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International Journal of Innovative Surgery

Open Access | Research Article

How can we increase the number of general and rural surgeons in the United States? A study of 789 graduates from 3 campuses who matched into general surgery over 40 Years: 1974 to 2015

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Received: Mar 09, 2018

Accepted: Apr 13, 2018

Published Online: Apr 20, 2018

Journal: International Journal of Innovative Surgery

Publisher: MedDocs Publishers LLC

Online edition: http://meddocsonline.org/

Abstract

Background: There is a national shortage of general surgeons in the United States. The shortage is most profound in rural areas. Fewer general surgery graduates are practicing general surgery today. Attrition from general surgery residencies is a major problem as approximately 1 in 6 surgery residents leave their residency. Furthermore, less medical students are choosing general surgery as a career.

Design, setting and participants: A list of 6271 graduates of the University of Alabama School of Medicine from the Birmingham, Tuscaloosa and Huntsville campuses from 1974 to 2015 was obtained from the published records of the medical school's main campus in Birmingham. Residents who changed from general surgery to another specialty, were dismissed, quit medicine altogether, specialized early into an integrated program or completed and practiced a surgical subspecialty were included. Graduates from the Tuscaloosa Campus from 1974 to 2015 and graduates from the Birmingham and Huntsville Campuses from 2001 to 2011 were interviewed by telephone or sent surveys by mail.

Results: Ninety residents were identified from the study who changed from general surgery (1 had expired). Fifty-eight graduates (65.2%) responded. Eighteen graduates matched into non-5 year categorical positions before other surgical specialties such as urology, ENT and were excluded from the calculations. Nineteen (47.5%) graduates changed to another specialty. Fourteen (35%) graduates completed general surgery, then subspecialty fellowships and prac-

Cite this article: Avery DM, Harrell AG, Wallace JC, Geno CE, Taylor G, et al. How can we increase the number of general and rural surgeons in the United States? A study of 789 graduates from 3 campuses who matched into general surgery over 40 Years: 1974 To 2015. Int J Innov Surg. 2018; 1: 1003.

ticed surgical subspecialties.

Discussion: There are many suggestions as to how to increase the number of general and rural surgeons. Reducing attrition in general surgery residency programs is paramount. Attracting medical students to general surgery and increasing the number of those matriculating in surgery residencies has been proposed. Female medical students interested in general surgery should be actively recruited. Female medical students interested in general surgery careers are the great opportunity to correct the deficit of general and rural surgeons in this country. Making general surgery residencies more attractive to medical students may also increase the number of general surgeons.

Introduction

There is a national shortage of general surgeons [1-4]. The Association for American Medical Colleges [5] has predicted a shortage of 21,400 general surgeons by 2020 and fall in the number of general surgeons from 39,100 in 2000 to 30,800 in 2020 [6]. Today, fewer general surgery graduates are practicing general surgery today [7]. Adequate numbers of general surgeons are essential to provide healthcare especially in rural areas [7]. The lack of general surgeons is most profound in rural areas where health care is tenuous at best in many areas [7]. There has been a significant decline in the number of rural general surgeons since the 1980s [8]. More than 40% of the profit margin in rural hospitals comes from general surgery cases [9]. Without surgery services many rural hospitals will not survive [8]. A sufficient number of general surgeons is essential to care for the aging population which is increasing [8].

Attrition is a major problem in general surgery residencies which have the highest rate of attrition of all specialty training programs [10,11]. Approximately, one in 6 general surgery residents today leave residency [12,13]. The national attrition rate from general surgery is 20% [14]. More than half of surgery residencies are impacted by attrition and a third lose more than one resident [10]. More than half of general surgery residents consider quitting residency [15]. Uncontrollable lifestyle factors remain the most common reason that residents quit [13]. Unfortunately, twice as many females as males quit surgery training [12]. In a study by Elmore et al, 40% of residents responded that they would not even pursue a career in medicine again and 69% met the criteria for burnout [16]. Many medical students matriculating into general surgery residencies intend on specializing [17]. The number of medical students matriculating into general surgery residencies has not changed since 1980 [18].

Fewer medical students are choosing surgery as a career today [17]. Many medical students have lost interest in pursuing a career in general surgery [9]. There has been a decline in the number of medical students matching into general surgery for the past 3 decades [19-21]. Some 40% to 60% of medical students originally interested in general surgery, choose another career specialty [21]. Lifestyle was the number one reason that 83% of males and 63% of females decide against a surgery career [21]. Ninety-nine percent of medical students believe general surgery is the most stressful specialty and that affects their choice of career specialty [21]. The top 10% of medical students who should be the brightest and best students, do not find general surgery an attractive career today [22]. Overall, the pool of applicants to surgery residencies is shrinking and residency programs are having to go further down their match rank lists to fill positions [22]. Debt figures into what specialty medical students choose. General surgery pays more than other specialties, but unfortunately, it pays less than many of the surgical subspecialties [23].

Design setting and participants

This research was approved by the Institutional Review Board of the University of Alabama. Financial support was provided by the Institute of Rural Health Research of The University of Alabama. A list of 6271 graduates of the University of Alabama School of Medicine from the Birmingham, Tuscaloosa and Huntsville campuses from 1974 to 2015 was obtained from the published records of the medical school's main campus in Birmingham. Graduates assigned to the Montgomery Campus were not included in this sample since this campus was just recently opened. This list contained the years of matriculation and graduation, full names, specialty choice, name and location of PGY1 institution and name and location of residency. This database was expanded to include additional information listed in Table 1. Information was obtained primarily from Google Search Engine. Publicly available data from internet sources was selected as the primary source of information with verification from other sources when feasible, recognizing the positives as well as the limitations of internet-based data. Information was obtained on 6238 (99.5%) graduates assigned to the three campuses from 1974 to 2015. Physicians were identified by their practice website. The database was then configured into a SPSS database so that descriptive statistics could be applied.

Graduates who matched into General or Categorical Surgery but then changed into another specialty, were dismissed, quit medicine altogether, specialized early into an integrated program or completed general surgery followed by a subspecialty fellowship and practiced a surgical subspecialty were included in the sample for this study. Graduates who matched Non-5 Year Categorical positions (i.e. 1 year of surgery before ENT) were not included. Phase 1 of the study included graduates assigned to the Tuscaloosa Campus from 1974 to 2015 who withdrew from their matched surgery residency. Responses from Phase 1 was used to prepare survey questions for Phase 3. Respondents were not given incentives for participating in the study Phase 2 of the study included an analysis of the Tuscaloosa Campus surgery clerkship student evaluations for the last 10 years from 2005 to 2015 to see if there were improvements that could be made in the clerkship to attract more medical students to surgery residencies and careers (These data are discussed in another paper). Phase 3 included graduates from the Birmingham, Tuscaloosa and Huntsville Campuses who changed from general surgery residencies over the last 10 years of the study (2001 to 2011). Physicians were interviewed initially by some of the authors and those unable to be contacted were sent paper surveys to be completed and returned on two separate mailings. The sample survey is shown in Figure 1. The survey included a self-addressed, self-stamped envelope.

Results

A number of suggestions have been proposed to increase the number of general and rural surgeons in this country both from the literature review and our research (Table 2). Information was obtained from graduate surveys and telephone interviews from the three campuses and medical student surgery clerkship evaluations from the Tuscaloosa Regional Campus.

Reduce attrition in general surgery programs

Reducing attrition in general surgery residency programs is vital in increasing the number of practicing general surgeons. Methods of reducing attrition in general surgery residencies are illustrated in Table 3. It does not matter how many medical students match into general surgery residencies if a significant number resign. Program Directors and attending surgical faculty must be proactive about retaining residents [24,25]. They must be vigilant about identifying residents at risk and already considering leaving [26]. Residents need guidance during the residency with feedback, encouragement, evaluations, and milestones [27]. Residents need role models and mentors, who are gender specific and include women and underrepresented minorities [11]. Female residents need special accommodations for pregnancy, delivery, breastfeeding and childcare [28,29]. Since most residents quit during their first two years and their research year, emphasis should be placed on these particular years [13]. Residents also need to be exposed to private practice general surgeons who are successful, enjoy being a surgeon and appreciate the need for their services [19]. During the research year, residents are isolated from the rest of the residents which increases their risk of attrition [13,28]. Surgery residents during the research year need to stay involved with the other residents and the training program in order to avoid antecedent of attrition.

Progression of residency depends on the development of confidence [28]. Residency programs can take steps toward promoting resident confidence levels by offering more learning experiences, including clinical simulation [28]. Stopping bullying [30], belittlement [30], burnout [27,31] and discrimination of women [26] is imperative. Mentoring programs can be a first line defense against burnout [11]. Female surgery residents and attending surgeons need to feel welcome in the operating room. Psychological assessment may be useful in identifying those at risk for attrition [14]. Social support, intervention and counseling programs all help residents cope with stress which may reduce attrition [26].

Increase the number of medical students interested in general surgery

A number of ways to attract medical students to general surgery and increase the number of those matriculating in surgery residencies has been proposed (Table 4). Career counseling for medical students interested in general surgery careers is essential. Program Directors (PD) and surgery faculty need to be more involved with medical students who express an interest in a general surgery career [32]. Educating medical students about exactly what general surgery residency and practice is about is crucial in selecting a general surgery residency and career [12]. Attrition early in residency suggests that the actual residency training was different from medical school expectations of the new intern [16]. It is important for students pursuing a general surgery residency to understand the demands and expectations of a surgery resident [12]. Limited exposure to surgery during medical school poorly prepares medical students for the actual life of a resident who then they get discouraged and are at risk for quitting [32].

Students ask for more experiences with inpatient and outpatient care, the operating room, postoperative management, emergency department, postoperative assessment, daily rounds and emergency surgery [4]. In a previous paper, medical students evaluating the surgery clerkship requested more case studies, more surgical experience, elective time, more postoperative management, more subspecialty surgery exposure and more technical skills training [25]. An acting internship or "AI" allows a medical student to experience what it is like to be a surgery intern in an actual general surgery residency [33].

Students respond positively to role models and faculty mentors [34]. Students even respond well to resident role models [34]. Gender specific role models are important for female medical students interested in general surgery [13]. The minimal interest in surgery by underrepresented minorities is probably the result of the lack of underrepresented minority role models and mentors [26]. Mentors in medical school are important [26]. More importantly if the female medical students can learn from a female mentor that being a female surgeon can fit into a family oriented lifestyle they maybe more likely to pursue surgery and have reduced attrition attributed to this important life area [23]. Female mentors have the advantage of experience with pregnancy, breastfeeding, pumping and child-raising that males would not have [23]. Perceived satisfaction of the specialty by mentors is important [9].

Medical students need exposure to private practice general surgeons. Most of the exposure students get in the hospital is with surgery residents who are tired, exhausted, and overworked [11]. Bland and Isaacs proposed a number of recommendations to increase medical student interest in general surgery. They emphasized the need for general surgery, employment opportunities and the lifestyle of private practice general surgeons along with student participation in grand rounds, procedure seminars, special lectures, interest groups, websites, accommodation of female residents and shadowing private practice general surgeons in the community [35]. Positive clerkship experiences are critical for attracting medical students into general surgery [20].

Recruit female medical students interested in general surgery

Female medical students interested in general surgery should be actively recruited [9,17] (Table 5). Female medical students interested in general surgery careers are the great opportunity to correct the deficit of general and rural surgeons in this country. Female rural surgeons make up a larger percentage of rural surgeons than males [8]. Our medical school regional campus experience is that almost half of women who match into general surgery resign, which is a lost opportunity both for themselves, the specialty and for society. The percentage of women applying to the general surgery residencies is increasing [36]. Female medical students interested in general surgery should be actively recruited into general surgery residencies [9,17]. Women surgeons are more likely to recommend general surgery to female medical students than their male counterparts [17]. By enhancing our recruitment efforts, we will open the door to more women who would make excellent surgeons but may not have considered surgery as a career [34]. While male mentors are important historically, female role models and mentors have the advantage of experience with pregnancy, breastfeeding, pumping and child-raising that males would not have [23]. Therefore, having access to female mentors and faculty who practice surgery is one solution in the battle against attrition and increase female interest into surgery.

Providing accommodations specific for females is necessary to attract females into surgery residencies. Policies addressing pregnancy, maternity leave, breastfeeding and pumping

and parenting along with policies for contingency plans when female residents cannot work are important [10,23]. The most common benefit for female surgery residents is maternity leave [23]. It is imperative to change the culture of training programs which would make general surgery more appealing to women [12,23]. Half of medical students are women and 33% of surgery residents are female [37]. Females are concerned about training programs must address reports by female residents that they feel unwanted and unwelcome in the operating suite [12]. Negative attitudes toward female residents and surgeons must also be addressed [24]. Sexual harassment and sex discrimination of female residents cannot be tolerated [24]. Programs cannot tolerate bullying, belittlement, and mistreatment [38,39]. Residents subject to these problems are more likely to quit surgery residencies.

Make general surgery residency programs more attractive to medical students

Making general surgery residencies more attractive to medical students is a method of increasing the number of general surgeons (Table 6). General surgery residency programs must change the culture of the male-dominated specialty. Female surgery residents and female attending surgeons need to feel welcome. Medical student expectations have changed dramatically over the years, but residency programs have not made sufficient adjustments to keep up with new expectations [40]. Training programs must address reports by female residents that they feel unwanted and unwelcome in the operating suite [12]. There is no place for discrimination of women or underrepresented minorities today [26]. Programs cannot tolerate bullying, belittlement, and mistreatment [38,39]. Residents subject to these problems are probably more likely to quit surgery residencies. Although general surgery programs will need to continue prioritizing excellence in training and achieving sufficient quotas for patient care and procedures to practice surgery, these programs will also need to adapt to offer students modifications to meet the high demands and achieve an overall better quality of life [12,26].

While general surgery training will remain one of the most challenging programs, and no one program design can accommodate every lifestyle, improvements can be made to be more inclusive and supportive of dedicated residents [17]. The work hour restrictions are not just a good idea—they are the rule. Explaining the work hour restriction rules but not modifying responsibilities has a detrimental effect. In order to be more accommodating, work hour restrictions should be enforced to help reduce the overwhelming workload on residents—a workload that can be especially overwhelming to residents who are pregnant or raising children. Surgery residencies in the future will need to improve access to portfolios and evaluations so that residents fully understand the expectations of the program and where they need to improve [38].

Support programs, counseling, and crisis intervention are an important aspect in every type of residency but are imperative in general surgery due to the demands that are placed on residents. Individual therapy, marriage counseling, substance abuse counseling, and career counseling may be needed. Some residents report social support with spouses, family, and friends. Religious beliefs may help dealing with the stresses of residency. Other residents may not have this support and need mechanisms to deal with discouragement, exhaustion and burnout [13]. Other residents report using exercise to deal with these stresses. Discouragement can be overwhelming to the point of quitting residency and then intervention will not be successful [12]. Residents experiencing stress and burnout may benefit from counseling before giving up [13,24].

Burnout is a serious concern for general surgery residents of either gender. According to recent studies, 69% of all surgery residents meet the criteria for burnout, and female residents are more likely to be affected by and report burnout than their peers [10,23]. The long work hours required of a general residency are almost always cited as a primary reason for burnout. Almost half of general surgery residents consider quitting their surgery residency and an equal number would not select general surgery for a career [23]. Improved support systems, increased availability of mentors, crisis intervention, wellness programs, and counseling may help reduce burnout [26,34]. Brooks and Bosk found that "duty regulation hours had made the field of surgery more attractive to women and men seeking a more balanced life" [39]. It had been hoped the work hour restrictions would have reduced burnout but that has not been the case [24].

Providing students with more information about which environments are more likely to create burnout could be a useful intervention in burnout reduction. A study by the American College of Surgeons suggests that private practice surgeons are more likely to experience burnout and lower career satisfaction than surgeons practicing in academic settings [39]. Crisis intervention programs teach residents how to deal with fatigue, stress, work hours, disasters, bad outcomes, patient deaths, and litigation [34]. Residents are often overwhelmed because of the demands of surgery residencies compared to other specialties. The ability to deal with acute stresses may reduce attrition. Residency programs of the future will be competency-based [27]. New interns will know exactly what is expected of them and they will receive regular feedback [27] and residents will progress toward defined milestones [27].

A program that is reaching out to the community or even world to impact health care would represent a balance beyond just keeping up with their own training or workload. Faculty and staff that are involved with medical missions and community outreach could help residents and faculty connect with their community and provide a sense of worth for their talents. Many applicants show interest in medical missions. Mentors that share this interest would attract these applicants to general surgery. Missions is interest that adds balance. Hobbies and activities outside of the hospital also add life meaning that residents need to see. This minimizes burnout and frustration that would lead to resident attrition from the specialty.

The challenge is to design a surgery residency with an acceptable lifestyle and yet provide an excellent training program [12].

Maintain community based surgery programs

Continuing community-based general surgery residencies helps produce general and rural surgeons. Reasons to maintain community-based surgery programs are listed in Table 7. Discontinuation of community programs reduces the number of graduating chief residents in general surgery available to practice surgery. It has been one of the author's observation (DMA) that residents who train at community surgery residency programs, usually practice general surgery, many in Alabama and many in rural areas. Training at a community-based program reduces the likelihood of quitting residency [15]. Training at larger,

academic, university-based training programs is associated with less confidence while training in community-based programs have higher confidence [28]. Surgery residencies need to expand rural experiences to include rural surgery training tracks [8,25].

Psychological assessment of general surgery residency applicants

Psychological assessment may be useful in the selection of medical students for general surgery residency programs. Methods of assessment are found in Table 8. Ninety-nine percent of medical students rank general surgery as the first or second most stressful specialty [21]. Some medical students may tolerate stress better than others and may make better surgery residents [41]. Studies that have shown that residents who handle stress better have a greater sense of control over their life [31] and may thrive in a stressful environment such as general surgery [41]. These students have more self-esteem and self-confidence They like status and economic rewards, and learn by active participation [41]. These students appreciate that general surgery is a stress-producing career [41].

The World of Work Inventory Online (WOWI Online) multidisciplinary assessment has been used to determine a stable profile of surgeons and suitability for the surgical profession [14]. This has been shown to be a consistent, reproducible personality assessment which could useful in predicting success in a residency program and practice of surgery [14]. The question remains if it could be useful to predict success of matriculates to surgery residencies [14]. Grit is character trait defined as passion and perseverance for long-term goals which may be a marker for resident attrition [10]. Low scores are associated with residents contemplating leaving residency [10]. Many students interested in surgery have been described as "aggressive, self-confident, competitive, thick-skinned, and authoritarian. Have less anxiety, are resistant to stress [21]. Personality may determine specialty choice—desire to fix things, correct problems, and produce immediate results have been thought to be desirable for surgery [21].

The relationship with the patient is also meaningful for specialty choice. If the physician gets most satisfaction from the effects of surgery on the patient's problems, then the choice for surgery makes sense. If the relationship is most meaningful to the physician that develops over time in multiple encounters and multiple circumstances and is associated with long term trust, then family practice would make a reasonable career choice for the physician.

Simulation as part of residency training

Medical students respond positively to simulation in technical skills laboratories [42]. Simulation may help medical students develop and improve their technical skills which may increase their interest in surgery. Likewise, the opportunity to participate with robotic surgery in the operating room may also increases interest in surgery.

Increase the number of surgery residents in existing programs

Increasing the number of general surgery resident positions in current training programs seems like a logical solution to the shortage of general surgeons in this country. There are more applicants to general surgery residencies than positions and 99% of these fill each year [43]. Increasing the number of residents in current general surgery residency programs has been studied by Charles et al. [43]. There are two major challenges to increasing the number of residency positions: funding and teaching volume [43]. While surveyed residency programs reported that they had teaching volume for additional matriculants if funding were not an issue, that number is insufficient to address the current need [43]. Capacity in the current training programs would only produce an additional 378 graduating residents [43]. Increasing the number of residents in existing programs will not meet the needed numbers. There has to be enough surgical cases to train residents and meet the competencies. In addition, only 20% of the graduating chief residents actually practice general surgery; 80% pursue additional subspecialty, fellowship training [38]. According to Inglehart's article in the *NEJM* in 2010, Congress redistributed 900 unused positions for primary care and general surgery [44]. The real answer is increasing the number of general surgeons is retaining those in existing programs who vacate, change to another specialty, do a fellowship or pursue a surgical subspecialty.Expansion within current training programs is insufficient to meet the anticipated demand [43].

Increase the number of general surgery residency programs

Increasing the number of general surgery residencies to meet the need of general surgeons may seem obvious, but obtaining financial support to start a new residency program would be a formidable task. Finding sufficient teaching volume, diversity of cases, faculty, support staff and facilities would be a substantial challenge as well. Funding for new residency programs comes from the Centers for Medicare and Medicaid Services. Obtaining such funding is a major task [43].

Rural surgery training programs

Rural surgery training programs including rural surgery rotations, dedicated rural surgery tracks, immersion experiences, rural fellowships and transition to practice programs have been developed to train general surgeons for rural practice [45]. There are 11 such programs in the United States recognized by the American College of Surgeons [45]. General surgery residencies with rural tracks produce more rural general surgeons [7]. Traditional general surgery training does not adequately prepare graduating chief residents for rural practice because rural surgeons need to be competent in more surgical areas than just traditional general surgery such as ENT, OB/GYN and Orthopedics [46]. Surgical training in rural areas increases the likelihood of graduates practicing general surgery and practicing in a rural area [1,3,48]. Broadly based surgery training also increases the likelihood of practicing in a rural area [2].

Attract foreign general surgeons

Recruitment of general surgeons from other countries has been proposed [47]. Exact numbers of available foreign surgeons are not known. Foreign trained surgeons brings up questions of accredited training programs and credentials. Approximately 20% of current surgery residents are international medical graduates [48].

Re-Entry surgeons

Another source of general surgeons are those surgeons who re-enter general surgery practice for a variety of reasons including retirement, leave of absence, another specialty, a surgical subspecialty, the mission field, another vocation, or the armed forces. While these are all potential general surgeons, their total

numbers are probably small. The largest group is probably those entering the private sector from the armed forces. Some may require retraining, being precepted, monitoring, reviewed or training in newer techniques such as less invasive techniques.

Increase applicants from rural areas

Medical students and significant others from rural areas are more likely to return to practice in rural areas more than students from other areas [13]. Residents who train in rural areas are more likely to return to rural areas as well [13]. Residents interested in a rural practice are usually from a rural area [13]. Having grown up in a rural area or a spouse or significant other from a rural area is often predictive of practicing in a rural area [45]. Many residents like the rural lifestyle with hunting, fishing, and recreational areas [45]. The interest in an expanded scope of practice may also attract graduating residents to rural areas [31]. Rural scholarships and loans repaid by service for medical students and stipends for surgery residents may also be attractive for those who wish to practice in rural areas [45].

Make research year optional

Make the research year optional for surgeons interested in academic medicine and/or research. Research is also a common time residents quit general surgery because they feel disconnected. It may be that a research project or a quality improvement project during the rest of residency may be sufficient instead of an entire year devoted to surgery research.

Expand regional medical campuses

The experience at the University of Alabama School of Medicine in our research is that regional medical campuses produce a higher percentage of students who matriculate into general surgery residencies and ultimately practice general surgery compared to the main campus. Our suspicion is that main campus medical students may be exposed to subspecialty surgery and regional campus students are exposed primarily to general surgery. Longitudinal Integrated Clerkships may better expose medical students to general and rural surgery [49].

Improve reimbursement for practicing general surgeons

Fisher has proposed suggestions to rescue general surgeons including better reimbursement for emergency cases, unattached call, trauma, complex cases, and indigent care in Emergency Medical Treatment and Labor Act (EMTALA) cases (9). Additional reimbursement for trauma and unattached call may also be helpful.

Improve manageability of general surgery practice

Improving the manageability of practicing general surgery would make the specialty more attractive to medical students and general surgery residents. The physical stress of practicing general surgery includes 2 to 3 call nights a week, unpredictable hours, a huge workload, and long hours [50]. Surgeons are working longer hours, getting reimbursed less, and have less time for teaching [12]. Payment for quality, Meaningful Use, MIPs, governmental oversight, EMRs, threat of litigation and more complex patients complicate practicing surgery [12]. Flexibility in call, surgery and work schedules, job sharing, and part time positions would also help achieve balance in surgeon's lives especially for women raising a family [50]. General and rural surgeons spend long hours at the hospital because of emergency surgery, unattached call, trauma, night, weekend and holiday call. Trauma surgeons who handle trauma, unattached, holiday and night and weekend call to reduce after hours work improve lifestyle and manageability of general surgeons. Accommodation for female general surgeons described above would improve to ability of women to have a balanced life and practice general surgery

Discussion

Many suggestions have been proposed to increase the number of general and rural surgeons from the literature and from our research. Reducing attrition in general surgery residency programs is paramount since 44% of surgery residents in our study quit during training [4]. Attracting medical students into general surgery and increasing the number of those matriculating in surgery residencies is also important since medical student interest in surgery has been decreasing for the past 3 decades [19]. Female medical students interested in general surgery should be actively recruited [9] (Table 5). Female medical students interested in general surgery careers are the great opportunity to correct the deficit of general and rural surgeons in this country. Making general surgery residencies more attractive to medical students is a method of increasing the number of general surgeons [12].

Tables

Table 1: Expanded database of the University of Alabama School of Medicine graduates from the Tuscaloosa, Birmingham and Huntsville Campuses (1974-2015).

Matriculation Year	Zip Code
Graduation Year	RUCA Code
MD Granted Date	Rural/Urban Area
Full Name	MUC (Medically Underserved Community)
PGY1 Specialty	Board Certification
PGY1 Institution	Matched in Categorical Surgery
PGY1 City	Matched in Preliminary Surgery
PGY1 State	Practiced General Surgery
Training State to Practice State	Practiced General Surgery in Alabama
Practicing Specialty	Practiced General Surgery in Rural Alabama
Subspecialty	Practiced General Surgery in Rural U.S.
Rural Medical Scholars Program	Matched in Subspecialty Surgery
Primary Care/Other	Matched in Family Medicine
Practicing Matched Specialty	Practiced Family Medicine in Alabama
Practice Location	Practiced Family Medicine in Rural Alabama
Practice State	Practice Primary Care
Address	Practiced Primary Care in Alabama
Contact Telephone	Practiced Primary Care in Rural Alabama
Stayed in Alabama/Left Alabama	

Table 2: Suggestions to increase the number of general surgeons.

1	Reduce Attrition in General Surgery Residency Programs
2	Increase the Number of Medical Students in General Surgery
3	Recruit Female Medical Students interested in General Surgery
4	Make General Surgery Residencies More Attractive to Medical Students
5	Maintain Community-based General Surgery Programs
6	Psychological Assessment of General Surgery Applicants
7	Simulation as part of Residency Training
8	Increase the Number of Surgery Residents in Existing Programs
9	Increase the Number of General Surgery Residency Programs
10	Rural Surgery Training Programs
11	Attract Foreign General Surgeons
12	Re-Entry General Surgeons
13	Increase Applicants from Rural Areas
14	Make Research Year Optional
15	Expand Regional Medical Campuses
16	Improve Reimbursement for Practicing General Surgeons
17	Improve Manageability of General Surgery Practice

Table 3: Methods of reducing attrition in general surgery residencies.

1	Program directors must be proactive about retaining residents
2	Identification of residents at risk for attrition
3	Residents need guidance during training programs
4	Role models and mentors who are gender specific
5	Accommodations specific for female residents
6	Emphasis on years at high risk for attrition
7	Keeping residents connected during the research year
8	Improving confidence for residents
9	Exposure to practice general surgeons
10	Bullying prevention and belittlement
11	Reduce burnout
12	Reduce discrimination against females
13	Psychological assessment for residency
14	Social support, intervention and counseling programs

Table 4: Methods of increasing medical student interest in general surgery.

1	Career Counseling of Medical Students Interested in General Surgery
2	Better Education of Medical Students about General Surgery Residencies
3	Better Preparation of medical students for residency training
4	Better pre-matriculation screening and selection of medical students for surgery residency
5	Positive Gender Specific Role Models and Faculty Mentors
6	Exposure to Private Practice General Surgeons
7	Positive Clerkship Experiences

Table 5: Methods to recruit female medical students into general surgery residencies.

1	Female role models and mentors
2	Accommodations specific to female surgery residents
3	Reduce negative attitudes about female surgery residents and female surgeons
4	Change the male-dominated culture of training programs
5	Stop sexual harassment and discrimination against female residents
6	Stop bullying, belittlement and mistreatment of female residents

Table 6: Methods to make general surgery residency programs more attractive.

1	Change the culture of a male-dominated specialty
2	Make female surgery residents feel welcome and wanted
3	Discrimination against women and underrepresented minorities must stop
4	Reduce bullying, belittlement and mistreatment of residents
5	Prioritize excellence in training
6	Achieve sufficient quotas for patient care and procedures to practice surgery
7	Offer students modifications to meet high demands and better quality of life
8	Accommodations for female residents
9	Enforcement of work hour regulations
10	Make work responsibilities commensurate with work hours
11	Access to resident portfolios and evaluations
12	Make expectations of residents clear from the beginning of the residency
13	Develop support programs, counseling and crisis intervention
14	Address issues contributing to burnout
15	Structured mentoring programs

Table 7: Why community-based general surgery residencies should maintained

1	Contribute to the number of general surgeons
2	Higher percentage of graduates practice general surgery
3	Higher percentage practice in rural areas
4	Less likelihood of quitting residency
5	Higher confidence in community training programs

Table 8: Psychological assessment of general surgery residency applicants

1	Tolerance of Stress
2	World of Work Inventory Online (WOWI Online)
3	Grit as a marker for attrition
4	Personality Types

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