Do Physicians' Attitudes toward Implantable Cardioverter Defibrillator Therapy Vary by Patient Age, Gender, or Race?

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Background: Implantable cardioverter defibrillator (ICD) therapy improves survival of patients with systolic heart failure. We assessed whether physicians' recommendation for ICD therapy varies as a function of patient age, gender, race, and physician's specialty.

Methods: We surveyed a random sample (n = 9969) of U.S. physicians who are active members of the American College of Cardiology (ACC). We asked participants about their likelihood to recommend ICD therapy in 4 clinical scenarios that randomly varied patient age, gender, race, and ICD indication (guideline Class I, Class IIa, Class III, and Class I in a noncompliant patient).

Results: Responses were received from 1210 physicians (response rate 12%), of whom 1127 met the study inclusion criteria. Responders and nonresponders had similar demographics. In responding to hypothetical clinical scenarios, physicians were less likely to recommend an ICD to older patients (≥ 80 vs 50 years) ($P < 0.01$) but were unaffected by gender or race for all class indications. Compared with nonelectrophysiologists (EPs), EPs were significantly more likely to recommend an ICD for a Class I indication (92.4% vs 81.4%; $P < 0.01$), but they were not more likely to offer an ICD for a Class III indication (0.4% vs 0.6%; $P = 0.95$).

Conclusions: Based on survey responses, physicians were equally willing to offer an ICD to men and women and to whites and blacks, but were less likely to offer an ICD to an older patient even when indicated by practice guidelines. Electrophysiologists (EPs) more often adhered to practice guideline recommendations on ICD therapy compared with non-EPs.

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Implantable cardioverter defibrillator (ICD) therapy improves the survival of patients with sys-

tolic heart failure (HF).^{1–5} Based on robust evidence from randomized clinical trials, in 2008, the

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American College of Cardiology (ACC) and the American Heart Association (AHA) designated ICD therapy as a Class I indication in patients with significant systolic dysfunction.⁶ Despite these guidelines, ICD therapy is underutilized in many potentially eligible patients.^{7,8} In an analysis of the AHA Get With The Guidelines-Heart Failure (GWTG-HF) database, only 35% of all patients having a Class I indication for a primary prevention ICD either had an ICD or were planned for ICD implantation.⁸

Racial and gender disparities in the use of ICD therapy have been reported in various patient populations including patients enrolled in the AHA GWTG-HF as well as patients in the Medicare Claims database.^{8,9} Various reasons have been proposed for the underutilization of ICD therapy and the observed disparities in its use.¹⁰ Several of these reasons have been attributed to physicians.¹⁰ We sought to assess physicians' attitudes toward ICDs and to examine the association of the physician's specialty with adherence to practice guidelines on ICD therapy.

METHODS

Survey Development

To conduct this study, a joint research effort was established between the ACC, Duke's Center for Education and Research on Therapeutics (CERTs), and the University of Colorado. The survey was developed by the investigators with guidance from a Racial and Ethnic Disparities in Care Survey developed by the Research AND Development (RAND) corporation as well as through expert review and pilot testing to assure clarity and content validity.¹¹ The survey was approved by the institutional review board at Duke University Medical Center and the University of Colorado before its inception.

Survey Sample

We surveyed a random sample ($n = 9969$) of U.S. physicians who are active members of the ACC. A total of 1210 members completed the survey (response rate of 12%). Categorization of specialty was based on the participant's response to the following question: "What is your cardiovascular subspecialty?" If the answer to this question was missing, we used data from the ACC's membership database. Respondents were excluded from the analysis if their specialty could not be ascer-

tained either from their responses to the questionnaire or the ACC's membership database ($n = 9$). We also excluded respondents who could not be confirmed as physicians ($n = 20$); physicians who are not expected, based on their specialty, to make a recommendation about an ICD in clinical practice ($n = 4$); and pediatric practitioners ($n = 50$).

Survey Design and Administration

A copy of the survey appears in the Appendix. We included questions on the respondent's demographics, medical specialty and certification, type and duration of clinical practice, and the number of ICD implants and referrals over the past 12 months. We presented 4 clinical scenarios asking respondents for their recommendation regarding an ICD: scenario 1 in which the ICD is clearly recommended (Class I) by current practice guidelines; scenario 2 in which the ICD is clearly not recommended (Class III); scenario 3 in which the ICD is reasonable but not clearly indicated (Class IIa); and scenario 4 in which the ICD is recommended by guidelines (Class I), but the patient in the scenario was previously noncompliant with recommended medical therapy. In these scenarios, we randomly varied the gender, race (white or black), and age (50 or 80 years) of the patient for the different respondents. Randomization codes were generated for each scenario according to a balanced $2 \times 2 \times 2$ factorial permuted block design. This scheme ensured an equal number of male and female, black and white, and young and older patients within each block of 8 survey respondents. This approach was implemented independently for each of the first 3 scenarios. For scenario 4 (class I indication with history of noncompliance), the patient's demographic characteristics were assigned the same values that were randomly generated for scenario 1 (class I indication without history of noncompliance). Thus, each respondent provided recommendations for 2 scenarios that were identical (same demographic and clinical characteristics) except for a history or no history of medication noncompliance. To minimize the potential effect of question order, the order of the presentation of the 4 scenarios was randomized for each respondent.

We then presented a hypothetical scenario of a 60-year-old patient having a Class I indication for an ICD and asked the respondents how much more or less likely they would be to recommend an ICD if the original scenario was modified by changing

the type of cardiomyopathy, the patient's life expectancy, frailty, or age. We asked the respondents about their thoughts on the ICD's effect on survival and quality of life and its cost. Finally, we asked respondents about the extent that certain factors affect their recommendations regarding primary prevention ICDs including guideline recommendations, cost to patients and society, reimbursement, the patient's functional status and comorbidities, and adherence to previously prescribed medical therapy.

An electronic message about the survey was sent to the target sample at the end of July 2009 and 3 electronic messages were sent over the subsequent 6 weeks as reminders to nonrespondents.

Statistical Analysis

Physician characteristics and responses were compared for electrophysiologists (EPs) versus non-EPs using a general association chi square statistic for nominal and dichotomous categorical variables and a 1-df chi square statistic for ordinal categorical variables. Percentages presented in the article are of the entire population, were based on unweighted data, and were not adjusted to reflect the characteristics of nonrespondents.

Response categories for clinical scenarios were (1) strongly recommend, (2) recommend, (3) undecided, (4) do not recommend, and (5) strongly do not recommend. To simplify presentation, categories 1 and 2 were collapsed into a single category (recommend ICD) and categories 4 and 5 were collapsed into a single category (do not recommend ICD; excluding undecided). We then reported the proportion of respondents who would recommend an ICD in the class I and IIa scenarios and the proportion who would not recommend an ICD in the class III scenario. A similar collapsing approach was used for other Likert-type response categories. A respondent was considered to "agree" with a statement if the survey response was "agree" or "strongly agree"; and was considered to be "more likely" to recommend an ICD if the survey response was "a little more likely" or "a lot more likely."

The percentage of physicians recommending ICD implantation in clinical scenarios was analyzed as a function of the patient's gender, race, and age. P-values for the association between patient factors and ICD recommendation were based on 1-df chi square statistics and were calculated us-

ing the original uncategorized response categories. In order to assess the effect of medication non-compliance on willingness to recommend an ICD, the proportion of physicians recommending ICD implantation for scenario 1 was compared with the proportion recommending it for scenario 4. Since each physician responded to both scenarios, we used McNemar's test for paired binary responses.

Data were highly complete with most questions answered by >99% of respondents. An exception was the respondent's race, which was answered by 94.6% of respondents. These rare instances of missing data were excluded from the denominator when calculating statistical tests and percentages.

RESULTS

Characteristics of Survey Sample

A total of 1127 respondents met our inclusion criteria. As shown in Table 1, respondents were similar to nonrespondents in demographics, but the 2 groups had statistically significant differences in the type of practice setting and the distribution of board certification. The characteristics of the respondents are presented in Table 2. A majority of respondents (77.9%) were non-EPs, 89.3% were men, and 75.6% were white. Over two-thirds of the respondents (68.3%) had been in practice for more than 10 years, 72.8% had referred between 1 and 50 patients for ICD implantation in the past 12 months, and 66.1% had not implanted an ICD within the past 12 months.

Responses to the Scenarios and Effect of Age, Gender, and Race on Responses

Data on whether or not a respondent would recommend an ICD for the different clinical scenarios are presented in Table 3. In the entire respondent sample, the majority recommended an ICD for scenario 1 (Class I indication) (83.8%), scenario 3 (Class IIa) (61.0%), and scenario 4 (Class I indication in a noncompliant patient) (64.7%) and did not recommend an ICD for scenario 2 (Class III) (98.4%). Responses to all scenarios did not differ significantly by patient age, gender, and race. Physicians recommended an ICD equally regardless of gender or race in all the scenarios. Physicians were significantly more likely to recommend an ICD to patients who are 50 years of age than to patients 80 years of age for Class I and

Table 1. Characteristics of Respondents and Nonrespondents*

	Respondents (n = 1210)	Nonrespondents (n = 8759)	P
Region			0.65
East North Central	14.1%	15.4%	
East South Central	4.9%	5.3%	
Middle Atlantic	20.4%	18.9%	
Mountain	5.5%	5.0%	
New England	8.0%	7.3%	
Pacific	11.7%	12.4%	
South Atlantic	20.0%	20.2%	
West North Central	7.0%	6.2%	
West South Central	8.4%	9.1%	
Female	11.3%	10.3%	0.27
Practice Setting			<0.0001
Academic	32.0%	21.4%	
Government	2.7%	2.1%	
Other: (solo, group, private, HMO)	65.2%	76.5%	
Board Certification			<0.0001
Electrophysiology	12.3%	4.3%	
General cardiology	54.1%	53.1%	
Pediatric cardiology	4.9%	4.8%	
All others	28.7%	37.8%	

*According to demographic variables collected by the American College of Cardiology. Values presented are percentages, unless otherwise indicated. HMO = Health Maintenance Organization.

IIa indications, but they were equally likely not to recommend an ICD to both age groups for a Class III indication. Physicians were significantly more likely to recommend an ICD for a class I indication if the patient has no history of medication noncompliance.

Responses to the Hypothetical Scenario

For the original scenario of a 60-year-old patient with ischemic cardiomyopathy and a Class I indication for an ICD, 98.2% of the respondents said they would recommend an ICD. Upon modifying the scenario, 83.1% of the respondents were equally likely to recommend an ICD for nonischemic cardiomyopathy, 93.2% were less likely to recommend an ICD for a patient whose life expectancy is less than a year, 70.4% were less likely to recommend an ICD if the patient is frail, and 62.6% were less likely to recommend an ICD if the patient is 80 rather than 60 years of age. A vast majority (96.7%) of the respondents were equally likely to recommend an ICD if the patient is a female. Among all respondents, 86.2% agree that an ICD will make the patient in the original scenario live longer, 7.5% indicate that an ICD will improve the patient's quality of life, 11.2% state that the

ICD will decrease the patient's quality of life, and 61.2% feel obligated to recommend an ICD to all patients who meet the guidelines. Financial factors that affect the decision to offer an ICD to a patient include the cost of ICD implantation to the patient (56.1%), the cost of ICD implantation to society (47.1%), and reimbursement from the patient's insurance company or other payer (23.8%). Clinical factors that affect the respondents' likelihood of offering an ICD to a patient include the patient's functional status (90.8%), HF symptoms (80.4%), comorbidities (95.9%), and adherence to previous medical therapy (77.2%).

Physician's Specialty and Adherence to Practice Guidelines

Compared with non-EPs, EPs were significantly more likely to recommend an ICD for a Class I indication (92.4% vs 81.4%; $P < 0.01$) and a Class I indication in a noncompliant patient (73.9% vs 62.0%; $P < 0.01$). EPs were not significantly more likely to recommend an ICD for a Class III indication (0.4% vs 0.6%; $P = 0.95$) and a Class IIa indication (66.3% vs 59.5%; $P = 0.11$). These data are displayed in Figure 1.

Table 2. Baseline Characteristics of Survey Respondents

Characteristic	All Respondents (n = 1127)	Non-EP Cardiologists (n = 878)	EPs (n = 249)	P*
Male	1006 (89.3)	785 (89.4)	221 (88.8)	0.77
Race				0.75
White	806 (75.6)	637 (76.4)	169 (72.8)	
Asian	219 (20.5)	167 (20.0)	52 (22.4)	
Other	41 (3.6)	30 (3.4)	11 (4.4)	
NASPEXAM or IBHRE certified	133 (11.8)	60 (6.8)	73 (29.3)	<0.01
Years in practice				<0.01
None	15 (1.3)	10 (1.1)	5 (2.0)	
≤10	342 (30.4)	235 (26.8)	107 (43.0)	
11–20	312 (27.7)	239 (27.2)	73 (29.3)	
21–30	291 (25.8)	241 (27.5)	50 (20.1)	
31–40	131 (11.6)	120 (13.7)	11 (4.4)	
≥40	36 (3.2)	33 (3.8)	3 (1.2)	
No. referred for ICD in past year				<0.01
0	110 (9.8)	39 (4.4)	71 (28.5)	
1–21	589 (52.3)	551 (62.8)	38 (15.3)	
22–50	232 (20.6)	191 (21.8)	41 (16.5)	
51–100	113 (10.0)	70 (8.0)	43 (17.3)	
>100	83 (7.4)	27 (3.1)	56 (22.5)	
No. of ICDs implanted in past year				<0.01
0	744 (66.1)	730 (83.2)	14 (5.6)	
1–21	87 (7.7)	72 (8.2)	15 (6.0)	
22–50	87 (7.7)	39 (4.5)	48 (19.3)	
51–100	91 (8.1)	17 (1.9)	74 (29.7)	
>100	117 (10.4)	19 (2.2)	98 (39.4)	

*P values are for comparisons between EPs and non-EP cardiologists.

Variables are presented as number (%), unless otherwise indicated. EPs = electrophysiologists; NASPEXAM = North American Society of Pacing Examination; IBHRE = International Board of Heart Rhythm Examiners.

DISCUSSION

Of the many reasons that have been proposed for the underutilization of ICD therapy and the demographic disparities in its use, several have been attributed to physicians' attitudes toward this

therapy.¹⁰ However, based on their responses to our survey, the vast majority of physicians would recommend an ICD to patients with a Class I indication for this therapy, and their recommendation would not differ based on the gender or race of the patient. Although gender and racial

Table 3. Responses to the Clinical Scenarios by Patient Age, Gender, and Race

Scenario and Guideline Recommendation	White	Black	P	Male	Female	P	50 yrs of age	80 yrs of age	P
Scenario 1 (Class I indication): Recommend ICD	83.6	84.1	0.62	83.9	83.8	0.39	93.7	74.1	<0.01
Scenario 2 (Class III indication): Do not recommend ICD	98.3	98.5	0.30	98.5	93.3	0.91	98.6	98.1	0.45
Scenario 3 (Class IIa indication): Recommend ICD	58.4	63.7	0.36	60.9	61.1	0.60	72.6	49.8	<0.01
Scenario 4 (Class I indication in noncompliant patient): Recommend ICD in noncompliant patient	63.4	65.9	0.57	62.1	67.3	0.19	76.0	53.4	<0.01

Values presented are percentages, unless otherwise indicated.

Figure 1. Percentage of respondents making an appropriate recommendation regarding ICD therapy.

disparities in ICD use have been observed repeatedly in different patient populations, our results suggest that these disparities are not motivated by physicians' biases.^{7-9,12-14} Other reasons for these disparities include patient preferences that may be influenced by age, gender, and race; unequal access to specialty care by different age, gender, and racial groups; and referral bias by the primary care physicians.

Although in our study physicians were significantly less likely to offer an ICD to hypothetical patients who were 80 years old versus 50 years old, the significance of this finding is uncertain due to the paucity of data on the efficacy and safety of ICD therapy in older patients. Not only was the median age of patients enrolled in the major clinical trials of primary prevention ICD therapy below 65 years, but due to competing risks for death and the potential for a higher risk of complications in older patients, such patients may not benefit from ICD therapy. However, this is not supported by the findings of 1 study that examined the clinical effectiveness of ICD therapy among elderly Medicare beneficiaries after discharge from a HF hospitalization. In that study, patients with an incident ICD had 29% lower relative risk of mortality over 3 years compared with eligible patients without an ICD after adjustment for the probability of treatment, other prognostic variables, and other medical treatment.¹⁵ Finally, it is noteworthy that age is associated with a higher frequency of comorbidities that may impact clinical decisions regarding an ICD. Therefore, future surveys should vary the description of older patients by functional

status and comorbidities to determine whether any observed lower guideline compliance is related to age alone or to the associated comorbidities and reduced functional class of an older patient.

Our study also provides data on nondemographic factors that may influence a physician's decision to recommend an ICD. A majority of respondents were less likely to recommend an ICD for a patient whose life expectancy is less than a year. This is in line with the practice guidelines that mandate a life expectancy of >1 year for a patient to be eligible for an ICD. In making a recommendation for an ICD, physicians reported that they consider the patient's functional status, frailty, HF symptoms, comorbidities, and adherence to previous medical therapy. None of these factors are surprising as poor functional status, frailty, advanced HF symptoms, significant comorbidities, and nonadherence to previous medical therapy may either increase the risk of complications from ICD implantation or lower the potential of benefit from ICD therapy.¹⁶

Our study found that in making a recommendation about ICD therapy in 4 hypothetical clinical scenarios, EPs were more likely than non-EPs to adhere to practice guidelines. EPs were significantly more likely to offer an ICD to patients with a Class I indication for an ICD, but they were not significantly more likely to offer an ICD to patients with a Class IIa or a Class III indication. One possible explanation for this finding is that EPs have better knowledge of the guidelines on ICD therapy and the data that support them. However, in our study, we could not verify that the physicians' clinical practice reflects their responses to our survey.

Future studies should investigate reasons for lack of adherence to practice guidelines especially among non-EPs. That specialized cardiologists adhere better to guidelines than general cardiologists has not been reported previously. Future studies should examine adherence to guidelines by specialty.

Some limitations should be considered in interpreting the results of our survey. First, the response rate to our survey is low. Thus, our results may only be applicable to a biased subset of currently practicing cardiologists; specifically, ACC members who are responsive to a research survey. However, in absolute terms, this is the largest survey of physicians' attitudes toward ICD therapy, to our knowledge. It is also worth noting the possibility that nonrespondents did not respond due to lack of confidence in their knowledge of the topic, thus, they may have performed differently. Therefore, our results may portray a best-case scenario. Second, by targeting ACC members, we may have selected a more guideline-driven group of physicians. Indeed, a majority of respondents to our survey said they feel obligated to recommend an ICD to all patients who meet the guidelines. This also may limit the generalizability of our findings to other physicians. Third, an appreciable difference may exist between what physicians say they do and what they actually do in their clinical practice. While this difference, which has been observed in other studies, may be due to a conscious attempt by the physicians to give the right answers, it is possible that subconscious factors and biases influence physicians' decision about an ICD and play a role during a physician-patient clinical encounter. Finally, studies showing gender and racial disparities in ICD use predate our analysis by at least a couple of years. Thus, it is conceivable that adherence to guidelines may have improved. Future studies should examine temporal trends in ICD use by gender, race, and other important factors.

Conclusion

In conclusion, based on their responses to our survey, physicians were not less willing to offer an ICD to women or black patients but were significantly less likely to offer an ICD to older patients. This disparity may be driven by the lack of definitive data on the effectiveness of ICD therapy in older patients, although emerging data

suggest that ICDs may be beneficial in such patients. EPs more often adhered to practice guideline recommendations on ICD therapy compared with non-EPs. Given our low response rate, future studies need to investigate whether our results can be generalized to a broader group of cardiologists.

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