

# Open abdominal surgical training differences experienced by integrated vascular and general surgery residents

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## ABSTRACT

**Background:** As the integrated vascular residency program reaches almost a decade of maturity, a common area of concern among trainees is the adequacy of open abdominal surgical training. It is our belief that although their overall exposure to open abdominal procedures has decreased, integrated vascular residents have an adequate and focused exposure to open aortic surgery during training.

**Methods:** National operative case log data supplied by the Accreditation Council for Graduate Medical Education were compiled for both graduating integrated vascular surgery residents (IVSRs) and graduating categorical general surgery residents (GSRs) for the years 2012 to 2014. Mean total and open abdominal case numbers were compared between the IVSRs and GSRs, with more in-depth exploration into open abdominal procedures by organ system.

**Results:** Overall, the mean total 5-year case volume of IVSRs was 1168 compared with 980 for GSRs during the same time frame ( $P < .0001$ ). IVSRs reported nearly double the number of surgeon-chief cases compared with GSRs (452 vs 239;  $P < .0001$ ). GSRs reported more than double the number of open abdominal procedures compared with IVSRs (205 vs 83;  $P < .0001$ ). Sixty-five percent of the open abdominal experience for IVSRs was focused on procedures involving the aorta and its branches, with an average of 54 open aortic cases recorded throughout their training. The largest single contributor to open surgical experience for a GSR was alimentary tract surgery, representing 57% of all open abdominal cases. GSRs completed an average of 116 open alimentary tract surgeries during their training. Open abdominal surgery represented an average of 7.1% of the total vascular case volume for the vascular residents, whereas open abdominal surgery represented 21% of a GSR's total surgical experience.

**Conclusions:** IVSRs reported almost double the number of total cases during their training, with double chief-level cases. Sixty-five percent of open abdominal surgeries performed by IVSRs involved the aorta or its renovisceral branches. Whereas open abdominal surgery represented 7.1% of an IVSR's surgical training, GSRs had a far broader scope of open abdominal procedures, completing nearly double those of IVSRs. The differences in open abdominal procedures pertain to the differing diseases treated by GSRs and IVSRs. (J Vasc Surg 2017;■:1-5.)

Open abdominal surgical training has traditionally been a coveted resource of surgical training programs. Given the shift to minimally invasive and endovascular procedures, there is now a concern among surgical educators that current surgical trainees may not be receiving adequate experiences in traditional open surgery.<sup>1,2</sup>

With the advent of endovascular aneurysm repair as well as the integrated vascular surgery residency program, there is a question about the ability to produce vascular surgeons technically proficient in open aortic surgery.<sup>3</sup> Truncating the general surgery training component has likely negatively affected integrated vascular

residents' overall operative experience and in particular their exposure to open abdominal surgical cases.

Our goals with this study were threefold. We first wished to analyze the overall surgical experience offered by both the general surgery and integrated vascular surgery residency training paradigms. Next, we wished to understand the open abdominal surgical training experience offered by the integrated vascular surgery residency program. Finally, we wished to compare the open abdominal surgical training experience between integrated vascular surgery residents (IVSRs) and general surgery residents (GSRs).

It is our belief that both training paradigms will offer adequate overall training to their residents, with GSRs having a higher number of overall open abdominal procedures throughout their training. With respect to IVSRs, although they will likely have a lower open abdominal surgical case volume, we expect them to have a focused exposure to open aortic surgery.

## METHODS

National operative case log data supplied by the Accreditation Council for Graduate Medical Education (ACGME) were compiled for both graduating IVSRs and graduating categorical GSRs for the years 2012 to 2014. Data were

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made publicly available by the ACGME through the following website: [www.acgme.org](http://www.acgme.org). There were a total of 30 IVSRs (in 2012-2013, there were 10 programs in the country; and in 2013-2014, there were 16 programs nationally) and 2203 GSRs contributing to the collected data. We next defined open abdominal surgery as exposure of any visceral organ system (including the aorta and its major branches) as reported under the ACGME category of "Area" or "Residency Review Committee procedures." Open abdominal procedures were categorized as open aortic surgery and open abdominal surgery. Table I shows the distribution of these case categories (in accordance with the ACGME case breakdown).

Cases were totaled for surgeon-chief, surgeon-junior, and total cases for both groups of residents (teach-assist, first-assist, and secondary procedures were excluded from the IVSR case totals as these categories do not exist on the ACGME reports for GSRs). Mean total and open abdominal case numbers were compared between the IVSRs and GSRs, with open abdominal procedures divided by organ system. IVSR case logs reported national averages with minimum and maximum values for each category. Standard deviation was calculated using the range rule of four. GSR case logs reported standard deviations of each case category, and variances were calculated to derive overall standard deviations. Results were first broken down into categories based on the level of the resident: surgeon-chief, surgeon-junior, and total cases. We then broke down each of these levels on the basis of the categories shown in Table I. Statistical significance comparing averages in case categories was calculated by Student *t*-tests using the program SAS 9.4 software (SAS Institute, Cary, NC).

## RESULTS

Looking at the overall surgical training experience offered by both paradigms, we see that IVSRs completed a significantly higher number of major cases for credit compared with their GSR counterparts (1168.1 vs 979.6;  $P < .0001$ ). In breaking down this major case credit based on the level of resident when completing these cases, the difference in case volume is clearly seen in chief case-load of these different cohorts. IVSR chiefs completed almost double the number of major cases for credit compared with GSR chiefs (452 vs 239;  $P < .0001$ ). As surgeon-juniors, there was no significant difference in the case volume of both these groups (716.5 vs 740.4;  $P = .3715$ ).

On delving into the specifics of open abdominal surgical training, there is a clear pattern in the distribution of case volume. Of all the case categories listed in Table I, there is only one category in which residents in both groups shared a similar case volume in their tenure as residents, transplant surgery. Both IVSRs and GSRs completed a comparable number of transplant surgery cases in their tenure as residents, most of which was

**Table I.** Categories of open abdominal procedures

Open abdominal procedures	
Open aortic surgery	Open abdominal surgery
Open aneurysm	Alimentary tract
Peripheral obstructive (aortoiliac)	Abdominal surgery: general, liver, biliary, pancreas, spleen
Renovisceral revascularization	Transplant surgery
Vascular trauma	Trauma
Spine exposure requiring vascular surgery	

accounted for during the surgeon-junior years as residents. Otherwise, the data are skewed in favor of either IVSRs or GSRs, depending on whether the case category is open aortic or open abdominal surgery (again as defined in Table I).

IVSRs completed an average of 83.3 total open abdominal procedures with 54.1 open aortic surgeries logged. GSRs reported an average of 204.6 open abdominal procedures with 4.7 open aortic surgeries in their tenure as residents. The largest contributor to open abdominal procedures for GSRs was alimentary tract surgery, for which they reported an average of 116.1 cases during their residency training. Open abdominal procedures represented 7.1% of an IVSR's overall training experience, whereas they represented 21% of a GSR's case volume. Table II shows the breakdown of all case categories for the total surgical experience of both training paradigms. Tables III and IV show the breakdown of case categories by surgeon level.

Sixty-five percent of the open abdominal experience for IVSRs was focused on procedures involving the aorta and its branches. Open aortic surgery represented only 2.3% of a GSR's total surgical experience during the course of a 5-year residency. GSRs' open surgery experience was spread across 11 different recognized case categories. The single largest contributor to open abdominal surgery for GSRs was open alimentary tract surgery, which contributed 57% of their total open surgical case volume.

More than 50% of the open aortic experience of IVSRs came during their surgeon-chief experience. GSRs' open abdominal surgical experience was distributed more throughout their training, with only 35% of their open abdominal cases logged as surgeon-chiefs.

Also, the majority of nonaortic abdominal surgery completed by IVSRs was done during their surgeon-junior years. IVSRs completed an average of 29.2 nonaortic, open abdominal cases as residents. Of these nonaortic cases, 90% (26.4) of these were done as junior residents.

## DISCUSSION

Between work hour restrictions, improvements in technology, changing disease patterns, and patients' needs

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