Resident Perception of Technical Skills Education and Preparation for Independent Practice

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Background. **Surgical skills are traditionally taught and practiced in the operating room. However, changes in health care policy and outcome-based evaluation have decreased trainee operative autonomy. We examined cardiothoracic residents' perceptions of operative experience and the role of simulation.**

Methods. **The In-Training Examination (ITE) is taken each year by all residents. Completion of a 30-question preexamination survey is mandatory, ensuring a 100% response rate. Survey data related to operative experience, career preparedness, and surgical simulation were analyzed. Opinion questions were asked on a 5-point Likert scale. Respondents were grouped into three cohorts by training paradigm (2-year versus 3-year traditional programs and 6-year integrated programs).**

Results. **In all, 314 respondents (122 2-year, 96 3-year, and 96 6-year integrated) completed the survey. Of the three groups, residents in 3-year programs had the highest levels of satisfaction. Advanced training was most common among residents in 6-year integrated programs (66%, versus 49% for 2-year and 26% for 3-year programs; $p = 0.63$). Desire to specialize drove further training (97%), with 2% stating further training was needed owing to inadequacy and 1% owing to a poor job market. In all assessed categories, the majority of residents believed that simulation did not completely replicate the educational value of an operative case.**

Conclusions. **Cardiothoracic residents largely feel well prepared for the transition to practice under the current educational paradigm. Although many residents seek advanced training, it seems driven by the desire for specialization. Residents view simulation as an adjunct to traditional intraoperative education, but not as a viable replacement. Further study is necessary to better understand how best to integrate simulation with operative experience.**

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The educational paradigm in cardiothoracic surgery continues to evolve; the traditional apprenticeship model has given way to a model of graduated experience wherein the trainee progresses through a period of mentored responsibility to monitored independence. However, with changing external pressures on educational time and performance, this model is changing. Increasing demands are now placed on trainees' time. Most obvious are federally mandated work hour limitations, which resulted in a measurable decrease in reported resident case volume, with the most significant decline being seen in thoracic, trauma, and vascular surgery [1]. Connors and colleagues [2] reported a 25% decrease in the volume of cardiac operations residents performed. The increasing complexity of cardiothoracic surgery also increases functional time demands. Evolving technologies such as robotic surgery, catheter-based interventions for valvular heart disease, and ablative therapy for pulmonary malignancy are added to the traditional skills of open and minimally invasive surgery.

The extent to which the resident operates in the "surgeon" role may also decline given an increased emphasis on outcome. Hospital benchmarks for improved operating room efficiency and utilization are often at odds with resident education. Resident operative times are significantly

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longer compared with those of attending surgeons, especially in higher acuity cardiothoracic procedures [3]. Public reporting of surgical outcomes has also likely decreased the tolerable margin of error in the operating room, perhaps resulting in further limitation of resident autonomy. That is compounded by an increasing deficit in the beginning technical skills of the trainee. A steady decline in cardiac and thoracic case exposure has been seen during general surgery training [1] among traditional cardiothoracic residents, whereas integrated residents often have little prior practical clinical experience.

Although these challenges are well known, very few data exist to quantify the efficacy of resident technical skills education during cardiothoracic training. Beginning in 2007, the Thoracic Surgery Residents Association coupled a compulsory resident survey with the mandatory yearly In-Training Examination (ITE). To improve data regarding the adequacy of technical skills training and preparation for practice, the survey was revised to assess resident perceptions of the training experience. Better understanding of the strengths and weaknesses in current training may be helpful in identifying appropriate areas to devote limited educational resources. We present data on the perceptions of current residents regarding preparation for practice with a specific focus on technical training and the role of simulation.

EDUCATION

Material and Methods

The ITE is administered each year by the Thoracic Surgery Director's Association (TSDA) to all residents enrolled in training programs approved by the Accreditation Council for Graduate Medical Education. This group includes all residents enrolled in traditional fellowship model training pathways after completion of general surgery training (2-year and 3-year programs) as well as residents matched directly from medical school into integrated cardiothoracic surgery programs. The examination is a mandatory part of training, and completion is necessary for promotion and for graduation from the training program. To be eligible to take the ITE, the resident must first fully complete a preexamination survey. This requirement thus guarantees uniform resident participation in the ITE survey, eliminating sampling bias.

In 2013, the ITE survey was redesigned in a collaborative effort by the Thoracic Surgery Residents Association, the TSDA, and the Joint Council for Thoracic Surgery Education. The goal of this revision was to collect accurate data regarding the learning strategies of thoracic surgery residents and to assess resident perceptions of their educational experience. A total of 30 questions were included in the survey, which was distributed in a secure electronic format approximately 1 month in advance of the ITE. The survey was administered using a Web-based platform with each resident having a unique login code, ensuring the survey was taken only once by each individual resident and that all residents did in fact complete the survey. All responses were centrally collected by the TSDA and the data presented to the investigators in a blinded fashion.

Survey questions examined three main domains: educational resource utilization, career choice, and perceptions of the training experience. Nondemographic questions included 5-point Likert rating scale responses (strongly agree, agree, neutral, disagree, strongly disagree) to quantify perceptions. Follow-up questions were included with the intent of better understanding the factors contributing to resident satisfaction. In addition, several questions regarding the extent of resident involvement or allotment of time to certain tasks were included to quantify relative effort. Results were stratified on the basis of training paradigm for the purposes of comparison.

Descriptive statistics are provided for all groups. Direct comparisons were analyzed using χ^2 and Fisher's exact tests. Analysis of variance was used to compare the results of the Likert scale responses. For all analyses, an α level of 0.05 was defined as the threshold for statistical significance. Data analysis was conducted using the statistical software package STATA, version 11.2 (StataCorp, College Station, TX).

Results

Survey data were collected from a total of 314 residents: 122 in 2-year programs, 96 in 3-year programs, and 96 in integrated programs. The majority of residents in the traditional training pathways (2 years and 3 years) were in the sixth and seventh postgraduate training years whereas most of the respondents from integrated programs were in the first 3 years of training (Table 1). Primary career interest was stated as general thoracic surgery by 39% (n = 47) of residents in 2-year programs and 26% of residents in 3-year programs. By comparison, only 5% of integrated program residents identified general thoracic surgery as a career interest ($p < 0.0001$). Conversely, a career in adult cardiac surgery was planned by 25%, 39%, and 61% of residents in 2-year, 3-year, and integrated programs, respectively ($p < 0.0001$).

Table 1. Demographics and Career Choice Information

Demographics and Career Choice	2 Years (n = 122)		3 Years (n = 96)		Integrated (n = 96)		*p* Value
Postgraduate year							
1–3	…	(0)	…	(0)	47	(49)	NA
4–5	…	(0)	…	(0)	27	(28)	NA
6–7	99	(81)	49	(51)	19	(20)	<0.0001
8–9	19	(16)	39	(41)	6	(6)	0.0001
10+	4	(3)	8	(8)	0	(0)	0.3719
Career interest							
Cardiac	31	(25)	37	(39)	59	(61)	<0.0001
General Thoracic	47	(39)	25	(26)	5	(5)	<0.0001
Mixed	22	(18)	20	(21)	10	(10)	0.1334
Congenital	10	(8)	6	(6)	16	(17)	0.1065
Transplantation	6	(5)	3	(3)	3	(3)	0.4864

Values are n (%).

NA = not applicable.