Pregnancy-Related Attrition in General Surgery

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**IMPORTANCE** Residency attrition rates remain a great challenge for general surgery training programs. Despite the increasing acceptance of pregnancy during training, a common perception is that women who become pregnant are at increased risk of leaving surgery programs.

**OBJECTIVE** To determine whether child rearing increases the risk of attrition from general surgery residency.

**DESIGN, SETTING, AND PARTICIPANTS** Retrospective review of all categorical general surgery residents in a single academic general surgery residency program over a 10-year period. All categorical general surgery residents matriculated from July 1, 1999, until July 1, 2009.

**MAIN OUTCOMES AND MEASURES** Voluntary attrition rate, involuntary attrition rate, and incidence of child rearing among residents.

**RESULTS** Eighty-five residents matched into categorical general surgery postgraduate year 1 spots from July 1, 1999, to July 1, 2009. Of the total residents, 49 (58%) were men while 36 (42%) were women. Attrition in the program was 18.8% (16 of 85). Seven (44%) of the residents who left the program were women; this was 19% of all female residents in the program. This was not significantly different from the proportion of men who left the program ($P = .90$). A higher percentage of women (57%) left after their intern year compared with men (22%). Furthermore, men had the highest rate of attrition during research (33%) while no women left during research years. Among the 85 residents, 9 women reported a total of 10 pregnancies and 16 men reported raising 21 children (1 woman and 1 man left the program). The proportion of child rearing was higher in those who did not leave the program but this did not reach significance ($P = .10$). Neither age (odds ratio, 1.0; 95% CI, 0.8-1.4), sex (odds ratio, 1.0; 95% CI, 0.2-3.6), nor incidence of child rearing during training (odds ratio, 1.0; 95% CI, 0.1-9.6) were associated with an increased risk of attrition. Residents with children born during training did not demonstrate fewer total case numbers (men, $P = .40$; women, $P = .93$) or board pass rates (men, $P = .76$; women, $P = .50$) compared with residents who did not have children during training. Women who had children during training were more likely to pursue fellowship (87.5%) than those who did not (66.7%)($P < .001$).

**CONCLUSIONS AND RELEVANCE** The current study demonstrated there was no association between female sex and attrition at our institution. Child rearing did not appear to be a risk factor for attrition in either men or women. Furthermore, child rearing did not negatively impact the quality of training based on case numbers and board pass rates. Despite prevalent stereotypes, child rearing did not cause women or men to leave the program.
General surgery residency is challenging. Despite the introduction of work-hour limitations to 80 hours per week and new restrictions on hours for postgraduate year (PGY) 1 residents, attrition from general surgery programs remains high. Some reports estimate that between 14% to 26% of residents fail to complete their surgical residency; however, not all studies corroborate this relationship. A consistent finding in research on residency attrition is that residents leave for lifestyle factors. However, these lifestyle factors are poorly and variably defined.

Few other causes have been identified as risk factors for attrition. Several studies have identified a relationship between female sex and increased risk of attrition; however, not all studies corroborate this relationship. Despite inconclusive data regarding the risk of attrition among female residents, the stereotype persists. Furthermore, women who become pregnant during residency may also be subject to stigmatization and speculation about their ability or desire to complete the training program. As many as two-thirds of residents reported a negative perception of pregnancy during training. To our knowledge, no other studies have investigated a potential link between childbearing and attrition.

Given the growing number of women in medicine, potential links between sex, pregnancy, and attrition need further investigation. The objective of this study was to determine whether child rearing during training increases the risk of attrition from general surgery residency. We hypothesized that pregnancy does not have a negative impact on training or attrition.

Methods

We performed a retrospective review of resident files for all categorical general surgery residents matriculating into a single academic general surgery residency program over a 10-year period (July 1, 1999-July 1, 2009). All categorical general surgery residents who matriculated to the general surgery residency program at University of California, Davis, for PGY-1 from 1999 until 2009 were included (men and women). Residents were excluded if they matched into preliminary positions or other designated surgery programs (plastic surgery, urology, cardiothoracic surgery, or vascular surgery). Residents beginning as preliminary residents who were later offered categorical positions and those joining our program after PGY-1 were also excluded. The study was reviewed by the University of California, Davis, institutional review board and consent was deemed exempt owing to the retrospective nature of the study.

Main outcome measures were voluntary attrition rate (defined as residents leaving the program by personal choice), involuntary attrition rate (residents leaving at the insistence of the program), and incidence of child rearing among male and female residents (all children born to or adopted by residents or their spouses during residency). No data on abortions or miscarriages were available. Secondary outcomes were length of leave, weeks of training extension, total number of cases at residency completion, board pass rates, fellowship rate, American Board of Surgery Intraining Exam (ABSITE) scores, age at the beginning of training, marital status, and residents with children prior to the start of training.

Results

A total of 85 residents matched into categorical general surgery PGY-1 positions from 1999 to 2009 (Table 1). Of the total residents, 49 (58%) were men, and 36 (42%) were women. The average age on entering residency was 27.7 years; there was no difference in age between men and women entering the program. The overall attrition rate in the program was 18.8% (16 of 85 residents).

Of the 16 residents who left the program, 1 resident left involuntarily while the remaining 15 left voluntarily. Six residents (38%) left after their first year, 3 (19%) after their second, and 4 (25%) after their third. During their research years (performed after PGY-3), 3 residents (19%) quit the program. No residents left during their last 2 years. Three residents left to join another surgery residency (2 for family reasons and 1 to pursue research opportunities). Twelve residents chose to pursue different specialties (family practice [n = 2], obstetrics and gynecology [n = 1], anesthesia [n = 4], plastic surgery [n = 1], pediatrics [n = 1], urology [n = 1], radiology [n = 1], and flight medicine [n = 1]). Only 1 resident decided not to practice medicine.

When examining the potential sex difference among residents leaving the program, 7 of the 16 residents who left were women (44%); this was 19% (7 of 36) of all female residents in the program during the period. The remaining 9 residents (56%) who left the program were men, which was 18% (9 of 49) of all male residents in the program. There was no statistically significant difference in the proportion of men vs women leaving the program (P = .90). While there was no difference in overall attrition rate by sex, the incidence of attrition per PGY dif-

Table 1. Cohort Demographics

<table>
<thead>
<tr>
<th>Demographic</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residents, total No.</td>
<td>85</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>49 (58)</td>
</tr>
<tr>
<td>Women</td>
<td>36 (42)</td>
</tr>
<tr>
<td>Attrition</td>
<td>16 (18.8)</td>
</tr>
<tr>
<td>Child-rearing residents</td>
<td>25 (29)</td>
</tr>
<tr>
<td>Average case No. at graduation</td>
<td>979</td>
</tr>
<tr>
<td>Average board pass rate, %</td>
<td></td>
</tr>
<tr>
<td>Written</td>
<td>100</td>
</tr>
<tr>
<td>Oral, first attempt</td>
<td>93</td>
</tr>
<tr>
<td>Fellowship, %</td>
<td>77</td>
</tr>
</tbody>
</table>

* General characteristics of the cohort of categorical general surgery residents entering the program between 1999 and 2009.
fered between men and women (Figure 1B). A higher percentage of women (57%) left after their intern year compared with men (22%). Furthermore, men had the highest rate of attrition during research (33%) while no women left during research years.

Rates of child rearing among the entire group of 85 residents were high, with 29% of residents participating in child rearing during residency (25 of 85). The proportion of child rearing was higher in those who did not leave the program (23 of 69 vs 2 of 16) but this did not reach statistical significance ($P = .10$). Six residents had children prior to beginning training; 5 of these 6 residents had additional children during training. Of all residents, 47% were married. Residents leaving the program were significantly less likely to be married compared with those who did not (12.5% vs 55.1%) ($P = .002$). Of all married residents, 55% had children during training; 1 of these residents left the program. Seven percent of unmarried residents had children during training; 1 of these residents left the program.

Looking specifically at the female residents, 25% of women had children during training. Nine women reported a total of 10 pregnancies. Only 1 of these women left the program. Children were born throughout residency, with the most common years for childbirth being during research (40%) and the final year of training (30%) (Figure 2). However, children were born during the first, third, and fourth clinical years as well; no women had children during their second year. The average maternity leave was 10.1 weeks for all women. Women having children during research years took longer maternity leaves (range: 12-16 weeks; average: 13.0) than women taking leave during clinical years (range: 5-12 weeks; average: 8.2; $P = .01$) (eFigure in the Supplement). One woman extended residency training by 2 weeks while the remaining residents completed residency on schedule. Women taking leave during clinical years used vacation time, the American Board of Surgery 46-week rule, and/or extended training.

Comparing women who had children during training with those who did not, there was no difference in average age (27.4 vs 27.6 years). Evaluation of surrogates for clinical performance revealed no significant difference in average case volume at graduation (1015 vs 1020), written board pass rate (100% for all), or oral board pass rate on first attempt (100% vs 93%) between the 2 groups (Table 2). Women who had children during training were significantly more likely to pursue fellowship (87.5%) than those who did not (66.7%) ($P < .001$). Finally, average ABSITE score prior to childbirth was compared with postpregnancy scores and revealed no difference.

Male residents also demonstrated a high percentage of child rearing during training. Sixteen men (32% of male residents) reported 21 pregnancies. Attrition among this group of residents was also low, with only 1 man leaving the program. Men were also most likely to have children born during research years (24%) and their final year of training (38%) (Figure 2). However, men also had children throughout training years, with 10% being born during the second year, 19% during the third year, and 10% during the fourth clinical year.
When comparing the cohort of men having children during residency with the men who did not participate in child rearing, the average age of men having children was older (28.5 vs 27.3 years); however, this was not significantly different ($P = .07$). Average total case number, board pass rates, and rates of fellowship were no different (Table 3). Childbearing did not affect ABSITE scores. Paternity leave during clinical years was 5 days.

Multivariate analysis of the entire cohort revealed that only marital status was a statistically significant predictor of attrition (odds ratio, 0.2; 95% CI, 0.01-0.9). This correlates with the univariate analysis that being married predicted a decreased risk of attrition. Neither age (odds ratio, 1.0; 95% CI, 0.8-1.4), sex (odds ratio, 1.0; 95% CI, 0.2-3.6), nor incidence of child rearing during training (odds ratio, 1.0; 95% CI, 0.1-9.6) were associated with an increased risk of attrition.

**Table 2. Female Cohort Demographics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pregnancy During Training (n = 9)</th>
<th>No Children During Training (n = 25)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age, y</td>
<td>27.4</td>
<td>27.6</td>
<td>.79</td>
</tr>
<tr>
<td>Average total No. of cases at graduation</td>
<td>1015</td>
<td>1020</td>
<td>.93</td>
</tr>
<tr>
<td>Board pass rate (oral), %</td>
<td>100.0</td>
<td>92.9</td>
<td>.50</td>
</tr>
<tr>
<td>Fellowship, %</td>
<td>87.5</td>
<td>66.7</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Comparison of women who had children during training vs those who did not. The only statistically significant difference was that women having children were more likely to pursue fellowship.

**Table 3. Male Cohort Demographics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Child Rearing During Training (n = 16)</th>
<th>No Child Rearing During Training (n = 33)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age, y</td>
<td>28.5</td>
<td>27.3</td>
<td>.07</td>
</tr>
<tr>
<td>Average total No. of cases at graduation</td>
<td>921</td>
<td>959</td>
<td>.40</td>
</tr>
<tr>
<td>Board pass rate (oral), %</td>
<td>88.9</td>
<td>92.9</td>
<td>.76</td>
</tr>
<tr>
<td>Fellowship, %</td>
<td>81.3</td>
<td>79.2</td>
<td>.87</td>
</tr>
</tbody>
</table>

*Comparison of men who had children during training vs those who did not. There were no statistically significant differences between the 2 groups.

**Discussion**

Several institutions have reported an association between female sex and attrition, with rates of attrition among women as high as 39%. Dodson and Webb noted that 19% of all residents voluntarily leaving their program had recently had children and that 22% of the women left the program after recent childbirth. Additionally, numerous studies have demonstrated the prevalence of negative perceptions regarding pregnancy during training. One study determined that female residents delay child rearing until after training owing to perceived threats to their careers and that women were more likely to report these perceptions than men. Turner et al surveyed female surgeons and demonstrated a persistent negative stigma regarding pregnancy in training; the study also found that both male and female surgeons (residents and faculty) exert negative influences on the decision to pursue child rearing during training.

To our knowledge, the current study is the first to examine potential links between pregnancy and attrition. In a cohort of residents at our institution, neither sex nor childbearing was a risk factor for attrition by univariate or multivariate analysis. Our attrition rate of 18.8% is comparable with rates published by other groups. Rates of attrition among men and women were equal yet there were differences in the timing of attrition, with women leaving the program earlier than men. Although these differences did not reach statistical significance, this was likely owing to the small sample size. Women composed a large overall percentage of the residency and 25% of these women had children during training. These women were not more likely to leave the program. Men choosing to participate in child rearing during training (32%) were not associated with an increased risk of attrition.

Further examination of the cohort of both male and female residents having children during residency did not reveal any decline in clinical performance compared with residents not participating in child rearing, based on case volume and board pass rates. Additionally, child rearing did not have an effect on ABSITE scores for either sex. Interestingly, women pursuing child rearing during training were significantly more likely to pursue fellowship training. Perhaps the additional time required for fellowship training is a factor in the decision not to delay pregnancy until after completion of training for some of these women or they believe that fellowship training may afford more career flexibility. However, it is also likely that these are highly motivated women who are unlikely to deviate from their career goals.

With more women entering the field of surgery than ever before, any attrition related to sex differences or child rearing needs to be carefully examined. A study by Arnold et al found that female medical students who completed their surgery rotation after the new work-hour limitations were more likely to believe that surgery could allow for a positive work-life balance. These students also held more favorable views of childbearing among female surgeons. While these changing perceptions are positive, it should be acknowledged that female surgeons are more likely to be childless or to have children later in life compared with male surgeons. The medical risks of delaying childbearing are significant. A recent survey revealed that 32% of female surgeons reported fertility struggles compared with 11% of the general population.
With increasing numbers of women entering surgical residency during prime childbearing years, the acceptance of pregnancy during residency is imperative. Furthermore, rates of child rearing for both male and female residents have been reported and are increasing.\(^1^7,1^8\) While accommodating maternity and paternity leave may place strain on a residency program, these adjustments must be made. By establishing written policies for leave and encouraging open communication and advanced notice, burden can be lessened. Furthermore, these policies may reduce perceived negative attitudes toward child rearing during training among surgery residents and faculty.

Our surgical residency program is large, with up to 50 categorical residents at a time and a high percentage of female residents. The incidence of pregnancy among our female residents has increased 4-fold, according to a recent study performed by our institution.\(^1^8\) While many of these women chose to have children during their research years, 60% of the women in this cohort had children during clinical years. Given the Family and Medical Leave Act mandating up to 12 weeks of leave for any woman after childbirth, residency programs must devise a way to accommodate this maternity leave.\(^1^8\) Our institution prioritizes maintenance of education for residents on service and aims to avoid overburden for covering residents. Schedule adjustments are based on the need for in-house coverage, service volume, number of residents on service, and the length of leave. Existing schedules can be adjusted to reallocate call shifts, residents can be redistributed to different services, and research residents can be used to cover clinical duties when needed. The aforementioned strategies, or combinations of such, have allowed residents to take their desired leave for child rearing without undue stress on their peers.

Our study was limited by the fact that it was a single-institution study. We have a long tradition of matriculating a high number of female residents and a high proportion of our residents choose to participate in child rearing during training. These factors may preclude wide application of these findings to other programs but they do highlight that neither sex nor child rearing need to be associated with attrition. Further investigation with a multicenter study is needed; however, we believe that programs should be prepared with systems in place to help support residents who elect to participate in child rearing during pregnancy.

Conclusions

Based on a review of 10 years of data in this single institution, women do not appear to be at increased risk for attrition. Furthermore, pregnancy and child rearing do not appear to be risk factors for leaving the program in either men or women. With the proper institutional support, child rearing during training can and should be accommodated and should not place residents at an increased risk for attrition.

ARTICLE INFORMATION
Accepted for Publication: March 21, 2014.
Published Online: July 16, 2014.

Author Contributions: Dr Brown had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Brown, Galante, Braxton, Farmer.
Acquisition, analysis, or interpretation of data: Brown, Galante, Keller, Braxton.
Drafting of the manuscript: Brown, Braxton.
Critical revision of the manuscript for important intellectual content: Galante, Keller, Farmer.
Statistical analysis: Brown, Keller, Braxton.
Study supervision: Galante, Farmer.

Conflict of Interest Disclosures: None reported.
Previous Presentation: This paper was presented at the 85th Annual Meeting of the Pacific Coast Surgical Association; February 17, 2014; Dana Point, California.

Additional Contributions: We thank Garth Utter, MD, University of California, Davis, for assistance with statistical analysis. He did not receive financial compensation.

REFERENCES