

A Heart Rhythm Society Electrophysiology Workforce Study: Current survey analysis of physician workforce trends

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BACKGROUND Recent economic trends influenced by health-care reform, an aging population, changes in physician reimbursement, and increasing competition will have a significant impact on the electrophysiology workforce. Therefore, there is an important need to obtain information about the EP workforce to assess training of arrhythmic healthcare providers in order to meet the requisite societal need. This report summarizes the data collected by the HRS Workforce Study Task Force in relation to physician workforce issues.

OBJECTIVE The HRS Workforce Study Task Force was charged with conducting a comprehensive study to assess changes in the field of electrophysiology since the last workforce study conducted in 2001 and to identify the population and distribution of professionals who treat patients with heart rhythm disorders.

METHODS A series of comprehensive questionnaires were designed by the HRS Workforce Study Task Force to conduct online surveys with physicians, basic science researchers, and allied professionals. Data collected in the physician survey included: personal demographics and professional profile characteristics such as primary work setting and areas of affiliation; workload characteristics such as hours worked, time spent by activity, workload relative to capacity, competition for patients, volume by specific procedure, sources of referrals, income levels, personal mobility, and anticipated future changes in the respondent's practice. Survey responses were collated and analyzed by the Workforce Study Task Force.

RESULTS Work capacity is expected to increase to offset some of the economic drivers; however, recruitment of new EPs could be challenging and uncertain. Specifically, geographic mobility (>50 miles) appears to be minimal at present overall and

unlikely to significantly change for the majority of physicians once they have established themselves in a given community following the completion of their training. Practice time is predominantly spent performing device implantations, device follow-ups and ablations. These activities are being tasked upon younger physicians, thereby suggesting a need for trained allied professionals to assume a greater role in device management. The perception of competition varied by respondent age and geographic location but, in general, was felt to be at least moderate by most respondents. Furthermore, there are concerns that increasing competition may dilute operator experience and potentially lower high quality outcomes if increasing competition leads to lower procedural volumes.

CONCLUSION Based on findings from this study, the task force identified specific workforce (supply) trends and the key drivers of current and future challenges. Although specific areas will require further analysis, overall, the current EP workforce is stable, with the exception of geographic dispersion. However, the workforce must adapt to the key economic drivers (demand) and address future recruitment challenges.

KEYWORDS Workforce; Workforce trends; Clinical cardiac electrophysiology; Time; Capacity; Mobility; Procedures; Competition; Survey

ABBREVIATIONS EP = electrophysiology/electrophysiologist; HRS = Heart Rhythm Society; IBHRE = International Board of Heart Rhythm Examiners (formerly NASPEXAM); ICD = implantable cardioverter defibrillator; non-EP = affiliations other than clinical electrophysiology

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Introduction

The changes in patient demographics, the evolution of healthcare delivery in response to healthcare reform, the increased use of new and sophisticated technologies to treat patients with heart rhythm disorders, and the development of quality initiatives to improve clinical outcomes will undoubtedly impact the number and type of professionals who treat patients with heart rhythm disorders

and those who are needed to provide the required services.

The Heart Rhythm Society Executive Committee, as a result of the 2008 strategic planning initiative, affirmed the urgent need to assess changes in the workforce, issues affecting professionals who treat patients with heart rhythm disorders, and to identify the population and distribution of these individuals. A workforce study was previously con-

ducted in 2001; however, the changes and advances in this scientific field justified an up-to-date assessment. In 2001, the HRS (formerly NASPE) workforce study focused on density and geographic dispersion of EPs to assess the current and future supply and demand. This 2009 study addresses more comprehensive measures and includes physicians, allied professionals, and basic scientists. This executive summary focuses on the physician survey; data on the other groups are available online at www.HRSonline.org.

Methods

The HRS Workforce Task Force was formed to work on behalf of the HRS Executive Committee. The Task Force reviewed previous research conducted by HRS including the 2007–2008 Strategic Planning Initiative (SPI) surveys¹ and the 2001–2002 workforce study,² roster data from the HRS central database,³ and a literature review of studies and/or guidelines conducted by other associations.⁴

Based on this review and the development of an outline of key research objectives, the task force designed a comprehensive questionnaire and administered it online from April 23 to May 18, 2009, to a group of 2,423 physician members of HRS and 4,598 physician non-members (randomly selected from the HRS IMIS central database³) in the United States and Canada. An invitation, several reminder messages to non-respondents, and personal distribution in select venues at the HRS 2009 Annual Scientific Sessions were employed to maximize participation. The compiled, confidential survey responses were then analyzed by the writing group.

Each of the subheadings in this report follows a consistent pattern and begins with a brief discussion of the issue to be addressed within that section. The discussion following each subheading includes a data summary of the results, with emphasis on key concerns or issues. The conclusion section highlights potential implications of the data, limitations of the data, and issues that may warrant additional study in the future.

Results

Respondent Characteristics

A total of 695 physicians (9.9% of those surveyed) from the United States and Canada responded to the survey. The final results are statistically significant, with a 95% confidence level, confidence intervals of $\pm 3.7\%$ for questions with a 50% response rate (sampling error varies by sample size and according to the specific finding: questions with smaller proportions indicating a specific response have broader confidence intervals, and questions with higher proportions indicating a specific response have narrower confidence intervals).

Geographically, 166 (31%) of the physician respondents were from the South, 144 (27%) from the Midwest, 117 (22%) from the Northeast, 91 (17%) from the West, and 16 (3%) from Canada (161 did not indicate geographic location). Based on the Heart Rhythm Society IMIS database and US Census Bureau, the calculated national US average population per EP was 127,500, with certain states (PA, NJ,

MN, OH, UT, MA, ME, VT) having higher ratios of EP distribution (<100,000 people per EP) and other states (WY, ID, ND, SD, NM, MT, SC, MS, NV, HI, and AK) having lower ratios of EP distribution (>175,000 people per EP).^{3,5}

The median age of the physician respondents was 50.0 years. Of the 365 respondents, who indicated their age group, 11 (3%) are 31–35 years, 87 (24%) are 36–45 years, 166 (45%) are 46–55 years, 79 (22%) are 56–65, and 22 (6%) are >65 years. The self-identified work settings of the respondents (multiple selections permitted) were evenly split between academic settings [university (33%), medical school (20%), other academic institutions (12%)] and non-academic settings [group private practice settings (37%), multi-specialty practices (9%), solo private practice (6%)]. Based on the aggregate of all physicians invited to participate in the survey (n = 7,118), 19% work in academic settings and 53% work in non-academic settings (the remaining 28% did not designate their work setting). The survey respondents include a greater representation of physicians in academic work settings than observed in the aggregate sample (n = 7,118) of physicians in the U.S. and Canada.³

A significant proportion of the respondents were board certified in clinical cardiac electrophysiology (CCEP; 66%), while fewer held International Board of Heart Rhythm Examiners (IBHRE/NASPE_xAM) accreditation (30%), or were credentialed for ICD implant by the HRS alternative pathway program (16%). Moreover, 13% were both CCEP and IBHRE/NASPE_xAM certified. In addition, 87% of respondents were board certified in cardiovascular disease, 77% were board certified in internal medicine, and fewer than 10% held pediatric or interventional cardiology subspecialty training. In the data presented, EP physicians were defined as those respondents that selected clinical electrophysiology. All other affiliations were considered non-EP.

The response rate is lower than most academic surveys,⁶ and is a limitation of this study. However, despite the 19.9% response rate among HRS members, the lower response rate of 4.6% among non-member physicians depressed the average response rate. The respondent characteristics are similar to that of HRS physician members (73% CCEP, 34% IBHRE, 48 median age, 2.4% Canada, 24% Midwest, 27% Northeast, 28% South, 18% West),³ with exception to work environment (23% academic, 70% non-academic among HRS EP members).³ A comparison of the aggregate characteristics of actual respondents with the aggregate characteristics of individuals who were invited to participate suggests that the results are relatively unbiased and fully representative of heart rhythm physicians.

I. Work Capacity

Based on a broader clinical acceptance of more time-consuming interventional electrophysiology procedures and an expanding proportion of older Americans, potentially in need of those services, there is a need to assess the currently perceived workforce capacity of clinical electrophysiology specialists as well as the nature of their workload.

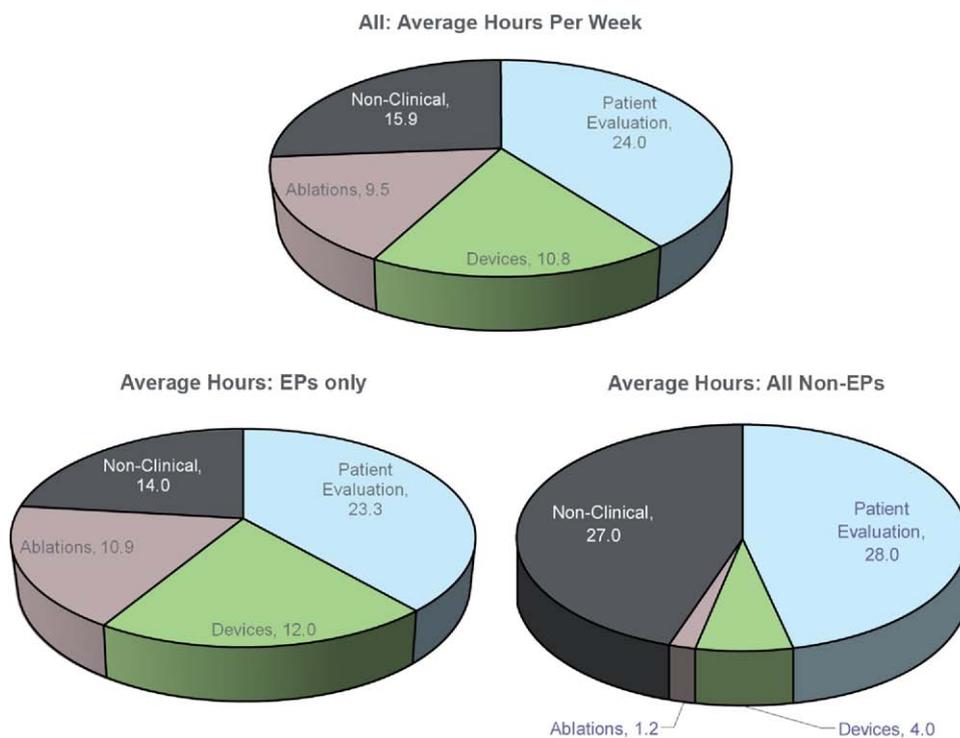


Figure 1 Breakdown of total work hours. N = 695 total respondents. N = 568 EP/124 non-EP (difference = non-response to question).

Data Summary

Work Hours (Figure 1)

The median work week for physician respondents was 60 hours, with 41% of physicians working 50–60 hours per week and 29% working 61–75 hours per week. There was no significant difference in work hours based on a physician’s credentials, demographics or geographic location. Age was only a differentiator for people older than 65 who have trimmed their hours to 40–50 hours per week. For every respondent age-range queried, the volume of work over the next five years was expected to increase. Of respondents >60 years of age, 23% expect to retire in the next five years.

To offset these challenges, the respondents expected that the volume of emerging heart rhythm specialists would grow somewhat (53.1%) or substantially (20.6%). In the Heart Rhythm Society Strategic Planning Initiative (SPI) research 2007–2008 survey of 462 US-based electrophysiologists, a significant proportion of respondents (64%) felt they would increase their workload to offset existing economic conditions.¹

Devices Versus Ablation

Nearly equivalent numbers of physician respondents indicated that their workload was at or above their workload capacity for

devices (63.6%) and ablation procedures (60.3%). Still, slightly more than a third of respondents felt that they had the potential to expand their ability to perform device implantation (36.4%) or ablation (39.7%) procedures.

Respondents in an academic setting were more likely to report that their ablation workload was at or greater than capacity (68.0%) than those in non-academic settings (52.5%). Those in non-academic settings felt that they spent more time on device implantation and follow-up.

Approximately one quarter of physicians are highly specialized in the type of procedural work they perform with 19% spending at least 85% of their total procedural work time performing device procedures and 5% spending at least 85% of their total procedural work time performing ablations. Furthermore, approximately one-sixth are somewhat specialized spending between 70% and 85% of their procedural work time performing either device procedures or ablations. The remaining 60% are relatively diversified spending more than 30% of their time performing both device procedures and ablations (Table 1).

Implication of Findings

As a larger proportion of the population becomes Medicare eligible and there is expanded individual insurance coverage

Table 1 Breakdown of Physician’s Procedural Work Time

Classification	Criteria: MD proportion of work time	Distribution
Highly specialized	>85% in one area of procedures	24% of respondents: 5% devices, 19% ablations
Somewhat specialized	Between 70–85% in one area of procedures	16% of respondents: 8% devices, 8% ablations
Diversified	No more than 69% of time in either area of procedures	60% of respondents

due to healthcare reform, the demand for cardiac electrophysiology specialty services continues to grow. This potential procedural growth, combined with the demand to reduce total healthcare costs, uncertainty about specialist physician compensation, and an aging provider population, creates ongoing uncertainty about physician supply and distribution. In response to these political and financial pressures, physician respondents of all ages and demographics confirmed that they anticipate their work volume will increase moderately or significantly in the next five years. While the majority of respondents believed that the pool of electrophysiologists will grow somewhat or substantially, they indicated that the uncertainty surrounding physician compensation may not only limit the willingness of electrophysiologists to recruit new colleagues into their practices but also decrease the number of physicians willing to pursue careers in cardiac electrophysiology.

The increased amount of time expended performing ablation among academic physicians, compared to non-academic physicians, likely stems from the increased time needed to train new physicians, systemic processes in place (e.g., more extensive equipment capability and more sophisticated staffing, etc.) to facilitate the performance of more complicated procedures and potentially the lower reimbursement scenario existent for AF ablation and other complex ablations.

- Nearly two thirds of respondents are currently at or exceeding their perceived workload capacity for catheter ablation and device therapies. Given the current workload of today's workforce (median workweek of 60 hours), the ability of these professionals to increase workload may be overestimated by respondents.
- Most physicians anticipate that they will face an increased workload in response to several key factors, including the aging patient demographic, broader access to care resulting from the recent healthcare reform legislation, a possible expansion in the indications for CRT-D and AF ablation therapies, increasingly complex procedures with an associated longer procedural duration and an aging and thus potentially decreasing physician workforce.
- Although some capacity remains to expand work volume, an expanded workload may create a perfect storm for physician burnout, particularly if the workforce capability fails to meet the needs of the marketplace, which would need to be assessed in a future study. Moreover, the recruitment of additional electrophysiologists may be tempered by the market uncertainty associated with future physician reimbursement.
- Performing a high volume of more complex procedures is possible but may require shifting complex procedures to tertiary centers, engaging skilled ancillary personnel, incurring expenses for sophisticated equipment, and involving physicians with extensive experience.

II. Device Procedures Work Analysis

The range of procedures included in the practice of clinical electrophysiology has expanded over the last decade. At

present, most hospitals that perform a significant volume of advanced interventional procedures are able, or plan to be able, to safely provide complex device implantations and lead extractions to their patients. Smaller hospitals are expanding to provide more routine electrophysiology procedures as well. There is a need to assess the current implantation volume among electrophysiology specialists and other implanting physicians, given the perception among electrophysiologists of device implantation as an important professional activity.

Data Summary

The respondents indicated that the total number of implantation procedures they performed each year compared to five years ago had increased substantially (26.1%), somewhat (29.3%), or were about the same (29.0%). The follow-up of implanted devices was numerically the largest activity reported (48.6% reported performing more than 200 annually).

The median proportion of time per respondent (Figure 1) spent on device procedures is 18% (EP: 20.0%; non-EP: 7.0%). Given the median 60 hours spent weekly on all professional activities, device procedures account for approximately 10.8 hours of a typical physician respondent's work week (EP: 12.0 hours; non-EP: 4.0 hours).

Pacemaker and ICD implantations are performed equally by physician respondents of all ages. Of the total respondents performing implant procedures, only 16.4% who implant pacemakers and 10.2% who implant ICDs are high volume (>101 annually) implanters. Implantation (>25 annually) of CRT devices is more common among young or mid-career physicians (46.3% at <45 years of age; Table 2). High-volume CRT implanters (>101 annually) are very rare (total: 2.3%; EP: 2.7%; non-EP: 0%). Physicians in non-academic practice settings were more likely to report high device implantation volumes of all types than those in academic settings (Table 3). The combined volume of im-

Table 2 Annual Procedure Volume–Age Breakdown

	None	1–50	51–100	101–200	>200
Pacemaker Age					
31–35	13%	38%	38%	13%	0%
36–45	3%	54%	28%	15%	0%
46–55	8%	43%	30%	17%	2%
56–65	18%	45%	23%	13%	0%
>65	55%	9%	36%	0%	0%
ICD Age					
31–35	13%	50%	25%	13%	0%
36–45	2%	62%	26%	8%	2%
46–55	10%	42%	32%	14%	2%
56–65	22%	47%	27%	5%	0%
>65	64%	9%	27%	0%	0%
CRT-D Age					
31–35	13%	50%	38%	0%	0%
36–45	11%	72%	15%	0%	2%
46–55	11%	71%	13%	3%	2%
56–65	33%	63%	3%	0%	0%
>65	64%	36%	0%	0%	0%

Table 3 Annual Device Procedure Volume—Academic v. Non-Academic Setting

	Academic (%)	Non-Academic Practice (%)
Pacemaker		
None	16%	4%
1–25	30%	16%
26–50	29%	17%
51–100	17%	38%
101–200	8%	21%
>200		4%
ICD		
None	19%	6%
1–25	30%	14%
26–50	26%	24%
51–100	19%	41%
101–200	4%	13%
>200	1%	2%
CRT-D		
None	25%	9%
1–25	46%	35%
26–50	20%	33%
51–100	7%	20%
101–200	1%	2%
>200	1%	1%

plantation procedures totaled 100 per year among academic respondents and 180 among non-academic respondents. High volume lead extraction (>25 annually) is performed by only a small minority (9.8%) of respondents (1–25: 41.2%). Among academic respondents, 34.8% perform between 1–25 extractions and an additional 11.5% perform greater than 25. Among non-academic respondents, 47.0% perform between 1–25 extractions and 8.4% perform greater than 25 extractions.

Implication of Findings

The follow-up of devices has generated renewed importance and scrutiny in light of recent device recalls and the increasing role of these devices in improving the treatment of patients with congestive heart failure (CHF). Although device follow-up has historically been done in the office, remote follow-up is increasing rapidly. The physician role typically involves supervision rather than direct performance. Thus, the need for larger numbers of well-trained allied professionals to help manage the increasing population of device patients is self evident. Current concerns about conflicts of interest between physicians and industry, in conjunction with increasing scrutiny of the device industry for support of educational activities, creates challenges for the training of these providers. Furthermore, there are ethical and professional considerations that impact the use of industry personnel who often provide technical expertise in the current era of increasingly complicated devices.⁷

Existing research suggests that patient-appropriate device selection and implantation outcomes are better achieved when physicians with EP certification are the implanters.⁸ However, even among board certified respondents, older physicians are

less likely to provide the full range of device services (CRT implantations and lead extractions).

- It appears that implantation of and subsequent follow-up of devices continue to constitute a significant proportion of the electrophysiologist's work week.
- Overall, device implantation accounts for a median of 19.6% of the respondent's workweek (EP: 20.0%; non-EP: 4.0%).
- Although the proportion of time devoted to device implantation, relative to other activities, has remained constant over the last five years, younger physicians are more likely to be involved with the implantation of the more sophisticated devices and are more frequently tasked with handling the complications observed among patients with implanted devices.
- The role of allied professionals, who help manage device patients, will most likely continue to increase. Therefore, meeting the educational/training of allied professionals will be important.

III. Ablation Work Analysis

The type and complexity of ablations performed in the practice of clinical electrophysiology has expanded significantly over the last decade. Similarly, just as some smaller hospitals that currently provide interventional cardiology procedures have begun to offer device implantation, many have also begun providing arrhythmia catheter ablation services. Accordingly there is a need to assess the current volume of ablation procedures among electrophysiology specialists and other physicians performing those procedures.

Data Summary

The median proportion of time each respondent spent on ablation procedures was 15.8% (EP: 18.8%; non-EP: 0.3%). Given the median 60 hours spent weekly on all professional activities, ablation procedures account for more than eleven hours of a typical respondent's work week.

Supraventricular Tachycardia (SVT)

In the previous 12 months, 76.9% of physician respondents indicated performing SVT ablation, with 15.0% reporting 1–25 SVT ablations, 25.4% reporting 26–50 SVT ablations, 24.6% reporting 51–100, 9.4% reporting 101–200 and 2.6% reporting greater than 200 ablations. Work setting (academic versus non-academic) played no discernible role in whether SVT ablation was performed (Table 4), but respondents performing more than 100 SVT ablations were more likely to be in an academic setting (academic: 14.2%; non-academic: 10%). SVT ablation became less common as the age range of respondents increased (Table 5), with 57% of respondents 45–65 years of age but only 36% of respondents 65 years of age or older performing any SVT ablation. Respondents 36–55 years of age were more likely than other age ranges to report >51 SVT ablations (62%).

Atrial Fibrillation (AF)

In the previous 12 months, 54.4% of physician respondents indicated performing atrial fibrillation (AF) ablation. 26.0%

Table 4 Annual Procedure Volume—Academic v. Non-Academic Setting

	Academic (%)	Non-Academic Practice (%)
VT Ablation		
None	29.8	37.1
1–25	62.8	59.4
26–50	6.9	3.2
51–100	0.5	0.4
AF Ablation		
None	45.0	46.2
1–25	21.6	29.9
26–50	17.9	17.1
51–100	7.8	6.0
101–200	6.4	
>200	1.4	0.8
SVT Ablation		
None	22.5	23.6
1–25	15.1	14.8
26–50	23.9	26.8
51–100	24.3	24.8
101–200	10.1	8.8
>200	4.1	1.2

reported 1–25 ablations, 17.5% reported 26–50, 6.8% reported 51–100, 3% reported 101–200 and 1.1% reported greater than 200 ablations. An academic versus non-academic work setting played no discernible role in whether AF ablation was performed (Table 4), but respondents performing more than 100 AF ablations (4.1%) were more likely to be in an academic setting (academic: 7.8%; non-academic: 0.8%). AF ablation became less common as the age range of respondents increased, with only 18% of respondents 65 years of age or older performing any AF ablation. In general, AF ablation is more likely to be performed by physicians aged 45 years or less (Table 6).

Ventricular Tachycardia (VT)

In the previous 12 months, 66.3% of physician respondents indicated performing VT ablations; 61.0% performed 1–25 VT ablations, 4.9% performed 26–50 ablations, and 0.4% performed 51–100 ablations. Academic physicians were more likely than non-academic physicians to perform VT ablation (academic: 70.2%; non-academic: 62.9%; Table 4). Older respondents were less likely to perform VT ablation (Table 7). Only half of respondents aged 56–65 reported performing VT ablation and even fewer (27%) of respondents 65 years of age or older did so.

Table 5 Annual Procedure Volume—SVT Ablation

Age	<50	51–100	>101
31–35	88%	13%	0%
36–45	48%	38%	15%
46–55	60%	24%	16%
56–65	68%	20%	12%
>65	100%	0%	0%

Table 6 Annual Procedure Volume—AF Ablation

Age	None	1–25	26–50	>51
31–35	38%	13%	38%	13%
36–45	33%	23%	25%	20%
46–55	45%	20%	23%	13%
56–65	65%	20%	7%	8%
>65	82%	9%	9%	0%

Implication of Findings

Even though ablation is performed by over three-fourths of the surveyed physicians many questions remain about the exact nature of the ablation performed and the settings in which they take place. This survey did not distinguish between the different types of SVT ablation performed other than to separate all other SVT ablations from AF. For respondents performing AF ablations, there are no additional data about the type of patients treated (e.g., paroxysmal vs. persistent vs. permanent AF) or the anatomical characteristics of those patients (e.g., left atrial (LA) size, left ventricular ejection fraction (LVEF)). A similar lack of patient information exists for patients undergoing VT ablation. In addition, the survey did not obtain any data about equipment requirements or success rates.

It is clear that a broader age range of respondents perform SVT ablation than AF or VT ablation and those physicians 65 years of age or older less commonly perform all forms of ablation. Among older physicians, the lack of formal ablation training and/or a possible conscious decision to perform fewer complex procedures as one ages may account for these differences. Practice type (Table 4) played no discernible role in whether SVT or AF ablation was performed overall, but physicians with the highest SVT or AF ablation volume (>100 annually) typically worked in an academic practice setting. Similarly, VT ablation is more commonly performed in academic centers regardless of procedure volume.

- Ablation volume is lower among older physicians, whereas AF and VT ablation are almost exclusively performed by early and mid-career physicians. It is not clear if that trend will remain as younger physicians with extensive experience age.
- High volume SVT and AF ablation, as well as most VT ablation, are performed in academic centers, and probably in other non-academic tertiary centers. Future surveys should address whether this trend continues.
- Future surveys should more completely define the specific types of ablation procedures performed, the loca-

Table 7 Annual Procedure Volume—VT Ablation

Age	None	1–25	26–50	>51
31–35	13%	88%	0%	0%
36–45	15%	70%	15%	0%
46–55	31%	64%	5%	0%
56–65	50%	48%	0%	2%

tions in which those ablations are performed, and the potential impact of these features upon the electrophysiology workforce.

IV. Mobility

Identifying the trajectory from training to retirement may elucidate where physicians practice; whether and why they change practices; and what methods may be required to target areas with service gaps.

Data Summary

Overall, 65% of physicians have made geographic changes since completion of training and only 35% of physicians practice in the state in which they were trained. The Northeast has the highest percentage (54%) of physicians who trained and currently practice in that region. In the past the two most commonly stated reasons (respondents could select up to three reasons), noted by physicians for a move of >50 miles from their current practice, were recruitment for a specific position (62%) and the personal reasons of oneself (30.6%) or those of a spouse (14.8%). Over the next five years, physicians overwhelmingly plan to stay in the same location (76%), and no more than 12% of physicians plan to relocate beyond a 50-mile radius from the location of their current practice. Of the 12% of physicians planning to relocate >50 miles, the majority (48%) are younger than 46 years (12% >46 years; 40% of respondents did not respond). Information on the respondents' practice proximity to their hometown (or those of their families), information on their inclination to remain in those locales and information about the age of their children were not collected. These may be factors with impact upon geographic mobility.

Implication of Findings

It appears that, if a physician chooses to move, the most common time for that move is immediately following training or early in the establishment of one's career. Future changes in the distribution of EPs will most likely require "change in location" decisions among younger, emerging EPs who are either completing their training or in the early stages of their career. Practices with a desire to add electrophysiology services may need to focus aggressively on recruitment efforts in order to attract these physicians. It would be useful to identify those factors, which are considered important by physicians in helping them to decide whether or not to join a practice (e.g., practice environment, hospital affiliations and relations, the availability of advanced technologies, economic compensation, support staff, etc.).

- Areas with significant EP service needs should focus on networking, negotiating, and recruiting young professionals who are more likely to move to a new location early in their careers.
- It is not clear whether physicians firmly positioned in a practice would consider relocation if economic constraints and competition in well-served locations increase

and the potential for greater economic return are more readily available in underserved areas.

- Identifying professional geographic flow patterns and the reasons for these patterns might help to define effective methods for the recruitment of physicians to underserved areas.

V. Competition

Competition leads to changes in practice patterns and referral patterns. It has also spawned the development of outreach programs by tertiary care centers to engage and/or partner with smaller community hospitals. The ability to assess the level of competition among heart rhythm specialists is vital not only to those in practice but also to those in training.

Data Summary

Most respondents (81%) are concerned with competition. In fact, of those who were concerned, 37% are noticing "a great deal" of competition and 44% are noticing "some" competition. Notably, there is no significant variation in aggregate responses based on gender, specialty, training or work setting. However, there was a difference in responses based on age. Physician respondents <35 years of age viewed competition as more prominent, with 91% seeing at least some competition; whereas only 68% of those older than 65 years of age believed competition to be moderate to severe. There are also geographic variations in perceptions of competition, with 50% of physician respondents in the Northeast reporting "a great deal" of competition in contrast to 42% in the West, 40% in the South, 37% in the Midwest, and 0% in Canada.

The flow of patients to electrophysiologists is almost exclusively felt to be controlled by referring physicians, with the majority (57%) of patient referrals generated by general cardiologists. Primary care physicians (26%) and hospitalists/emergency medicine doctors (12%) account for the remainder of referrals. Only 5% of patients are self-referred.

Implication of Findings

Data from the HRS SPI Research (2007–2008) support the findings from this 2009 survey. Respondents of SPI indicated increasing competition compared to the previous three years, and they anticipated greater competition three years from the survey date. When asked about "turf" battles at hospitals over who is qualified to implant ICD devices, respondents also anticipated greater competition in future years. In addition, 65% of the SPI respondents stated that ablations, more so than medical management or device implants, are under-accessed in the communities in which they practice. Almost half believe that a lack of education (among physicians) of cardiac arrhythmia treatment options is the reason for the lack of access to AF ablation for appropriate patients.¹

Competition may dilute operator experience. The relationship between patient outcomes and the volume of ICD

implants has been evaluated by Al-Khatib et al,⁹ who observed an association between a higher volume of ICD implants and a lower rate of mechanical complications and infections. Consequently, the implications of a potential decrease in procedural volume should not be underestimated. Furthermore, there is an association between physician certification and ICD implantation outcomes. Among patients enrolled in the NCDR, 111,293 ICD implants, 29% of the devices were implanted by non-electrophysiologists and these implantations were associated with a higher risk of procedural complications. Fewer CRT-Ds were implanted, even when criteria for a CRT-D implantation were met, when the implanting physician was a non-electrophysiologist (EP: 83.1% [21,303/25,635]; non-EP cardiologists: 75.8% [5,950/7,849]; thoracic surgeons: 57.8% [269/465]; other specialists: 74.8% [1,416/1,892]; $P < .001$).⁸

- Although the data reported are helpful in identifying competitive differences in geographic regions in the US and Canada, these findings do not clarify the hypothesis that metropolitan areas will be more competitive than rural areas within a given region. In addition, uncertainty about future reimbursement may disproportionately limit the number of new EP jobs in metropolitan areas, if, indeed, these regions are already oversaturated. These points warrant further investigation.
- Training programs may need to reevaluate the number of fellows-in-training to adequately meet but not surpass market needs.
- Currently, general cardiology is the major driver of referrals. In the future, new relationships with other specialties could be fostered through education and networking programs with internists, general practitioners, hospitalists, emergency medicine doctors and non-heart rhythm allied professionals. Programs sponsored by HRS, such as AF 360°, represent promising educational forums that can be targeted to these professional audiences.
- Supplementing the workforce with highly trained allied professionals who are capable of performing routine non-invasive care, such as the follow-up of devices under physician supervision, may alleviate some of the work of electrophysiologists without detracting from the necessary procedure volume required to maintain advanced invasive skill sets.

Overall Study Conclusion

As noted, the previous HRS (formerly NASPE) workforce analysis study in 2001 focused on the density and geographic dispersion of electrophysiologists in order to address the issues of current and future supply and demand. This 2009 workforce study was undertaken to address additional components and issues and to evaluate the role of physicians, allied professionals and basic scientists in providing comprehensive cardiac electrophysiology care. This specific summary focuses on the physician survey. Data on

the other groups can be accessed online at <http://www.hrsonline.org/Policy/ClinicalGuidelines/Workforce>.

The field of cardiac electrophysiology has evolved significantly in the past decade. There has been substantial growth in the volume and complexity of procedures performed. A larger number of patients will need high-quality follow-up, especially among patients undergoing device implantation or AF ablation. Improvement in procedural technologies, advances in basic and translational research capabilities, the maturation of the field of Heart Failure Management, and an increase in overall patient volumes underscore the need for all arrhythmia professionals to develop cooperative approaches to improve clinical outcomes. Training programs should be designed to achieve a high level clinical and scientific expertise, and educate the appropriate number of physicians, allied professionals and scientists needed to advance the arrhythmic health of the population as a whole.¹⁰

- Although one third of the practicing electrophysiologists (based on survey respondents) state that they have an ability to increase their workload, the relatively long hours currently worked, in conjunction with an increase in the age, suggest that their perception may not match the clinical demand. The aging patient demographic, an expanding population of insured patients associated with healthcare reform, and improved procedural outcomes suggest that there will be a need for more EP professionals.
- Device implantation and management constitutes a significant component of the work expended by most electrophysiology professionals. Younger, well-trained professionals can be expected to spend greater amounts of time performing more complex procedures (e.g., CRT implantations, device upgrades, lead extractions). Older physicians may migrate toward a role in which they do fewer procedures but spend more time managing patients and supervising allied professionals.
- Although the volume of ablation procedures is increasing, there appears to be a trend in which more non-complex ablations (e.g., atrial flutter, atrioventricular node (AVN) ablation with permanent pacemaker insertion, atrioventricular nodal reentry tachycardia (AVNRT) and atrioventricular reentrant tachycardia (AVRT)) are migrating to smaller, regional centers, while the performance of more complex ablations (e.g., AF ablation, atypical atrial flutter ablation, atrial tachycardia ablation, VT ablation, failed ablations) are still clustered among tertiary centers.
- The historical lack of geographic mobility among the majority of electrophysiologists, particularly after they become established in their careers, suggests that in their efforts to develop programs, distant suburban or rural centers may encounter challenges recruiting and retaining well-trained, newly-minted electrophysiologists.
- Most respondents are concerned about competition. Although there are geographic differences in perceived competition among the various regions of the United

States and Canada, the present study does not clarify the suspicion that metropolitan areas are more competitive than rural areas. The development of new referral patterns among internists, general practitioners, hospitalists, emergency medicine doctors and non-heart rhythm allied professionals might open up previously closed referral opportunities and decrease competitive forces.

Some specific limitations of this study format (i.e., survey) include the greater incidence of opinion versus fact. The format predominately provides the responder opinions and is limited in objective fact. The conclusions are an interpretation of the survey results and represent expert opinion. The present study examines the current and future human resource issues, but does not assess current or future demand and patient access.

The present study addresses a number of factors operative in determining the appropriate workforce requirements for the field of electrophysiology. A myriad of competing and converging forces, including patient demographics, physician demographics, provider reimbursement, physician career decisions, work capacity, the impact of health-care reform, patient access, and the evolving role of new and developing technologies, reminds us that analyses, such as these, are works in progress that will require consistent re-evaluation and updating.

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Final Comments: Reflections on the HRS 2009 Physician Workforce Study

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The Heart Rhythm Society has undertaken strategic planning exercises most recently in 2001, 2004 and 2008. In preparation for, or arising from, these strategic planning exercises, surveys of the membership and/or the heart rhythm community at large have been completed. The most recent Strategic Planning Summit in 2008 identified a need to conduct a broad survey of heart rhythm professionals to better understand their demographics and the workforce environment. The data collected during the current workforce study, which included surveys of allied professionals, basic scientists and physicians as well as academic institutions, is extensive, and due to the volume of information collected only some data from the Physician Workforce Survey is presented in the report published in this issue of *Heart Rhythm*.¹ More detailed data are available on the Heart Rhythm Society website and depending on the context and perspective different interpretations are possible. It is precisely for that reason that the Physician Workforce Survey report is written in a factual way, providing summary statements but with limited interpretation.

Survey data have limitations, but these surveys provide important information reflective of the status of the heart rhythm community in 2009. One may question the validity of the survey report given that only 10% of the physician workforce surveyed responded. Nevertheless, based on social science methodology the survey results are considered to be representative of the physician workforce in Canada and the United States. Since the survey was conducted in the spring of 2009, important changes have occurred in the medical environment in the United States as healthcare reform evolves. Accordingly, it seemed appropriate to provide a perspective on the physician workforce survey in the context of these emerging environmental factors.

The physician workforce is aging with a median age of 50 years; 22% of whom are greater than 56 years of age. Yet only 23% of the cohort >60 years of age indicates that they plan to retire in the next 5 years. Nevertheless, those >65 years significantly reduce their work hours and transition to performing fewer and less complex procedures. What impact will the aging of the workforce have on our ability to provide complex ablation and device implant services if many physicians stop doing procedures or reduce procedure volumes after the age of 60? If physicians reduce their procedure volumes will that impact quality outcomes? The move to link reimbursement to performance outcomes

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might encourage aging physicians to stop doing certain procedures.

Arrhythmia specialists are working very hard, an average of 60 hours per week, and 30% of our colleagues work more than 60 hours per week. Yet there appears to be a logical disconnect between the report of extremely long work weeks versus the strong sense that there is still excess capacity to see more patients and to perform more device and ablation procedures. Is the latter driven by a sense of increased competition in the workplace? Will reductions in fee reimbursement force physicians to increase their work hours? Is such a workload sustainable over the long term or should it be discouraged in the interest of a healthier work-life balance? Will the new generation of electrophysiologists embrace such a lifestyle? The current generation of medical students, residents and fellows appears to have a strong focus on balancing work with other interests and pursuits. Thus, as the physician workforce ages will we have sufficient arrhythmia specialists to meet the growing demands for specialty services that are anticipated?

There has been much dialogue about how healthcare reform might change the electrophysiology community. Many large healthcare organizations are buying physician group practices and incorporating them into hospital-based practices. Will these new practice models improve access to arrhythmia service or conversely might they restrict access to such services by reducing or discouraging such referrals? These new practice models may transfer more delegated responsibilities to allied professionals while decreasing direct physician involvement in some activities such as device follow-up. To provide these services, specific practice guidelines will be required and allied professionals may require additional training to achieve the level of expertise required. Furthermore, for such new practice models to be successful and more broadly embraced a departure from the traditional fee-for-service to the development of alternate reimbursement strategies may be required. The evolution of new practice models involving more indirect physician involvement in care delivery may also require tort reform to reduce the risk of litigation.

At present complex ablation procedures (atrial fibrillation and ventricular tachycardia ablation) and complex device procedures (lead extraction and cardiac resynchronization therapy) are more commonly performed at academic institutions. This likely reflects the fact that these procedures are still in evolution led by the academic leaders in the field. Yet more trainees are accepting jobs in private practice rather than remaining at academic centers. Does this mean that more complex procedures will be more broadly available in the future? That can only be achieved if

fellows pursue additional year(s) of training as it is impossible in one year of training to acquire the skill sets to perform complex ablation or device procedures. Furthermore, the success of complex ablation procedures requires well trained electrophysiology laboratory based allied professionals. There is a growing trend towards consolidation of arrhythmia practice groups in parts of the country. Although these are not necessarily affiliated with academic institutions, they provide tertiary care services and are actively involved in clinical research. Since the volume of procedures are frequently linked to improved outcomes and reduced complications, such groups may provide substantial competition to smaller group practices with a sole electrophysiologist in the group as well as to some academic institutions where referral volumes may be low. As presently exists, we may observe the continued evolution of arrhythmia services to those centers offering complex ablation and device procedures and those offering consultative and less complicated procedural services.

There is a disparity in the distribution of arrhythmia specialists across the country with fewer electrophysiologists located in states with smaller urban centers. Does this impact referral for and provision of arrhythmia specialty services? There is a general sense that trainees emerging from electrophysiology programs are having a difficult time finding jobs. Some practices/groups have decided not to hire new or additional electrophysiologists at present as they monitor the changing practice environment. Thus, it is possible that many newly minted electrophysiologists may have to focus on job opportunities in regions that are presently underserved despite the fact that those regions may not be their preferred practice location.

There are many uncertainties about the heart rhythm community workforce. We have posed more questions than we have provided answers. We invite the community to review the survey data in more detail and to more actively engage in discussion about these important issues including engaging in a blog on our website. In the end the interpretation of these data will be decided by history and by individual perspective. However, it is better to interpret data than to speculate on the basis of bias. We need the membership to be more vocal so the Heart Rhythm Society leadership can ensure that our strategic directions are current, visionary and aligned with the membership.

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