



Interactive multidisciplinary pilot workshop to improve medical student perception of and interest in breast surgical oncology

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ABSTRACT

Background: Exposure to breast surgical oncology (BSO) and the multidisciplinary management of patients with breast cancer is limited in medical school. The purpose of this study was to assess changes in student perceptions of BSO as a career following an interactive multidisciplinary workshop.

Methods: Pre-clinical medical students participated in a multidisciplinary, hands-on workshop, composed of breast radiology (BR), breast surgical oncology (BSO) and breast plastic reconstructive surgery (B-PRS). BR presented students screening and diagnostic breast imaging followed by hands-on ultrasound-guided biopsy on phantom simulators. BSO demonstrated lumpectomy, mastectomy, sentinel lymph node biopsy, and axillary lymph node dissections while B-PRS demonstrated oncoplastic techniques and autologous flap reconstruction with cadavers. Pre-and post-workshop surveys assessed student opinions on surgery and BSO. Results were compared using Wilcoxon Signed Rank, Wilcoxon Rank Sum, and Fisher's Exact.

Results: The workshop was attended by twenty-four students. There was a statistically significant increase in interest in BSO from 52% to 86% after the workshop ($p = 0.003$). The event improved understanding of the work and lifestyle in BSO for 79% (19/24). All students (100%) expressed interest to further explore BSO. The most common attractors to a career in BSO were impacts on patients' lives ($N = 23$), intellectual stimulation ($N = 22$), and earnings ($N = 20$). The most reported deterrents were lack of personal time ($N = 18$) and stress ($N = 15$).

Conclusion: An interactive, anatomically based exposure to multidisciplinary breast cancer surgery improves medical student perception and interest in BSO. Medical schools should consider incorporating similar events to foster interest in BSO and other surgical subspecialties.

1. Introduction

The number of medical students selecting a career in general surgery has declined in recent years, resulting in focused efforts to improve exposure and educational content for students [1]. Research shows that medical students are open to the idea of pursuing a career in surgery in pre-clinical years but this engagement decreases in subsequent years [2]. In particular, there is minimal exposure to more complex areas of surgery, such as breast surgical oncology (BSO) and the

multidisciplinary management of patients with breast cancer. Although pre-clinical medical school curriculum teaches some common breast pathologies and histological findings, the clinical years surgical exposure to BSO or complex general surgical oncology is institution-specific and not standardized. In the clinical setting, breast-related content has focused on basics of breast physical examinations but not approaches to management of breast-specific issues [3]. Treatment of patients with breast cancer often involves a team of breast surgical oncologists, radiologists, medical oncologists, radiation oncologists, pathologists, and

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plastic surgeons, amongst other specialties. As a result, physicians in multiple specialties such as internal medicine, family medicine and obstetrics and gynecology will routinely encounter breast-related disease; thus, appropriate screening, work-up and referrals are crucial to patient care. There is a clear need to augment both the exposure to and education on breast cancer at the medical student level.

Given that medical students in traditional United States programs must decide their specialty by the end of their 3rd year for sub-internships and residency applications, lack of exposure may prevent students from considering BSO and therefore deter them from pursuing a general surgery residency program. Research has shown that exposure through anatomy-focused pilot programs and pre-clinical surgical exposures increases medical student interest and perception of surgery [4, 5]. While this data is promising for increasing surgical interest among medical students, there is currently limited data on implementation of an educational program specific to BSO for medical students. The purpose of this pilot study is to assess changes in medical student perceptions of BSO following a hands-on interactive workshop exposure to BSO.

2. Methods

A multi-specialty, interactive workshop composed of breast radiology (BR), breast surgical oncology (BSO) and breast plastic and reconstructive surgery (B-PRS) was hosted for pre-clinical medical students at a single academic medical center. Students were invited to register for the event via class-wide emails. Participation in the event was voluntary, free of cost, and held in the evening after required medical school classes. The facilitators of the event were School of Medicine faculty and residents from their respective departments.

The event was a station-based program utilizing soft-embalmed Thiel cadavers in the anatomy lab. Students were divided into small groups and spent 30 min rotating through each station. BR presented screening and diagnostic breast imaging followed by a hands-on ultrasound-guided biopsy experience on phantom simulators. BSO demonstrated lumpectomy, mastectomy, sentinel lymph node biopsy, and axillary lymph node dissection procedures on soft embalmed cadavers. B-PRS demonstrated oncoplastic reduction, mastopexy, and autologous flap reconstruction on the cadavers. Surgical faculty and residents were present at the stations to perform the demonstrations, allow students to practice on the cadaveric tissue, and answer any questions.

Pre- and post-workshop surveys were designed in and distributed to students via REDCap electronic data capture tools to assess demographic data, current career interests, opinions on surgery, previous surgical exposure, and attractants/deterrents to a career in BSO [6].

Descriptive statistics were utilized to evaluate medical student demographic data, current career considerations, and previous surgical exposure. Participants' changes in their interest in BSO and confidence in pursuing a surgical specialty were compared in the pre/post surveys using Wilcoxon signed rank tests. Associations between prior surgical exposure and interest in surgical specialty were compared using Fisher's Exact test and Wilcoxon Rank Sum tests, respectively. All analyses were conducted using R (version 4.2.1), and a p-value <0.05 was used to define statistical significance.

3. Results

A total of 24 students attended the workshop and 23 (96%) completed the pre- and post-workshop surveys. Descriptive statistics for study participants are outlined in Table 1. Nearly all participants were female (95.7%) and a majority were in the first year of medical school (78.3%). Of the workshop attendees, 34.8% self-identified as a non-traditional student who did not apply to medical school shortly after completing undergraduate education and 22% as an underrepresented minority student from racial and ethnic groups that are underrepresented in the medical profession relative to the general population. Only

Table 1

Descriptive statistics for study participants, N = 23.

Survey Question	Frequency (n)	Percent (%)
Year in school		
1	18	78.3
2	4	17.4
3	1	4.3
Gender		
Female	22	95.7
Male	1	4.3
Underrepresented student		
Yes	5	21.7
No	18	75.0
Non-traditional student		
Yes	8	34.8
No	15	65.2
First generation college student		
Yes	3	12.5
No	21	87.5
First generation medical student		
Yes	20	83.3
No	4	16.7
Physician family member		
Yes	3	12.5
No	21	87.5
Surgeon family member		
Yes	3	12.5
No	20	87.0

Table 2

Participant reported surgical exposures, n (%).

Survey Item	Yes	No
<i>Exposure to surgery via:</i>		
Medical Student Enrichment Week	1 (4.2)	23 (95.8)
Shadowing	4 (16.7)	20 (83.3)
Student Interest Group Activities	15 (62.5)	9 (37.5)
<i>Specific shadowing experiences:</i>		
Anesthesia	5 (20.8)	19 (79.2)
Breast surgical oncology	0 (0.0)	24 (100)
Cardiothoracic surgery	2 (8.3)	22 (91.7)
Otolaryngology	0 (0.0)	24 (100)
Neurosurgery	1 (4.2)	23 (95.8)
Obstetrics-Gynecology	0 (0.0)	24 (100)
Orthopedic surgery	2 (8.3)	22 (91.7)
Plastic surgery	4 (16.7)	20 (83.3)
Urology	0 (0.0)	24 (100)

three attendees (12.5%) were first generation college students, although a majority (83.3%) were the first in their family to attend medical school. Few students (8.3%) reported having a family member who is a surgeon (see Table 2).

Eighteen students (75%) reported pre-event interest in BSO. On average, students reported an average of 2.2 (SD = 1.6) different types of previous surgical exposures, including through student interest groups (62.5%) and previous surgical shadowing (16.7%). No students reported previous shadowing specifically in BSO. Students who reported four or more types of surgical experiences (n = 6) had significantly greater confidence in their decision to pursue their selected specialty prior to the event (p = 0.04).

Before completing the event, seventeen students reported interested in a surgical career, five in a non-surgical career, and one student choose to not respond to the question. On the post-survey, eighteen students reported interest in surgical careers and five in non-surgical careers, with eleven students (48%) reporting higher interest levels in the post-workshop survey. While the relative number of students interested in a career in surgery remained similar, there was improved confidence in the students' initial surgical interest after completing the event (p = 0.04). There was an overall significant increase in student interest in BSO specifically after completion of the workshop (p = 0.003).

Student perceptions of BSO after completion of the workshop were

evaluated using a 5-point Likert scale, ranging from “strongly disagree” to “strongly agree” (Table 3). Students reported that the workshop increased their understanding of the breast surgery scope of practice (mean = 4.6) and improved their understanding of the lifestyle of a BSO (mean = 4.1). Most respondents disagreed with the statement “Shadowing surgeons of other surgical specialties made me less interested in breast surgery” (mean = 2.3) and “The lifestyle I wish to have is not compatible with a career in breast surgery” (mean = 2.2). All participants reported that they “agree” or “strongly agree” when asked if they intended to explore BSO further through shadowing. All participants reported “agree” or “strongly agree” that the experience improved their interest and understanding of the scope of breast cancer care.

Student responses regarding attractors and deterrents to breast surgery are shown in Tables 4 and 5. All respondents found BSO appealing because it is a well-respected profession and has a positive impact on patient’s lives (100%). A majority also found BSO-related earnings (87.0%) and intellectual stimulation (95.7%) to be attractors. The factors perceived to be most deterrent to BSO included a lack of time for relationships and hobbies (78.3%) and stress (65.2%). There were concerns about the overall competitiveness of the profession (78.3%) and competition for residency (91.3%). Students were not deterred by the thought of treating complex patients (8.7%).

4. Discussion

The breadth and quality of surgical education throughout medical school is imperative to cultivating interest, challenging perceptions, and attracting students to careers in surgery [7,8]. Demonstrating the entirety of the field of surgery during a surgical clerkship is not feasible due to time constraints of typical clerkships. There are multiple subspecialty pathways that can be taken after general surgery training, but students have minimal exposure to these pathways when thinking of their long-term career goals as a surgeon. For students to make fully informed decisions about their career trajectory, it is important that surgical educators offer opportunities for students to gain exposure to general surgery, as well as the surgical subspecialties which may be considered as part of future fellowship training. The purpose of this pilot experience was to provide students with a hands-on, educational experience in BSO and demonstrate the multidisciplinary approach to breast cancer care. The event was designed to be a concise, reproducible workshop that included exposure to breast screening and diagnostic imaging, image-guided biopsy, diagnosis, surgical management, and surgical reconstructive options.

The workshop structure utilized simulation to create an interactive

Table 3

Post-test perceptions of breast surgery by study participants, N = 23 1 = strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, and 5 = strongly agree.

Survey item	Median	IQR
The program has improved my understanding of the lifestyle of a breast surgeon.	4.0	4.0, 4.5
Shadowing surgeons of other surgical specialties made me less interested in breast surgery.	2.0	2.0, 3.0
This experience made me more interested in breast surgery.	4.00	4.0, 4.0
The program has improved my understanding of the scope of practice of breast surgery.	5.0	4.0, 5.0
The lifestyle I wish to have is not compatible with a career in breast surgery.	2.0	2.0, 2.5
I would fit in well with the culture/personalities associated with breast surgery.	4.0	4.0, 4.4
I intend to explore breast surgery further following my experiences with this event through shadowing.	4.0	4.0, 4.0
I intend to explore breast surgery further following my experiences with this event through a research project.	3.0	3.0, 4.0
If all surgical specialties had the same lifestyle constraints in residency, what would be your interest in breast surgery?	4.0	4.0, 4.0

Table 4

Participant reported attractors to BSO. Total number of participants was 23.

Survey Item	Attractor N (%)	Not an Attractor N (%)
Well respected profession	23 (100)	0 (0)
Earnings	20 (87.0)	3 (13.0)
Impact on patients’ lives	23 (100)	0 (0)
Academic specialty	13 (56.5)	10 (43.5)
Intellectual stimulation	22 (95.7)	1 (4.3)
Staying busy and significant workload	9 (37.5)	14 (60.9)
Competitiveness	13 (56.5)	10 (43.5)
Culture of specialty	8 (34.8)	15 (65.2)

Table 5

Participant reported deterrents to BSO. Total number of participants was 23.

Survey Item	Deterrent N (%)	Not A Deterrent N (%)
Workload and time commitment as staff	12 (52.2)	11 (47.8)
Stress	15 (65.2)	8 (34.8)
Lifestyle during residency	14 (60.9)	9 (39.1)
Length of residency	10 (43.5)	13 (56.5)
Potential earnings	3 (13.0)	20 (87.0)
Competition for residency	13 (56.5)	10 (43.5)
Treating complex patients	2 (8.7)	21 (91.3)
Job market post-residency	14 (60.9)	9 (37.5)
Lack of time for family/friends/hobbies	18 (78.3)	5 (21.7)
Culture of specialty (hierarchies, expectations)	10 (43.5)	13 (56.5)

environment where students were taught by specialty physicians. Exposure to surgical careers through simulation-based learning can stimulate interest in surgery and provides students with a low-stakes, non-threatening environment which both fosters interest and improves educational outcomes [9,10]. With a minimal time commitment of only 2 h from the faculty, the degree of exposure and instruction at the pre-clinical level was shown to be effective at improving student interest in BSO (p = 0.003).

Instead of a purely didactic experience, this workshop utilized soft-embalmed, Thiel cadavers for the surgical demonstrations as a means for fostering student engagement and demonstrating surgical techniques. Kimura et al. showed that surgical training through use of cadavers increases interest in surgery, as it provides more realistic instruction than traditional didactic teaching methods [11]. Soft-embalmed cadavers, compared to traditionally embalmed cadavers in formalin or ethanol, appear more life-like, have better color retention and simulate natural tissue [12]. The use of this type of cadaver has been found to be more preferable for surgical demonstration [12,13]. Existing research supports the use of cadaver-based anatomy teaching to improve student confidence and knowledge of anatomy pertinent to BSO [14]. However, in this laboratory session students were additionally able to assist with lumpectomy, mastectomy, axillary lymph node dissection and reconstruction demonstrations which has not been previously reported in the literature.

Following the event, the most significant reported attractors to BSO were prestige (100% agree), impact on patients’ lives (100% agree) and intellectual stimulation (95.7% agree). Prior studies have also reported intellectual stimulation, prestige, and the positive impact of procedures on patients to be attractors to surgical specialties [15,16]. Interestingly, the attractors identified by the medical students are similar to a study conducted by the American College of Surgeons, where faculty surgical oncologists reported higher satisfaction than other surgical subspecialties [17]. This implies that students’ perceptions of the field of surgical oncology mirror those of surgeons actively practicing in this area and supports our hypothesis that a single high quality event can appropriately expose students to the reality of surgical specialty practice. By increasing exposure through interactive workshops, students may decide that the initial deterrents for surgery, often cited as poor

lifestyle, increased length of training and lack of collegiality in training [18], may be lessened if a surgical subspecialty practice and lifestyle is perceived as more desirable. Negative perceptions can be challenged by creating opportunities for students to connect with surgeons and interact in a low-pressure environment, as done in this pilot study.

Although the event was open to all medical students, the students who voluntarily participated were 1st and 2nd year students in pre-clinical training. This highlights the desire of surgical exposure at the pre-clinical stage, prior to students starting their core surgery clerkships, which has been documented in prior publications [19]. Pre-clinical medical students are notably in an exploratory phase, learning about different career pathways and forming opinions on options. Pre-clinical students also have more free time to attend meetings and workshops, making it a suitable population to target.

According to the National Resident Matching Program (NRMP) data, 12.2% of US medical students go on to pursue surgical training, and of those, 13.2% become breast surgical oncologists [19,20]. Statistically, more students ultimately pursue non-surgical specialties. This workshop has educational value for students pursuing non-surgical careers as well as those interested in surgery or BSO. Breast cancer is routinely encountered in various specialties, especially primary care [21], and demonstrations of the process of patient workups and diagnoses may inform better screening awareness and referral patterns in the future.

While our pilot study was limited by small sample size, our initial results reported here support planned yearly events focusing on multidisciplinary cancer care and surgical oncology exposure. The data specific to radiology and plastic surgery experience were not evaluated individually under the scope of this initial pilot study but will be evaluated in future studies. Longitudinal studies evaluating the impact of this pilot study and specialty choice will also be conducted. Additional limitations to our study include this being a voluntary workshop attracting students with an interest in surgery, which could have an affect on the results of the study.

5. Conclusion

Breast surgical oncology is a surgical subspecialty that medical students have little exposure to during their training. This study successfully showed that an interactive multidisciplinary pilot workshop highlighting the complex scope of breast cancer care by breast radiologists, breast surgical oncologists, and breast reconstructive plastic surgeons improves medical student perceptions of BSO as a career. Medical schools should consider incorporating similar medical student outreach events to encourage exploration of BSO and other complex multidisciplinary surgical subspecialties.

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CRediT authorship contribution statement

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Declaration of competing interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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