do-not-resuscitate order were all associated with a significantly higher chance of having documented ADs. A significant increase in ADs over time was noted, but more than 80% of patients did not have ADs in medical records at the end of the study period.

CONCLUSIONS In a diverse population of hospitalized patients with HF, most did not have a documented AD in the medical records. Although several factors were associated with a higher probability, major opportunities exist for all subgroups of patients with HF to improve documentation of ADs. (J Am Coll Cardiol HF 2015;3:112-21) © 2015 by the American College of Cardiology Foundation.

Patients with heart failure (HF) suffer high morbidity and mortality risk and poor patient-centered outcomes (1,2). Almost 50% of patients with HF die within 5 years of diagnosis, including many who suffer sudden cardiac death (1). There are more than a million hospitalizations in the United States annually with HF as the primary discharge diagnosis and an additional 2 million hospitalizations with HF as a contributory diagnosis. One-year mortality post HF hospitalization remains higher than 30% (3-6). Costs of care for HF exceeds \$40 billion annually, with more than 50% consumed during the last 6 months of life (7).

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Considering the poor prognosis and the inability to predict the terminal phase of the disease accurately (8), discussing advance directives (ADs) early in the disease process is critical to optimize management, identify treatment goals consistent with patient

preference, and facilitate health care team communication and advance care planning (9,10). HF management guidelines recommend integration of palliative care and discussion of ADs (11). The federal Patient Self-Determination Act encourages patients to decide about the type and extent of care they want to accept or refuse if they become unable to make those decisions, and it mandates AD discussion with all hospitalized adults (12). The purposes of the Patient Self-Determination Act are to inform patients of their rights regarding decisions toward their medical care and to ensure that the health care providers communicate these rights. The 2 types of ADs are as follows: a living will, in which patients indicate the kind of care, especially life-sustaining care, they would or would not like to receive, and a medical power of attorney, in which a patient names another person to make decisions about the patient's medical care, if the patient is temporarily or permanently unable to communicate or make these decisions. ADs

**ABBREVIATIONS
AND ACRONYMS****AD** = advance directive**HF** = heart failure**IQR** = interquartile range

should be discussed when the patient is not overwhelmed by the disease and can ask relevant questions and absorb this information to make optimal decisions. Ideally, this should be done in the outpatient setting, but the inpatient setting provides a captured, unhurried opportunity. Importantly, because of the heightened risk for adverse outcomes during hospitalization, it is important that this process take place.

Integrating palliative care into disease management can create a comprehensive support system by adding expertise in assessment and treatment of physical, psychosocial, and spiritual issues that are of concern to patients (13). Although the rationale for ADs is to improve patient-related outcomes, documentation of ADs is also associated with lower costs, lower risk of in-hospital death, and higher use of hospice care in regions with higher levels of end-of-life spending (14). Limited data exist regarding the frequency of documented ADs among hospitalized patients with HF, a group that is at high risk for poor outcomes (15,16). In this study, we sought to assess the frequency and correlates of documented ADs among patients hospitalized for HF in a large academic institution over a 5-year period.

METHODS

STUDY DESIGN AND POPULATION. This retrospective study was conducted using the electronic medical records of adult patients with HF who were admitted to 2 large tertiary care hospitals (Emory University Hospital and Emory University Hospital Midtown, both in Atlanta, Georgia) affiliated with Emory University over a 5-year period from September 2008 to August 2013. Overall, 48,319 inpatient stays with a primary or secondary HF diagnosis, defined as an International Classification of Diseases revision 9 diagnosis codes 425.xx or 428.xx, were included. Because we did not intend to focus solely on acute decompensated HF, all admissions with an HF diagnosis were included. Both hospitals have an inpatient HF service and an HF consultation team and provide inpatient palliative care services through multidisciplinary teams that include physicians, nurse practitioners, and dedicated chaplains. Data were extracted from patients' electronic medical records by using a strategic analysis program (MicroStrategy, Inc., Tysons Corner, Virginia). The electronic medical records system is the same at both hospitals and is fully integrated across the health care system. Data entered into the electronic medical records system both in the inpatient or the outpatient setting are always visible to anyone logged into the

system. Also, both hospitals share the same electronic health record system, and there is no distinction between the 2 hospitals once someone enters the records. The strategic analysis program is a large relational database that links inpatient and outpatient data from our electronic medical records system with several other systemwide sources and can be queried for any of this information. The AD document can be modified if changes in health status or other reasons lead a patient to change his or her decisions. In such cases, a copy of the modified AD should be placed in the medical record.

Observation unit stays were excluded because of their typically short duration, which may not provide sufficient time to discuss ADs. We also excluded 2,539 patients from outside the state of Georgia or whose home addresses were unknown because collecting ADs for these patients was assumed to be particularly difficult. Our final sample consisted of 44,768 admissions from 24,291 individual patients. The Emory University Institutional Review Board approved this study.

DEFINITIONS AND OUTCOMES. Demographic data collected included age, race, sex, insurance status (Medicare, Medicaid, commercial, and other), billing zip code, and marital status (married, common law, or life partner) versus unmarried (divorced, parted, separated, single, or widowed). Socioeconomic status was classified based on the zip code's median household income from the 2010 Census. Clinical data included admission and discharge date, hospital length of stay (defined as discharge day minus admission day), in-hospital mortality, discharge to hospice, admission day of the week (weekday vs. weekend), primary and secondary diagnosis codes, attending physician specialty (HF vs. general cardiology vs. other), and number of previous admissions during the study period. The total number of hospitalizations was calculated as the current admission plus the number of earlier admissions for that patient during the study period.

Billing data were used to determine whether the patient had received a consultation from palliative care service, and medical order data were searched to ascertain code status (e.g., do-not-resuscitate). Data were also collected for the earliest recorded measurements of blood urea nitrogen and serum creatinine levels and systolic blood pressure to stratify risk for in-hospital mortality in these patients (17). Briefly, patients with blood urea nitrogen <43 mg/dl and systolic blood pressure \geq 115 mm Hg were considered low risk; those with blood urea nitrogen \geq 43 mg/dl, systolic blood pressure <115 mm Hg, and serum creatinine \geq 2.75 mg/dl were considered high risk; and

all others were intermediate risk, as described by Fonarow et al. (17).

The main outcome of this study was the presence of documented AD, defined as a scanned copy of the patient's AD form in the Emory electronic medical

records system at any time during or before the patient's hospital stay. We searched for any file with the title "Advance Directive" scanned and uploaded in the medical records. Time to AD was calculated as admission day minus the date of the first or most

TABLE 1 Patient and Provider Characteristics of the Study Cohort

	Heart Failure as Either Primary or Secondary Admission Diagnosis				Heart Failure as Primary Admission Diagnosis			
	Full Sample (N = 24,291)	With Advance Directives (n = 3,077)	Without Advance Directives (n = 21,214)	p Value	Full Sample (N = 3,592)	With Advance Directives (n = 413)	Without Advance Directives (n = 3,179)	p Value
Age, yrs	64.8 ± 15.9	71.3 ± 15.5	63.9 ± 15.7	<0.0001	63.9 ± 15.9	69.3 ± 16.6	63.2 ± 15.7	<0.0001
Race*				<0.0001				<0.0001
White	46.5%	62.9%	44.1%		39.3%	56.1%	37.1%	
Black	51.8%	36.2%	54.1%		59.2%	42.9%	61.4%	
Other	1.8%	0.9%	1.9%		1.5%	1.0%	1.6%	
Female	47.9%	52.2%	47.3%	<0.0001	44.5%	49.6%	43.8%	0.02
Insurance				<0.0001				<0.0001
Medicare	65.3%	77.0%	63.6%		62.2%	75.1%	60.5%	
Medicaid	9.4%	5.0%	10.0%		10.9%	7.8%	11.3%	
Commercial	18.7%	14.9%	19.3%		18.9%	13.8%	19.5%	
Other, N	6.6%	3.1%	7.2%		8.1%	3.4%	8.7%	
Zip code median household income quartile				<0.0001				<0.0001
1st (lowest)	15.2%	11.0%	15.8%		17.2%	11.6%	17.9%	
2nd	17.7%	13.4%	18.3%		18.7%	12.8%	19.4%	
3rd	33.9%	30.7%	34.4%		34.0%	33.2%	34.1%	
4th, N (highest)	33.2%	44.9%	31.5%		30.2%	42.4%	28.6%	
Married*	45.0%	40.5%	45.6%	<0.0001	42.9%	39.3%	43.4%	0.12
BUN, mg/dl*	21.0 (14.0-34.0)	23.0 (16.0-38.0)	20.0 (14.0-33.0)	<0.0001	22.0 (15.0-36.0)	29.0 (18.0-46.0)	21.0 (15.0-35.0)	<0.0001
High risk (≥43 mg/dl)	16.8%	20.1%	16.3%	<0.0001	18.3%	30.0%	16.8%	<0.0001
Creatinine, mg/dl*	1.2 (0.9-1.9)	1.2 (0.9-1.9)	1.2 (0.9-1.9)	0.66	1.3 (1.0-1.9)	1.5 (1.0-2.2)	1.3 (1.0-1.8)	0.66
High risk (≥2.75 mg/dl)	15.6%	14.5%	15.8%	0.07	11.6%	16.5%	11.0%	0.001
SBP, mm Hg*	135.3 ± 36.6	130.7 ± 33.9	136.0 ± 36.9	<0.0001	134.8 ± 35.7	125.7 ± 30.7	136.0 ± 36.2	<0.0001
High risk (<115 mm Hg)	26.2%	31.5%	25.4%	<0.0001	27.9%	40.3%	26.3%	<0.0001
Risk level*				<0.0001				<0.0001
Low	63.4%	57.9%	64.2%		61.9%	45.2%	64.0%	
Intermediate	33.5%	38.0%	32.8%		35.0%	49.1%	33.2%	
High	3.2%	4.1%	3.1%		3.1%	5.6%	2.8%	
Length of stay, days	5.0 (3.0-10.0)	7.0 (3.0-12.0)	5.0 (3.0-10.0)	<0.0001	4.0 (2.0-8.0)	6.0 (3.0-12.0)	4.0 (2.0-7.0)	<0.0001
Admission at weekday	81.5%	81.0%	81.6%	0.41	82.5%	82.8%	82.4%	0.84
Died in hospital	7.9%	10.8%	7.4%	<0.0001	5.2%	9.9%	4.5%	<0.0001
Discharged to hospice	6.9%	15.6%	5.6%	<0.0001	8.2%	22.3%	6.4%	<0.0001
Primary diagnosis of HF*	14.8%	13.4%	15.0%	0.02	N/A	N/A	N/A	N/A
Palliative care consult	11.6%	23.0%	9.9%	<0.0001	12.6%	32.5%	10.0%	<0.0001
DNR code status	12.5%	27.9%	10.3%	<0.0001	11.9%	32.0%	9.3%	<0.0001
Attending physician specialty				<0.0001				<0.0001
Heart failure	7.2%	9.0%	7.0%		23.2%	30.0%	22.3%	
Cardiology	17.4%	11.7%	18.2%		28.3%	17.7%	29.7%	
Other	75.4%	79.3%	74.8%		48.5%	52.3%	48.0%	
Number of hospitalizations over study period				<0.0001				<0.0001
1	66.9%	53.7%	68.9%		55.1%	32.7%	58.0%	
2-3	23.0%	29.4%	22.1%		28.9%	40.4%	27.4%	
4+	10.1%	16.9%	9.1%		16.0%	26.9%	14.6%	

Values are mean ± SD, %, or median (interquartile range). *1,052 subjects were missing data for race; 1,063 for marital status; 416 for primary diagnosis; 107 for serum creatinine, 104 for blood urea nitrogen, 150 for systolic blood pressure, and 242 for composite risk level.

BUN = blood urea nitrogen; DNR = do-not-resuscitate; HF = heart failure; IQR = interquartile range; N/A = not applicable; SBP = systolic blood pressure; SD = standard deviation.

TABLE 2 Proportion of Admissions With Documented Advance Directives

	Heart Failure as Either Primary or Secondary Admission Diagnosis (N = 24,291)		Heart Failure as Primary Admission Diagnosis (N = 3,592)	
	% With Advance Directives	p Value	% With Advance Directives	p Value
Age		<0.0001		<0.0001
≥65 yrs	16.6%		14.6%	
<65 yrs	8.3%		8.4%	
Race*		<0.0001		<0.0001
White	17.3%		16.5%	
Black	8.9%		8.4%	
Other	6.6%		7.7%	
Sex		<0.0001		0.02
Male	11.6%		10.4%	
Female	13.8%		12.8%	
Insurance		<0.0001		<0.0001
Medicare	14.9%		13.9%	
Medicaid	6.7%		8.2%	
Commercial	10.1%		8.4%	
Zip code median household income quartile		<0.0001		<0.0001
1st (lowest)	9.2%		7.8%	
2nd	9.6%		7.9%	
3rd	11.5%		11.2%	
4th (highest)	17.1%		16.1%	
Marital status*		<0.0001		0.12
Married or life partner	11.5%		10.5%	
Other	13.8%		12.2%	
Blood urea nitrogen*		<0.0001		<0.0001
High risk (≥43 mg/dl)	15.2%		18.9%	
Low risk (<43 mg/dl)	12.2%		9.9%	
Creatinine*		0.066		0.001
High risk (≥2.75 mg/dl)	11.8%		16.4%	
Low risk (<2.75 mg/dl)	12.9%		10.9%	
Systolic blood pressure*		<0.0001		<0.0001
High risk (<115 mm Hg)	15.3%		16.5%	
Low risk (≥115 mm Hg)	11.8%		9.5%	
Risk level*		<0.0001		<0.0001
Low	11.6%		8.4%	
Intermediate	14.4%		16.1%	
High	16.2%		20.5%	
Length of stay		<0.0001		<0.0001
≥5 days	14.9%		14.9%	
<5 days	9.9%		9.9%	
Admission day		0.41		0.84
Weekday	12.6%		11.5%	
Weekend	13.0%		11.3%	
Discharged dead		<0.0001		<0.0001
Yes	17.4%		22.2%	
No	12.3%		10.9%	
Discharged to hospice		<0.0001		<0.0001
Yes	28.7%		31.3%	
No	11.5%		9.7%	

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recent instance of a scanned AD. We sought data on both figures because we were interested in how long it took the health system to document AD presence, as well as whether these documents may be obsolete. Complete data were available for the majority of patients; missing data included marital status (4.4%), race (4.3%), primary diagnosis (1.7%), and laboratory data (1.0%).

STATISTICAL ANALYSIS. Descriptive statistics are reported for patients with and without documented ADs. Continuous variables were described using mean and standard deviation or median and interquartile range, and categorical variables were described as number and percentage. All analyses were performed at the patient level using each patient's most recent hospitalization only (N = 24,291). Bivariate tests were conducted comparing the percentage of patients with documented ADs across categorized versions of each variable listed earlier. Seasonal variations were assessed across discharge months and for secular trends across discharge fiscal years. Chi-square tests were used to account for clustering.

Multivariable models were constructed to investigate independent associations with AD status among all significant bivariate correlations. The models included age, race, sex, insurance, income quartile, marital status, length of stay, discharge disposition (dead, hospice, or other), primary diagnosis, code status, attending physician specialty, clinical risk score, and total number of hospitalizations (earlier admissions plus 1). We did not include individual laboratory values because of collinearity with the clinical risk score; model performance and results did not vary meaningfully whether we included the risk score only or individual laboratory values only. We built a multivariable logistic regression model to test associations in each patient's most recent hospitalization. A 2-sided $p < 0.05$ was accepted as statistically significant. Analysis were performed with SAS version 9.3 (SAS Institute, Cary, North Carolina).

RESULTS

STUDY POPULATION. Among patients admitted with HF as either the primary or secondary diagnosis, mean age at last admission during the study period was 64.8 ± 15.9 years; 47.9% of these patients were female, 46.5% were white, and 51.8% were black (Table 1). The distribution of demographic and clinical characteristics in patients admitted with a primary diagnosis of HF was comparable to the entire cohort, although with a higher proportion of black patients (Table 1). The median length of stay for all admissions was 5 days (interquartile range [IQR]: 3 to 10 days) for

patients admitted with HF as either the primary or secondary diagnosis and 4 days (IQR: 2 to 8 days) for patients with HF as the primary diagnosis.

PATIENT AND ADMISSION CHARACTERISTICS. At the time of each patient’s last admission during the 5-year study period, 12.7% had documented ADs. In the subset of patients with HF as primary admission diagnosis, 11.5% of patients had documented ADs. Characteristics of patients with and without AD are presented in **Table 1**. ADs were more frequently available in patients older than 65 years; in white, female, and unmarried patients; in patients living in higher-income areas; and in patients with higher clinical risk scores (**Table 2**).

More patients had documented ADs when length of stay was ≥ 5 days and when the patients died during admission or were discharged to hospice. No difference was observed when the patients were discharged during a weekday versus weekend. ADs were more frequent when a palliative care consultant or an HF specialist was part of patient management. When do-not-resuscitate status was not present or the diagnosis of HF was secondary, a lower proportion of admissions had documented ADs. Patients with multiple hospitalizations over the course of the study had a higher likelihood of having a documented AD by their most recent admission.

TIME TO ADVANCE DIRECTIVES. Among most recent admissions that included a documented AD (N = 3,077), the median date for the earliest such document was the day of admission (IQR: 291 days pre-admission to 6 days post-admission). The median date for the most recent such document was 3 days post-admission (IQR: 86 days pre-admission to 11 days post-admission).

MONTHLY AND TEMPORAL VARIATION. No statistically significant seasonal variation was observed (p = 0.14), and the authors did not observe any meaningful trends (**Figure 1**). A significant increase in the prevalence of ADs over time among most recent admissions was observed for both analyses (primary and secondary HF admission diagnosis and primary-only HF admission diagnosis) (**Figure 2**). The prevalence rose from 10.1% in 2008 to 14.3% in 2013 (p < 0.0001) among patients’ most recent admissions (**Figure 2**). However, in all years, most patients did not have documented ADs.

PREDICTORS OF ADVANCE DIRECTIVES. Most variables retained their significant associations in the adjusted model (**Table 3**). Patients more than 65 years of age, women, patients with length of stay of ≥ 5 days, those who were discharged to hospice, those with a palliative care consultation, those with a do-not-resuscitate order, and those with more total

TABLE 2 Continued

	Heart Failure as Either Primary or Secondary Admission Diagnosis (N = 24,291)		Heart Failure as Primary Admission Diagnosis (N = 3,592)	
	% With Advance Directives	p Value	% With Advance Directives	p Value
Primary diagnosis of heart failure*		0.0224		N/A
Yes	11.5%		N/A	
No	12.9%		N/A	
Palliative care consult		<0.0001		<0.0001
Yes	25.2%		29.7%	
No	11.0%		8.9%	
Code status		<0.0001		<0.0001
Do-not-resuscitate	28.3%		30.8%	
No do-not-resuscitate	10.4%		8.9%	
Attending physician specialty		<0.0001		<0.0001
Heart failure	15.7%		14.9%	
Cardiology	8.5%		7.2%	
Other	13.3%		12.4%	
Number of hospitalizations over study period		<0.0001		<0.0001
1	10.2%		6.8%	
2-3	16.2%		16.1%	
4+	21.2%		19.3%	

Values are %. *1,052 subjects were missing data for race; 1,063 for marital status; 416 for primary diagnosis; 107 for serum creatinine, 104 for blood urea nitrogen, 150 for systolic blood pressure, and 242 for composite risk level.

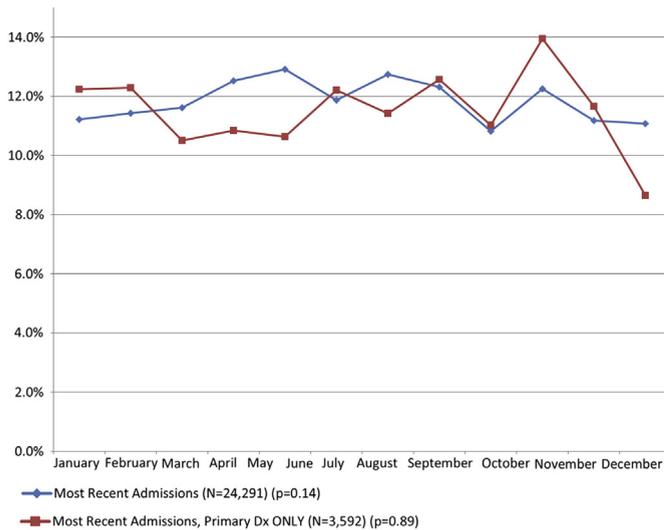
admissions were all more likely to have documented ADs. Conversely, blacks, those with Medicaid, those living in lower-income areas, married patients, and those with a general cardiologist as an attending physician were all significantly less likely to have documented ADs. The observed increase in ADs over time also remained significant in the model (**Table 3**).

PRIMARY AND SECONDARY VERSUS PRIMARY-ONLY HF ADMISSION DIAGNOSIS. Although the results were similar, in patients with primary-only HF diagnosis, the effects of age, marital status, insurance, and length of stay were diminished, whereas the effect of clinical risk score was considerably pronounced.

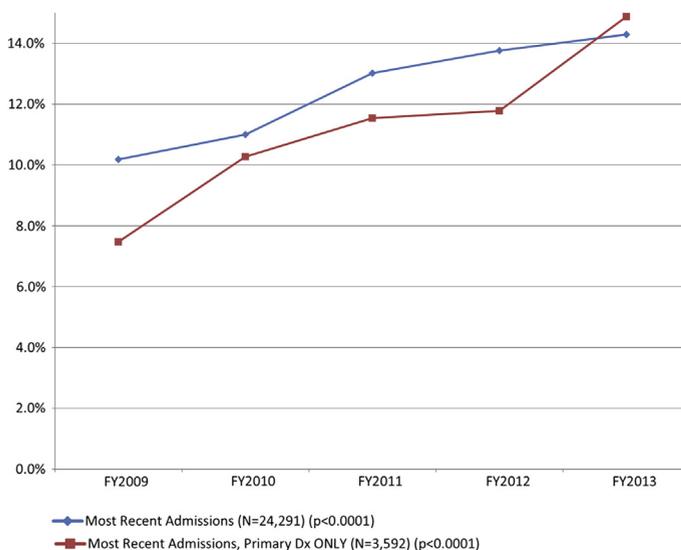
SENSITIVITY ANALYSIS. The results of the analysis at the visit level are presented in the **Online Appendix** as sensitivity analysis (**Online Tables 1 to 3**). The results are similar, with the exception of creatinine, which is a univariate predictor but not a multivariate predictor of AD at the visit level.

DISCUSSION

The risk for adverse events and mortality among patients with HF, especially among those who are

FIGURE 1 Monthly Variation in Admissions With Documented Advance Directive Over Time

This figure demonstrates no significant seasonal variation in a patient's most recent admission irrespective of primary and secondary heart failure (HF) admission diagnosis (N = 24,291; p = 0.14) or primary-only HF admission diagnosis (N = 3,592; p = 0.89) between September 2008 and August 2013. Dx = diagnosis.

FIGURE 2 Admissions With Documented Advance Directive Over the Study Period

This figure indicates a significant linear increase in the prevalence of advance directives over time in most recent admissions irrespective of primary and secondary heart failure (HF) admission diagnosis (N = 24,291; p < 0.0001) or primary-only HF admission diagnosis (N = 3,592; p < 0.0001). Dx = diagnosis; FY = fiscal year.

hospitalized for worsening symptoms, is well known (18). Based on this trajectory, the HF management guidelines acknowledge the importance of palliative care and ADs for these patients (11). Despite these facts, we observed a very low rate of AD documentation among patients with HF who were hospitalized for HF symptoms or other comorbidities. Although we did see an encouraging improvement over time during the 5-year study period, more than 80% of the patients did not have documented ADs in the medical records at any time during the study period.

Our findings should represent a call to action for providers who care for patients with HF to focus on advance care planning. It is estimated that less than one-half of patients with any serious illness have ADs (19-23), and a high proportion of existing ADs seem to fail to address important end-of-life medical decisions (23). This may reflect situations in which patients initially are asked to provide basic information about their willingness to receive specific advanced treatments in case of cardiopulmonary arrest including defibrillation, resuscitation, and artificial ventilation. Besides this basic information, which is imperative to collect, an optimal AD would include more detailed and in-depth discussion on other issues related to end-of-life decisions, including nonmedical personal decisions. Even after interventions to engage patients in preparedness planning, <50% of patients complete ADs (22). In HF, a significant opportunity exists for improving documentation of advance care plans. Current care models in advanced HF suggest that advance care planning should occur early in the disease course when an opportunity exists for clinicians, patients, and their surrogates, if chosen, to discuss end-of-life choices, followed by appropriate documentation. It is crucial that primary care physicians or cardiovascular specialists understand the patient's goals and values and participate in advance care planning by giving expert medical advice regarding the utility of interventions at the end of life for the individual patient.

We found a strikingly low rate of ADs (<17%) in patients more than 65 years of age and an even lower rate (<9%) in younger patients. Among patients cared for by cardiologists, those cared for by HF specialists had a slightly higher prevalence of advance care plans than did patients in the care of general cardiologists, although this was not statistically significant in the multivariable analysis. Overall, among all characteristics studied, those that were predictors of documented ADs included female sex, age >65 years, white race, residence in a high-income area, unmarried status, hospital length of stay >5 days, disposition to hospice, and involvement of a palliative

care consultant. Clinical risk score was not significantly associated with a documented AD after adjusting for other covariates in the group of patients with HF as either the primary or secondary admission diagnosis; however, it was significantly associated with an AD in patients with a primary-only HF admission diagnosis. This finding is plausible because this score was designed specifically to assess the risk of patients hospitalized for HF. Our sample contained a relatively large number of African-American patients, a population that has historically had low rates of documentation of advance care plan. We did find lower rates of documented advance care plans in African Americans, consistent with other studies (24,25), and this finding underscores the perpetuation of these trends and the need for more focused efforts to eliminate racial disparities in care.

Cultural differences affect several decisions that patients make and how physicians discuss treatment options with them. Considering the high proportion of African-American patients with HF seen in our center and previous data reporting lower rates of documented ADs in black patients, cultural differences may have affected the rates of documented ADs in our study. However, there are studies from different geographic areas with fewer African-American patients and from different health care systems showing low rates of documented ADs even after interventions (22). Moreover, in the multivariate analysis, race or ethnicity was not associated with prevalence of ADs in our study.

Although the proportion of documented ADs is also low in most other studies (23), in our study, that proportion is lower than in some previous studies. A possible explanation could be the different patient population, and there may be disease-specific differences that we cannot exclude. Our study had more black patients, who have lower rates of ADs, as reported previously.

With increased community and clinical provider awareness regarding advance care planning, it is not surprising that from 2008 to 2013 there was an increase in AD documentation, although the trend is modest, and most patients remain without documented ADs in the medical records.

Perhaps not surprisingly, patients who had ADs more often had a do-not-resuscitate order entered by the physician. Resuscitation is only one aspect of most advance care planning documents and should not be used as a proxy for implying that comprehensive advance care planning that assists providers with defining the goals of care when the patient faces a terminal phase of illness is occurring.

TABLE 3 Predictors of Documentation of Advance Directives

	Heart Failure as Either Primary or Secondary Admission Diagnosis (n = 23,034)		Heart Failure as Primary Admission Diagnosis (n = 3,455)	
	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Year (1-yr increase)	1.05	1.02-1.08	1.08	0.99-1.18
Age (≥65 vs. <65 yrs)	1.58	1.41-1.77	1.27	0.93-1.72
Race				
White	–			
Black	0.46	0.42-0.51	0.41	0.31-0.54
Other	0.36	0.24-0.54	0.31	0.10-0.93
Sex (female vs. male)	1.19	1.10-1.30	1.31	1.04-1.66
Insurance				
Medicare	–			
Medicaid	0.75	0.61-0.92	0.89	0.56-1.44
Commercial	0.96	0.84-1.10	0.81	0.56-1.18
Other	0.73	0.57-0.93	0.63	0.33-1.19
Income quartile				
1st (lowest)	0.68	0.59-0.79	0.55	0.37-0.81
2nd	0.67	0.59-0.76	0.54	0.37-0.77
3rd	0.79	0.71-0.87	0.79	0.60-1.04
4th (highest)	–			
Marital status (married or life partner vs. other)	0.96	0.93-0.99	0.98	0.89-1.08
Risk level				
Low	–			
Intermediate	1.04	0.81-1.26	1.45	1.13-1.86
High	1.01	0.96-1.14	1.15	0.66-2.03
Length of stay (≥5 days vs. <5 days)	1.35	1.23-1.47	1.18	0.93-1.51
Discharged dead (yes vs. no)	1.10	0.94-1.28	1.22	0.78-1.92
Discharged to hospice (yes vs. no)	1.30	1.11-1.53	1.43	0.93-2.18
Primary diagnosis of heart failure (yes vs. no)	0.92	0.81-1.04	N/A	N/A
Do-not-resuscitate vs. no do-not-resuscitate	1.87	1.65-2.12	1.77	1.27-2.48
Palliative care consult (yes vs. no)	1.47	1.28-1.68	1.94	1.37-2.75
Attending physician specialty (ref. other)				
Other	–			
Cardiology	0.63	0.56-0.72	0.50	0.36-0.68
Heart failure	0.95	0.81-1.12	0.70	0.53-0.94
Number of hospitalizations over study period				
1	–			
2-3	1.67	1.51-1.83	2.13	1.63-2.78
4+	2.53	2.23-2.87	2.64	1.91-3.64

It is possible that some of the patients in this study had an advance care plan that was not scanned into our electronic health records. However, considering the complexity of these patients and the number of providers who care for them, a verbal advance care plan not complemented by a documented AD in the medical record represents suboptimal care patterns and provides opportunities for improvement. Similarly, a few patients may have had documented advance care planning discussions written in 1 or

more of the daily clinical progress notes based on providers' communication with the patients or surrogates. However, although such discussions are invaluable and critical in the interpretation of any AD, formal ADs are legal documents that are durable and portable, and they provide the opportunity to name a legally authorized surrogate decision maker. We therefore defined a documented AD as the standard outcome for our study. Also, considering the many providers take care of these patients and there are care transitions that occur, advance care planning discussions alone may not be optimal unless records of these discussions are located in a specific, recognized, and expected place in the electronic medical record.

STUDY LIMITATIONS. These data represent a single, academic health care system and may not be applicable to other institutions or community hospitals. However, considering that this tertiary care referral center tends to have many ongoing quality improvement initiatives, inpatient and outpatient palliative care services, and a team of researchers interested in advance care planning, documentation of ADs is likely to be more infrequent in other settings. Our results of low rates of documented ADs are confirmed by other studies conducted in different health care systems in different geographic areas. This finding underscores the fact that the absence of ADs may be a problem across different health care settings. We identified eligible patients through International Classification of Diseases codes, and the diagnosis of HF was not verified on a case-by-case basis. Nevertheless, considering that large sample size and the fact that International Classification of Diseases codes have been proven fairly accurate for capturing patients

with HF in previous publications, this is unlikely to have affected the results on a large scale (26). Finally, we cannot exclude selection bias toward sicker patients considering the academic tertiary institution from which these data were derived. However, we have included patients with HF regardless of provider specialty, an approach that should have resulted in a broader population of patients with HF. Even if such bias were present, one would expect higher rates of ADs in this population; therefore the frequency of ADs is probably even lower in community settings.

CONCLUSIONS

We found a very low rate of documented ADs in the medical records of patients with HF who were hospitalized for worsening HF symptoms or other comorbidities. Despite modest improvement over time, most patients remained without an AD in the medical records. This large, practice-based, real-life experience over a long period of time is in sharp contradiction to the acknowledged importance of advance care planning for patients with HF in both cardiovascular practice guidelines (11) and palliative care guidelines (27). These data underscore the significant opportunities to improve care for this vulnerable group of patients in accordance with their wishes and call for a concentrated and systematic effort to improve on the current trends.

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APPENDIX For supplemental tables, please see the online version of this article.



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