



Anatomy Scholars Program for Medical Students Entering a Surgical Residency

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Abstract

A near-peer teaching experience for upper-level medical students could help prepare them for surgical residency by providing specific education opportunities and exposure to the field of surgery. Five medical students were selected to be near-peer teachers (NPTs) in gross anatomy, and then they reflected on their experiences. The NPTs spent the majority of effort in a teaching role, and reported improved NTS, anatomy knowledge, and dissection skills. MS1s and faculty also reported on the value of the ASP. Further development and evaluation of the ASP may be an excellent opportunity for future surgeons.

Keywords Surgical education · Nontechnical skills · Medical education · Teaching

Acronyms

ASP	Anatomical Scholars Program
NPT	Near-peer teaching
NPTs	Near-peer teachers
NTS	Nontechnical skills
MS1	First-year medical student
MS2	Second-year medical student
MS3	Third-year medical student
MS4	Fourth-year medical student

Background

Medical school prepares students for surgical careers by providing exposure to the field of surgery, developing technical and nontechnical skills (NTS), and teaching fundamental knowledge. New programs or courses that

complement the standard third- and fourth-year surgery clerkships may be needed to improve students' preparation for entering surgical residency programs. Interest in incoming interns' readiness for residency is demonstrated by the recent development of a "Resident Readiness Assessment Program" by the American College of Surgeons [1].

A near-peer teaching (NPT) program in gross anatomy for medical students entering surgical fields may address the need for improved preparation. The use of medical students as teachers is beneficial for both teachers and learners [2–6]. The success of NPT programs is premised on the idea that learners can communicate with peers more easily than with faculty, and this has been demonstrated in the unique environment of the anatomy lab [7–10]. While studies have shown the effectiveness of NPT for learners, faculty, and institutions, the benefits for the near-peer teachers (NPTs) may be underappreciated, particularly as related to surgical training.

We describe the implementation of a NPT program in gross anatomy. The primary goal of this project was to determine if and how this program could be helpful for students entering surgery residency programs. Secondary goals of this project included identifying other benefits of the new program and how the program might be improved.

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Activity

Description of the Program

At our institution, each class of 174 medical students completes 2 years of basic science curriculum (MS1 and MS2 years) followed by 2 years of clinical curriculum (MS3 and MS4 years). The first course in the MS1 year is an 8-week gross anatomy course, consisting of lecture and laboratory time. The College of Medicine faculty developed the Anatomy Scholars Program (ASP) with the intention for the program to benefit MS3s and MS4s interested in surgery by providing teaching experience, anatomical review, and broad exposure to surgery. The NPTs, henceforth referred to as Scholars, were chosen through a competitive application process that included indicators of interest in a surgical field, academic success, and relevant experiences. Part of the application was intended to identify Scholars who would use their time productively.

The Scholars' primary responsibilities were teaching in the lab, tutoring students, and facilitating a weekly journal club. Scholars' instruction to MS1s included answering questions about anatomical structures, helping with dissection, and discussing approaches to studying. Scholars met with anatomy faculty throughout the program to review anatomy and dissection techniques and to discuss optimal teaching methods. The quality of the Scholars' teaching was ensured by the selection of Scholars who had previously shown an aptitude for anatomy and teaching skills and by appropriate supervision of faculty. Scholars facilitated a weekly journal club attended by faculty from departments of anatomy, surgery, and radiology. Scholars chose articles related to surgical education, anatomy education, and NTS (see Table 1).

Evaluation of the Program

Approval for this study was obtained and classified by our Institutional Review Board as not human subjects research (Protocol # 249,983). All five Scholars, all MS1s ($n = 174$), and five faculty were invited to complete surveys that were designed and administered by two Scholars. During the last week of the program, Scholars completed a 5-item, open-response survey that asked about benefits, strengths, weaknesses, and potential improvements for the ASP. Anatomy faculty took a 4-item post-course survey that asked about the most beneficial aspects of the program and suggestions for improvement. Surveys of Scholars and faculty were administered online through SurveyMonkey, and responses were evaluated using content analysis.

MS1s completed an 8-item pre-course survey and an 8-item post-course survey, both administered on paper. Items assessed MS1s' perceptions of the ASP program using Likert-type scale and open-ended response options. For example, MS1s were asked to indicate, on a scale of 1 (not at all) to 5 (very), how comfortable they were with the Scholars and faculty. Responses were analyzed to compare aggregate changes in pre- and post- responses (unpaired) using independent groups Mann–Whitney U tests. Data analysis was performed using SPSS.

Results

All Scholars ($n = 5$) reported that they felt the ASP helped to prepare them for a career in academic surgery, with reasons of being in a faculty role ($n = 3$), practicing dissection and anatomy ($n = 3$), and developing NTS ($n = 2$) and teaching skills ($n = 3$). All Scholars ($n = 5$) believed they were able to develop NTS during the course. In elaborating on

Table 1 Articles chosen and discussed by the Anatomy Scholars in weekly journal clubs

Title	First author	Topic(s)
Core trainee boot camp, a method for improving technical and non-technical skills of novice surgical trainees. A before and after study	R. Bamford	Nontechnical skills, surgery
Is it just semantics? Medical students and their 'first patients'	N. Cohen	Anatomy, medical education
"Hands" figural teaching method in hepatic anatomy: a surgeon's teaching experience	L. Wang	Anatomy, medical education, surgery
Interprofessional approach for teaching functional knee joint anatomy	J. Meyer	Anatomy, medical education
Revisiting the merits of a mandatory large group classroom learning format: an MD-MBA perspective	S. Li	Medical education
Motivation in medical education	T. Pelaccia	Medical education
Efficacy of medical student surgery journal club	D. Berman	Medical education, surgery
The preferred attributes of a trauma team leader: Evidence from a discrete choice experiment	D. Mo	Leadership, trauma, surgery

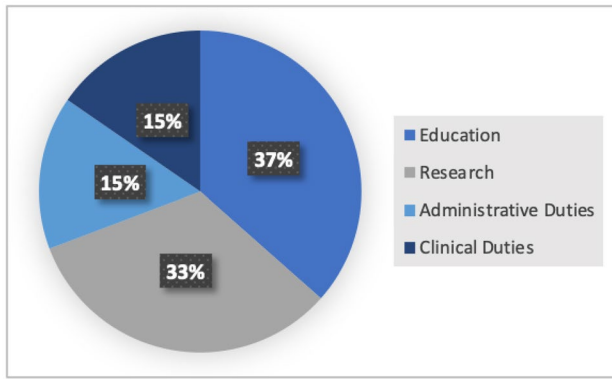


Fig. 1 Anatomy scholars' time was divided among the four components of academic surgery

which of the NTS they felt they had developed most, Scholars' responses included communication ($n = 4$), teamwork ($n = 4$), and leadership ($n = 3$). When asked what development they felt was most beneficial from the ASP, teaching skills was most common ($n = 3$); others were leadership and communication ($n = 1$), and anatomy ($n = 1$). When asked about components of the program that should be kept or changed in future years, the most common response was that journal club should be continued ($n = 3$). Suggestions for improvement included adding opportunities for Scholars to give lectures, offering structured tutoring for struggling MS1s, and adding a weekly Scholars meeting.

Scholars reported which activities they were involved with during the ASP and time spent on those activities was estimated (see Fig. 1). The greatest amount of time was spent in educational activities (37%) (e.g., teaching in the lab, review sessions, lab practical exams, journal clubs, attending lectures). Scholars also spent time in research activities (33%), administrative duties (15%) and clinical duties (15%). Administrative activities included advising MS1s and

assisting anatomy faculty. Clinical duties involved assisting in surgeries and surgery clinic, volunteering at student-run free clinics, and taking call on surgical services.

All faculty respondents ($n = 4$) believed that the Scholars had a positive impact on the course. They believed the most beneficial aspects of the program were improved learning for the MS1s ($n = 2$) and assistance for the anatomy faculty ($n = 2$). Faculty responses about which ASP components were beneficial included the review sessions for MS1s, the assistance during the lab hours to provide additional attention to MS1 questions, being relatable to the MS1s, and providing clinical perspective. All faculty ($n = 4$) favored continuing the program.

MS1 survey responses (Table 2) reflect response rates of 99% at pre-test (173/174) and 97% (168/174) at post-test. Pre-test responses were high across all items, indicating confidence in instructors and comfort in approaching them. Improvements were observed at post-test for items assessing comfort with approaching both faculty and Scholars.

Discussion

Results from the evaluation of this formal NPT program in gross anatomy indicate that the ASP was subjectively beneficial for students intending to enter surgery residency programs. Scholars practiced and developed NTS, gained experiences in many aspects of surgery, and improved their knowledge and skills in anatomy and dissection. To our knowledge, this is the first study to give primary consideration to how an NPT experience can be relevant for training in surgery.

Medical students entering surgical residency may be unprepared due to lack of exposure to the field of surgery [11]. In the ASP, students gained experiences to complement their clerkships. Specific tasks that are known to be

Table 2 MS1 pre- ($n = 173$) and post-survey ($n = 168$) descriptive statistics

	Pre-test mean	(SD)	Post-test mean	(SD)	Mann–Whitney U test, p -value
Confidence level in faculty's ability to adequately assist with your anatomical education	4.69	(0.58)	4.76	(0.49)	0.366
Confidence level in anatomical scholar's ability to adequately assist with your anatomical education	4.09	(0.86)	4.24	(0.73)	0.174
Comfort level with approaching faculty	4.35	(0.80)	4.55	(0.69)	0.010
Comfort level with approaching anatomical scholar	4.57	(0.65)	4.72	(0.62)	0.010
Importance of adequate number of instructors during gross anatomy dissections	4.92	(0.37)	4.99	(0.11)	0.005
Importance of faculty present during gross anatomy dissections	4.88	(0.41)	4.95	(0.24)	0.032
Importance of anatomical scholars present during gross anatomy dissections	4.58	(0.69)	4.72	(0.61)	0.045
Anatomical scholars should continue in the future to assist anatomy faculty with teaching the Human Structure course	4.69	(0.56)	4.83	(0.43)	0.006

beneficial, such as taking call, could be incorporated into the ASP in a more structured way in future years.

The importance of NTS has been increasingly recognized in surgery [12–18]. While our findings that Scholars had improved NTS are subjective, there should be interest in any program that might lead to such development. The importance of teaching skills has also been recognized. Most general surgery residency program directors believe residents' ability to teach is an important part of their job, but they are reluctant to incorporate teaching education due to time constraints [19]. The ASP experience addresses this need by developing teaching skills earlier in the medical education continuum.

The main limitation of our study is the small sample size because only the first year of the program was evaluated. Another limitation is the subjectivity of results. Evaluation of NTS is challenging, but methods such as clinical exams could be adapted to assess NTS development more objectively in the ASP in future years [20, 21].

Although Scholars believed the ASP did provide leadership development, the ASP could have a more intentional focus on leadership development in the future. Topics important for surgical leadership that could be focused on with discussions or workshops include problem-solving, diversity and inclusion, and leadership styles [22–24].

Further evaluation of the ASP should explore Scholars' competitiveness for residency applications. Both USMLE 1 and 2 scores are predictors of success on American Board of Surgery In-Training Exam (ABSITE) scores [25]. With USMLE Step 1 moving to a pass/fail grading system beginning in 2022, a competitive NPT program may allow applicants to demonstrate competitiveness among peers.

Objective results of the ASP could include assessing Scholars' career trajectories. Following the first year of the ASP, the one MS4 Scholar matched into a preliminary general surgery year and a guaranteed interventional radiology residency program. The four MS3 Scholars matched into general surgery ($n=2$), vascular surgery, and family medicine residencies. The College of Medicine administration intends to continue the ASP.

The ASP is a competitive NPT program that complements surgical clerkships to prepare medical students for surgical residency. In addition to helping Scholars, the program conferred benefits to MS1s and anatomy faculty. The program could be adapted and expanded in future years and may be an excellent opportunity to address needs in the preparation of medical students entering residency.

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Author Contribution AG and JTG performed the literature search, data collection, analysis and interpretation, and writing of the manuscript. RJR and CRT performed statistical analysis, interpretation, and editing.

MKK and DD contributed to study design, conceptualization, and editing. HN, MP, and ZS contributed to study design and data collection. All authors were involved in drafting and editing the manuscript.

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Declarations

Ethical Approval Approval for this study was obtained and classified by our Institutional Review Board as not human subjects research (Protocol # 249,983).

Informed Consent Informed consent was not applicable in this study.

Conflict of Interest The authors have no conflicts of interest to declare.

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