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Impact of integrated programs on general surgery operative volume

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ABSTRACT

Background: Integrated residencies are now commonplace, co-existing with categorical general surgery residencies. The purpose of this study was to define the impact of integrated programs on categorical general surgery operative volume.

Methods: Case logs from categorical general, integrated plastics, vascular, and thoracic surgery residents from a single institution from 2008 to 2016 were collected and analyzed.

Results: Integrated residents have increased the number of cases they perform that would have previously been general surgery resident cases from 11 in 2009–2010 to 1392 in 2015–2016. Despite this, there was no detrimental effect on total major cases of graduating chief residents.

Conclusions: Multiple integrated programs can co-exist with a general surgery program through careful collaboration and thoughtful consideration to longitudinal needs of individual trainees. As additional programs continue to be created, both integrated and categorical program directors must continue to collaborate to insure the integrity of training for all residents.

1. Introduction

The landscape of general surgery training has changed drastically over the last few decades with over 80% of general surgery trainees now pursuing further surgical subspecialty training following residency.[1,2] Additionally, there have been advances in technology, increasing complexity in treatment of surgical diseases, duty hour restrictions, the potential for less independence, and the addition of integrated programs.[3,4] These issues potentially impact the "final product" of the graduating general surgery resident.

With the transition to further sub-specialization there has been a creation and implementation of integrated surgical programs for peripheral vascular surgery, cardiothoracic surgery and plastic surgery. This paradigm shift in surgical education has created additional changes in surgical education, but few studies have examined how this has impacted core general surgery (GS) programs.

The Indiana University (IU) Department of Surgery has experienced a rapid infusion of integrated residents in the last seven years and is now one of thirteen residency programs to have integrated peripheral vascular (added in 2009), plastic surgery (added in 2011), and cardiothoracic surgery (added in 2013) programs. In a program with 10 categorical GS residents/year, these programs contribute an additional 4 residents/year in the first three post-graduate years (PGY) vying for general surgery cases. With concerns of dilution of case volume with the forty percent expansion of trainees, we sought to quantitatively study the educational experience for all trainees.

The purpose of this study was to investigate and analyze categorical general surgery resident operative experience over time with the addition of multiple integrated surgical residents. We hypothesized that there would be a decrease in general surgery operative volumes with the addition of integrated residents in post graduate years (PGY) 1–3.

2. Materials and methods

Individual resident data were collected from operative case logs using the Accreditation Council for Graduate Medical Education (ACGME) operative case log system. Resident data obtained was retrospectively reviewed for categorical general surgery residents, integrated plastic surgery residents, integrated peripheral vascular residents, and integrated cardiothoracic residents over an eight year period from July 1st, 2009 through June 30th, 2016.

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2.1. Data set description

2.1.1. Integrated residents and general surgery PGY 1-5

The "Experience Report by Year" report from the ACGME operative case log system was used for data collection. Appropriate adjustments were made to ensure that the PGY year corresponded to the clinical year of the resident as about 50% of general surgery residents at IU pursue additional research time.

ACGME case definitions were used to define major cases. Only cases in which the resident served as the "Surgeon Junior" or higher were included. Vascular cases for vascular integrated and thoracic cases for cardiothoracic integrated residents were excluded as they are not part of the core general surgery requirements of their respective integrated programs.

2.1.2. Graduating general surgery chief residents

Total major operative cases at time of graduation were also obtained for all chief general surgery residents who matriculated from IU general surgery residency from 2009 to 2016 using the ACGME operative case log system.

2.2. Data analysis

The average number of operations performed by general surgery residents in our program at levels PGY 1–5 and integrated residents PGY1-3 were expressed as mean ± standard error. Graduating chief data was also expressed as mean ± standard error. Linear regression models were created to examine relationship between operative case volumes and time stratified by PGY-level. A linear regression model was also created to investigate total major operative volume by graduating chief residents over time. All analyses were performed using Statistical Analysis Software (SAS, Charlotte). *P*-values < 0.05 were considered statistically significant.

3. Results

3.1. Operative volume of integrated surgical residents

The integrated peripheral vascular program has been at full complement (with a resident in all of the PGY1-3 classes) since July 2011. Individual integrated peripheral vascular resident operative volume since that time has ranged from 35.0 to 94.3 with a mean of 66.1 ± 10.5 per resident/year (Fig. 1A). Integrated plastic surgery has been at full complement since July 2013. Individual integrated plastic surgery resident operative volume since that time has ranged from 81.7 to 120.0 with a mean of 96.2 ± 12.0 per resident/year (Fig. 1A). Integrated cardiothoracic surgery has been at full complement since July 2015. Individual integrated cardiothoracic resident operative volume for that year was 97.3 ± 30.8 per resident/year (Fig. 1A).

Overall, since the inception of integrated programs at our institution there has been an increase in operative cases being done by integrated residents per year during their PGY 1–3 years (Fig. 1B). This has resulted in integrated residents logging >600 cases/year since 2012 that would have been previously done by categorical general surgery residents. This past year was our first year at full complement for all programs. There were a total of 1392 cases done by integrated residents this past year.

3.2. Operative volume of categorical general surgery residents

For each PGY level, individual operative case volumes since the implementation of integrated programs for categorical general surgery residents were obtained per academic year (Fig. 2A). After performing linear regression analysis, for PGY-1 residents and PGY-2 residents, there was no significant impact on operative volume over time (p-value = 0.57 and 0.51 respectively, Fig. 2C). For PGY-3 level residents, the mean number of cases performed was 220.8 ± 5.0 with an average decrease in cases over time by 8.9 cases per year (95% Confidence Interval (CI): 5.0 to 12.9 cases/year, p-value < 0.0001, Fig. 2C). Additionally, for PGY-4 level residents, the mean number of cases performed was 346.8 ± 9.8 with a decrease in the average number of cases over time by 18.4 cases per year (95% Confidence Interval (CI): 10.8 to 26.4 cases/year, p-value < 0.001, Fig. 2C). In both the PGY-3 and PGY-4 level resident model there was a great deal of heterogeneity with R-squared values of 0.21 and 0.23 respectively. For PGY-5 residents, there has been no significant impact on operative case volume over time (p-value = 0.13, Fig. 2C).

3.3. Graduating general surgery residents

Over time, there has been no significant impact on the total number of major operative procedures at time of graduation for matriculating general surgery chief residents (p-value = 0.56, Fig. 2B).

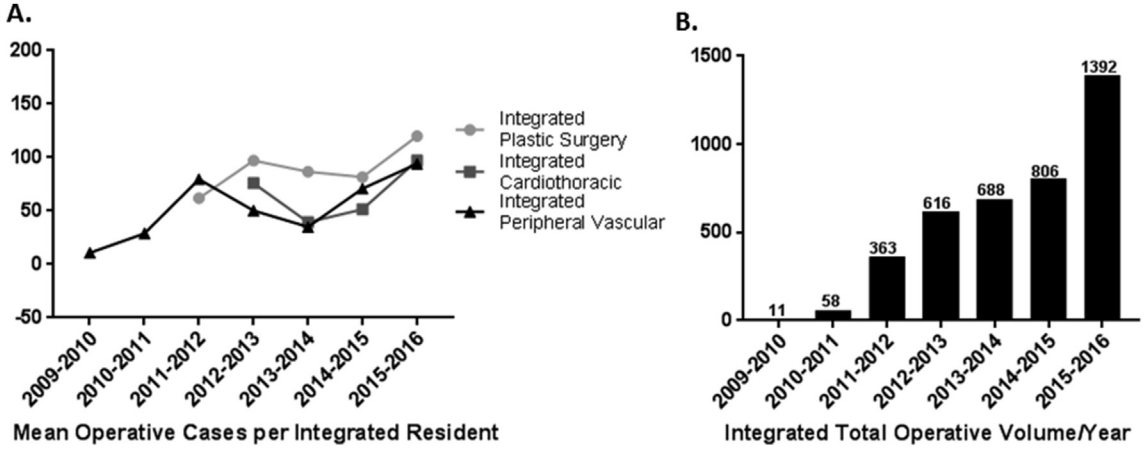

Fig. 1. A. Mean operative case volumes for integrated peripheral vascular, plastic and cardiothoracic residents by academic year. **B**. Total general surgery operative cases volumes performed by all integrated residents per year during their PGY 1–3 years.