



## Challenges training left-handed surgeons



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### ABSTRACT

**Background:** Being left-handed (LH) is considered a disadvantage in surgical training. We sought to understand the perspectives of LH trainees and surgical educators on the challenges and modifications in training LH surgeons.

**Methods:** A survey was distributed to surgeons, surgical residents, and medical students about challenges teaching and learning surgical technique.

**Results:** 25 LH surgeons, 65 right-handed (RH) surgeons, and 39 LH trainees completed the survey. Compared to LH surgeons, RH surgeons reported more difficulty (46% vs 16%,  $p = 0.003$ ) and less comfort teaching LH trainees (28% vs 4%,  $p = 0.002$ ), and 10 (15%) reported that LH trainees have less technical ability. RH surgeons identified challenges translating technique to LH trainees and physical limitations of an environment optimized for right-handed mechanics.

**Conclusions:** The disadvantage LH surgical trainees face is due to barriers in training rather than inherent lesser ability. Nonetheless, minimal modifications are made to overcome these barriers.

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## 1. Introduction

Left-handedness is considered a disadvantage in surgical training. Studies report that left-handed (LH) surgical trainees are thought to be less technically skilled than their right-handed (RH) counterparts.<sup>1–5</sup> LH residents report lack of mentorship, anxiety about laterality, and faculty annoyance with their hand dominance in the operating room.<sup>4–7</sup> Conventional surgical procedures and instrumentation are optimized for RH surgeons, requiring LH surgeons to reverse usual motion to perform even basic tasks. LH surgeons and LH surgical trainees have reported challenges in both open and minimally invasive surgery based on their lateral predominance.<sup>3,5,7,8</sup> When working in tandem across the table, RH and LH operators do not fit as naturally together as two RH operators, making it more challenging for a LH trainee to assist a RH surgeon and vice versa. Furthermore, differences in handedness between an

attending and a trainee may make standard teaching methods, such as show and tell, modeling, and physical adjustments of hands and instruments more detrimental than beneficial for LH learners.

Despite these difficulties, there is a significant lack of technical literature and mentorship for LH trainees, and it is unclear how LH surgeons develop their technical skills. To our knowledge, no one has attempted to identify the specific challenges encountered teaching LH trainees, nor has there been documentation of modifications made by experienced LH surgeons to perform safe and comfortable operations. We solicited perspectives of LH trainees and their surgical teachers, both RH and LH surgeons, in order to better understand the challenges encountered teaching LH surgical trainees to identify opportunities to improve the technical training of LH surgeons.

## 2. Methods

A survey was developed asking demographic information, laterality, and level of training. Respondents were separated by writing hand dominance and level of training into four response groups: RH surgeons, LH surgeons, LH advanced trainees (residents and fellows), and LH novice trainees (interns and clinical medical students). Respondents were queried about handedness-based

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mentoring, challenges teaching and learning surgical technique for left-hand dominance, and modifications to operating procedures and instrumentation for LH surgeons and trainees. All respondents were also given the opportunity to provide in text comments on the above subjects. The survey was validated by a small cohort of LH surgeons and LH trainees through a simulated focus group prior to widespread distribution. The survey was distributed through our institution, and to surgery Clerkship Directors at 30 allopathic medical schools in the United States, to be forwarded to their departments for recruitment of faculty, house staff, and medical students. The survey is provided for future study (Supplementary Fig. 1).

As our study focused on training LH surgeons, RH trainees were excluded from the study. Incomplete responses were also excluded from analysis. For data analysis responses from LH advanced and LH novice trainees were consolidated into a single LH trainee group. Frequency of responses was compared to determine salient differences between groups. P-values are presented for selected comparisons, calculated by Chi-squared tests or Fisher's exact test, when any to expected cell size was less than 5; continuous variables were compared by *t*-test.

This study was determined to be IRB exempt by the University of Michigan IRB (HUM00104314).

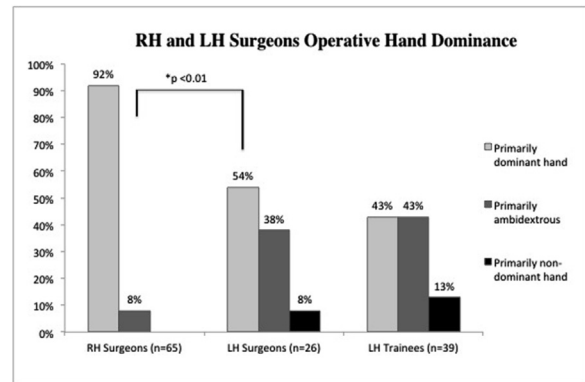
### 3. Results

#### 3.1. Demographics

We received 130 responses from 22 institutions, including 65 RH surgeons 25 LH surgeons, and 39 LH trainees. Given the widespread distribution of the survey, we do not have a true denominator to estimate the response rate. Basic demographic data is listed in Table 1. There were no significant differences in mean age, gender distribution, or number of specialists between RH and LH surgeons. There was a statistically significant difference in reported operative hand dominance between RH and LH surgeons with LH surgeons reporting significantly more use of their non-dominant hand (40% vs 8%,  $p < 0.01$ ) (Fig. 1).

#### 3.2. Defining challenges training LH surgeons

Perspectives of RH and LH surgeons on teaching LH trainees in comparison to their RH counterparts are presented in Table 2. There was no significant difference in exposure to LH trainees between groups ( $p = 0.572$ ). In comparison to LH surgeons, RH surgeons reported significantly more difficulty (46% vs 16%,  $p = 0.003$ ) and less comfort teaching LH trainees (28% vs 4%,  $p = 0.002$ ). Only a small minority of surgeons reported that LH trainees have less technical ability. There was a significant correlation between perceived difficulty and comfort teaching LH trainees for both RH and LH surgeons ( $p < 0.01$ ), but no statistically significant



**Fig. 1. RH and LH surgeons' operative hand dominance.** Surgeons and trainees were asked if they operate primarily right-handed, primarily ambidextrous, or primarily left-handed. For ease of comparison, responses are reported above as primarily dominant hand (i.e. RH surgeons operating primarily right-handed), primarily non-dominant hand (i.e. RHA surgeons operating primarily left-handed) or primarily ambidextrous. Response frequencies were compared by Fisher's exact test. Percentages do not always sum to 100% due to rounding.

relationship to technical ability ( $p_{RH} = 0.125$ ;  $p_{LH} = 0.474$ ). Among RH surgeons, increased difficulty teaching LH trainees correlated significantly with decreased comfort ( $p < 0.01$ ). Conversely among LH surgeons, increased comfort teaching LH trainees correlated with less difficulty teaching ( $p = 0.005$ ).

We compared degree of experience teaching LH trainees with responses to difficulty teaching, comfort teaching, and their perceived technical ability. For RH surgeons, there was a significant correlation between increased experience working with LH trainees and increased difficulty teaching LH trainees ( $p = 0.035$ ). For LH surgeons, there were no significant relationships between responses ( $p > 0.5$ ). From the trainee perspective, 38% of LH trainees reported feeling disadvantaged by their laterality and 30% reported that specific procedures are more difficult because of their left-hand dominance.

All 65 RH surgeons provided qualitative commentary on specific challenges teaching LH trainees, and 69% of RH surgeons noted at least one area of increased difficulty (Fig. 2). The majority included challenges due to a lack of understanding by both RH surgeons and LH trainees about how to set-up and perform procedures with the left hand, including difficulty translating or demonstrating technique due to mirror-like orientation (20%) and more time and thought required for planning and set up (22%). The remaining comments pertained to physical limitations of LH trainees operating in environments optimized for right-handed mechanics including the handedness of surgical instruments (20%) as well as requiring increased use of the left hand by the attending surgeon (11%). Of note, RH surgeons only commented on decreased skill of LH trainees when using their right (non-dominant) hand (9%).

**Table 1**

**Demographics.** Response frequencies were compared by Chi square test; age was compared by *t*-test. There was no statistically significant difference in mean age ( $p = 0.710$ ), gender distribution ( $p = 0.239$ ), or surgical specialty ( $p = 0.244$ ) between RH surgeons and LH surgeons. \*Specialties include urology, OMFS, neurosurgery, plastics, vascular, orthopedic and cardiac surgery. Trainee specialty not recorded due to inclusion of medical students.

	RH attendings (n = 65)	LH attendings (n = 25)	LH trainees (n = 39)
<b>Mean age</b> ( $p = 0.71$ )	48.3 yrs	48.1 yrs	28.4 yrs
<b>Gender distribution</b> ( $p = 0.239$ )			
Male	83%	72%	56%
Female	17%	28%	44%
<b>Surgical specialty</b> ( $p = 0.244$ )			
General surgery	68%	64%	—
All other specialties*	32%	36%	—

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