

Assessing interest in cardiothoracic surgery at an osteopathic medical school: Results of an institutional survey



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ABSTRACT

Objective: Cardiothoracic surgery is a surgical subspecialty that attracts few medical students. As integrated surgical residency programs continue to grow in number, there is increased interest in what factors influence specialty selection during undergraduate medical education. Previous institutional studies have studied allopathic medical schools affiliated with academic institutions. This study aimed to assess the interest and perception of cardiothoracic surgery at an osteopathic institution.

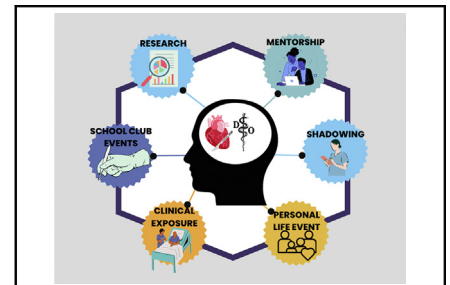
Methods: Active medical students at a US osteopathic institution were invited to complete an original online survey. Means and 95% confidence intervals were calculated and graphed for questions using Likert scale responses. Comparison of mean responses for preclinical versus clinical students was assessed by a Kruskal–Wallis nonparametric analysis of variance.

Results: There were 166 surveys (22%) completed, and interest in cardiothoracic surgery was indicated by 7.8% of respondents. Work/life balance, personality of cardiothoracic surgeons, and lack of family time were negative factors associated with cardiothoracic surgery. Clinical exposure, shadowing, mentorship, and significant personal/life events before medical school were strong factors in establishing students' interest in cardiothoracic surgery. Preclinical students noted exposure to cardiothoracic surgery would further increase their interest when compared with clinical students ($\mu = 3.39$ vs $\mu = 2.69$, $P = .008$).

Conclusions: All factors that established interest in cardiothoracic surgery occurred before students entered medical school. Although there are negative perceptions associated with cardiothoracic surgery, these may be ameliorated with more exposure to the field. Further research is needed to explore how early exposure in preclinical years of medical school affects students' perceptions and ultimate interest in cardiothoracic surgery. (*JTCVS Open* 2023;15:332-41)

Cardiothoracic (CT) surgery is a subspecialty of surgery that has traditionally struggled to attract medical students into its training programs. Recent reports suggest that interest in CT surgery has been decreasing among medical

students over the last decade.¹⁻³ Factors that decrease interest in CT surgery include work/life balance, length of residency training, and the personality of CT surgeons.⁴ With interest in CT surgery decreasing, there will continue



Avenues to CT surgery exposure for premedical and preclinical students.

CENTRAL MESSAGE

Although there are negative perceptions associated with CT surgery, these may be ameliorated with more exposure to the field during premedical and preclinical years.

PERSPECTIVE

This study demonstrates the continued need for the field of CT surgery to engage and invest in future physicians during their premedical years. The first 2 years of medical school seem to be a malleable time for students exploring specialties. These data suggest investigating how early exposure affects students' perceptions and ultimate interest in CT surgery.

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The Institutional Review Board of the Alabama College of Osteopathic Medicine classified this project as exempt (HS220801-E) and was initially approved on August 2, 2022. Students took the anonymous survey voluntarily and gave written consent.

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Abbreviations and Acronyms

CT	= cardiothoracic
NRMP	= National Resident Match Program
OMS-I	= first-year osteopathic medical student
OMS-II	= second-year osteopathic medical student

to be a shortage of CT surgeons. It is predicted that by 2035, the national CT caseload will increase by 61% due to the aging population and by 121% for each CT surgeon.¹

Previous institutional studies assessing interest in CT surgery have been conducted at large allopathic medical schools within an academic institution.³⁻⁷ Although most medical students are educated in the allopathic profession, currently 25% (7416 students in 2022) of each graduating class are educated in the osteopathic profession.⁸ Osteopathic medical schools serve as a large subset of the medical school population and have not been considered as a subset when studying interest in the CT surgery specialty.³⁻⁷ Although most osteopathic medical schools are in rural areas and are not connected to an academic institution, it should not prevent studies assessing the interest of osteopathic medical students' interest in surgical subspecialties throughout medical school.

This study is the first of a series that will assess osteopathic medical students' interest in CT surgery from one institution at the beginning of the academic year, determine the impact of a CT Surgery Committee on preclinical student's interest in the field, and nationally assess osteopathic medical student's interest in CT surgery who are members of the American College of Osteopathic Surgeons-Medical Student Section. The purpose of this study was to determine what experiences or opportunities drove medical students toward a specific specialty of interest, what factors made them want to pursue or not pursue a surgical specialty, and ultimately assess the interest and perception of CT surgery at an osteopathic institution.

MATERIALS AND METHODS

The Institutional Review Board of the Alabama College of Osteopathic Medicine classified this project as exempt (HS220801-E) and was initially approved on August 2, 2022. Students took the anonymous survey voluntarily and gave written consent for publication of study data.

Study Recruitment and Design

Students actively enrolled at the Alabama College of Osteopathic Medicine during the 2022 to 2023 academic year were eligible for inclusion. The Alabama College of Osteopathic Medicine had 756 students enrolled in its osteopathic training program during the study period. Of those, 400 (52.9%) were female, 96 (12.7%) were Alabama residents, 288 (38.1%) were Florida residents, and 151 (20%) were classified as underrepresented in the medical profession. Students are subjected to a standard medical school curriculum, with the first 2 years dedicated to the study of medical sciences (preclinical students) and the second 2 years dedicated to the study of clinical medicine via experiential clinical rotations (clinical students).

Preclinical students can join and participate in the American College of Osteopathic Surgeons-Medical Student Section school chapter to gain exposure to general surgery. However, there were currently no CT surgery events conducted before or during the study period. Clinical students can complete 3 elective rotations during their third year when they may have the opportunity to complete a rotation in CT surgery if their clinical site offers that elective or they can travel to a site that does offer a CT surgery elective. There were 410 preclinical students (54%) enrolled during the study period. The parent institution of the Alabama College of Osteopathic Medicine is Southeast Health, a not-for-profit community health system with 420 beds. Clinical students are able to complete rotations at 32 different sites located in Alabama, Florida, Mississippi, and Georgia. A total of 6 preceptors across 4 sites provide clinical students with electives in CT surgery.

An original survey was created to identify specialty interests, determinants of interest, reasons for and reasons against the pursuit of a surgical specialty, the interest and perception of CT surgery, and the perception of preclinical exposure to surgery and CT surgery among current medical students of all levels. After reviewing existing survey instruments, a de novo online survey instrument was constructed with input from past literature.^{4-6,9} The survey instrument questions were developed by authors A.D.V., A.W., M.C.R., and M.S. with input and review by the co-authors. The instrument was then tested by a focus group of medical students with feedback incorporated by the survey designers as appropriate. Baseline demographics, medical specialty interest, interest in CT surgery, reasons for pursuit of a surgical specialty, reasons against pursuit of a surgical specialty, experiences that influenced specialty interest, and the perception of CT surgery and preclinical exposure to surgery were evaluated. The survey instrument questions are provided in [Online Data Supplement](#). The survey was created with an online survey platform and distributed to all medical students via class e-mail list-servs and class GroupMe chats. The survey was conducted over 6 weeks at the beginning of the academic year (August to September), with a GroupMe message distributed after 3 weeks to each medical school class and a single reminder e-mail sent 1 week before the deadline to complete the survey. Only completed surveys were included in the data analysis.

Statistical Analysis

Active medical students from all years at the medical school were invited to complete an original online survey via Qualtrics XM (Qualtrics). A total of 176 survey responses were initiated; however, 10 were excluded from analysis for not participating beyond the initial question of consent. Statistical analysis of data was performed using IBM SPSS Statistics for Windows, Version 28. Chi-square analysis (2-tailed) was used to compare the difference in response probability between preclinical students, as defined by first-year and second-year osteopathic medical students (OMS-I and OMS-II, respectively), and clinical students, as defined by third- and fourth-year osteopathic medical students.

Questions assessing participants' Likert scale (1 = strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, and 5 = strongly agree) ranked responses were also used. Mean values and standard error were calculated for the total population and for the clinical and preclinical subpopulations. Differences between mean rank values between clinical and preclinical students were compared with a Kruskal-Wallis nonparametric analysis of variance (2-tailed). GraphPad Prism version 9.5.0 for Windows was used for the generation of graphs.

RESULTS

Demographics

There were 166 surveys (22%) completed. Of those 166, 42 (25.3%) were OMS-I, 56 (33.7%) were OMS-II, 31 (18.7%) were third-year osteopathic medical students,

and 37 (22.3%) were fourth-year osteopathic medical students. A total of 93 of the 166 students were female (56.0%). The majority of participants were aged 25 and 26 years, 21.7% and 19.9%, respectively. Furthermore, 150 (90.4%) of the 166 responses were nontraditional students not matriculating into medical school immediately after the completion of their undergraduate degree.

Interest in Cardiothoracic Surgery

Most students selected subspecialties such as family medicine, internal medicine/medical subspecialty, general surgery/surgery subspecialty, and emergency medicine in response to questions regarding what specialties students were interested in. More than 40 participants were interested in each of these categories (Figure 1, A). Trauma

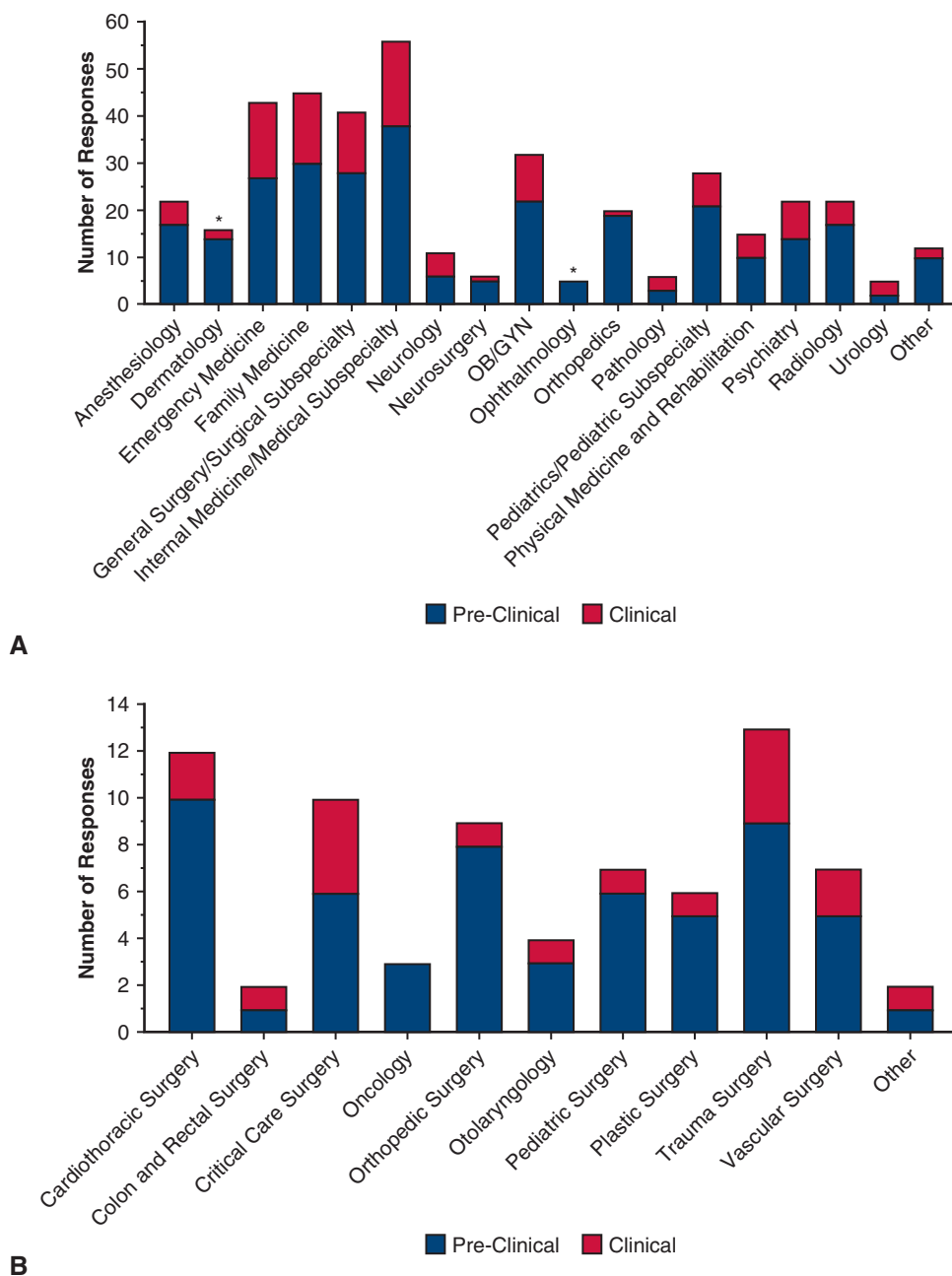


FIGURE 1. Specialties and surgical subspecialties of interest to students. The total number of survey responses for the listed specialties (A) and subspecialties (B) are depicted in the bar graphs. The number of preclinical (blue) and clinical (red) student responses are depicted for each specialty and subspecialty, with the total number of responses depicted by the stacked bars. Statistical difference between the proportion of preclinical and clinical student responses for each specialty and subspecialty were assessed via chi-square analyses, and significance ($P < .05$) depicted with an asterisk (*). OB, Obstetrics; GYN, Gynecology.

surgery, CT surgery, critical care surgery, and orthopedic surgery were the highest choices to questions regarding surgical subspecialty interest after selecting general surgery/surgical subspecialty (Figure 1, B). Preclinical students represented 10 of the 12 students interested in CT surgery.

Factors Influencing the Pursuit of Surgery

Main reasons to not pursue surgery were hours associated with residency training, lifestyle as a resident, and lifestyle as an attending surgeon, with mean values of all students at 3.94, 4.10, and 4.08, respectively, when participants were asked to select multiple reasons why they chose not to pursue surgery (Figure 2). Preclinical students rated a 2.06, and clinical students rated a 2.89 and an overall score of 2.41 ($P = .005$) when asked if surgical subject matter was

uninteresting. This question was given if students selected any specialty other than surgery, regardless of if they also picked surgery. This significant difference could indicate that preclinical students find surgery in general more interesting than clinical students. Preclinical students rated a 2.84 and clinical students rated a 2.36 and an overall rating of 2.64 ($P = .033$) when asked to rate lack of exposure to surgical fields as a reason to not pursue surgery.

Participants picked future job security, compensation, and previous work experiences as factors to consider surgery when given questions to rank the factors that contributed to considering surgery (Figure 3). On the Likert scale detailed above, both preclinical and clinical students considered future job security and compensation equally valuable, with preclinical students rating job security at

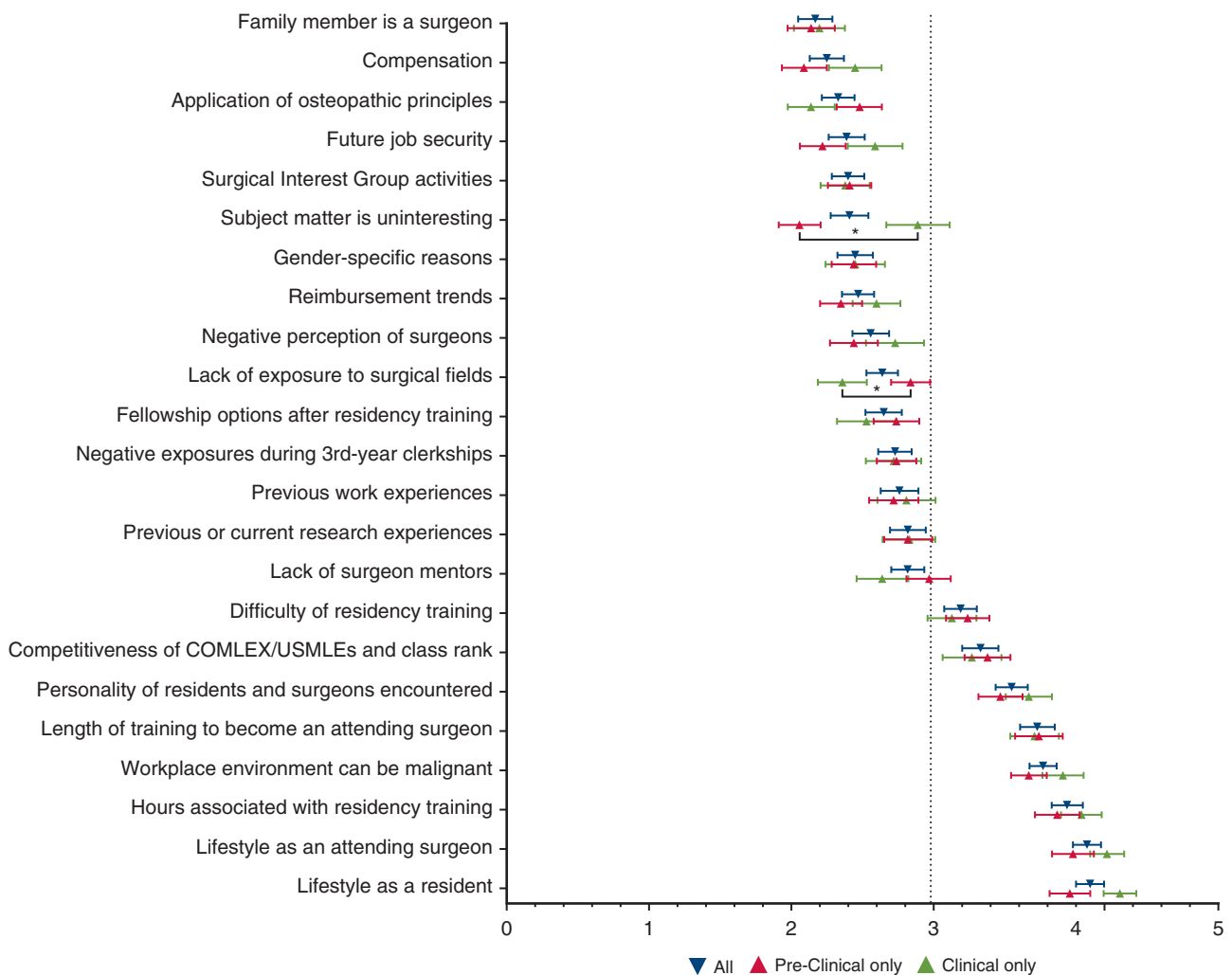


FIGURE 2. Factors influencing decision to not pursue surgery. Participants were asked to rank their responses (1-5) for the factors influencing their decision to not pursue surgery. Mean ranks for all respondents (blue) are depicted, with the mean ranks for the preclinical population (red), and the clinical population (green) depicted below the total for each question. Error bars are indicative of the standard error of the mean. Differences between responses in the preclinical and clinical populations were compared with a Kruskal–Wallis test, and significance ($P < .05$) denoted by an asterisk (*). COMLEX, Comprehensive Osteopathic Medical Licensure Examination; USMLE, United States Medical Licensing Examination.

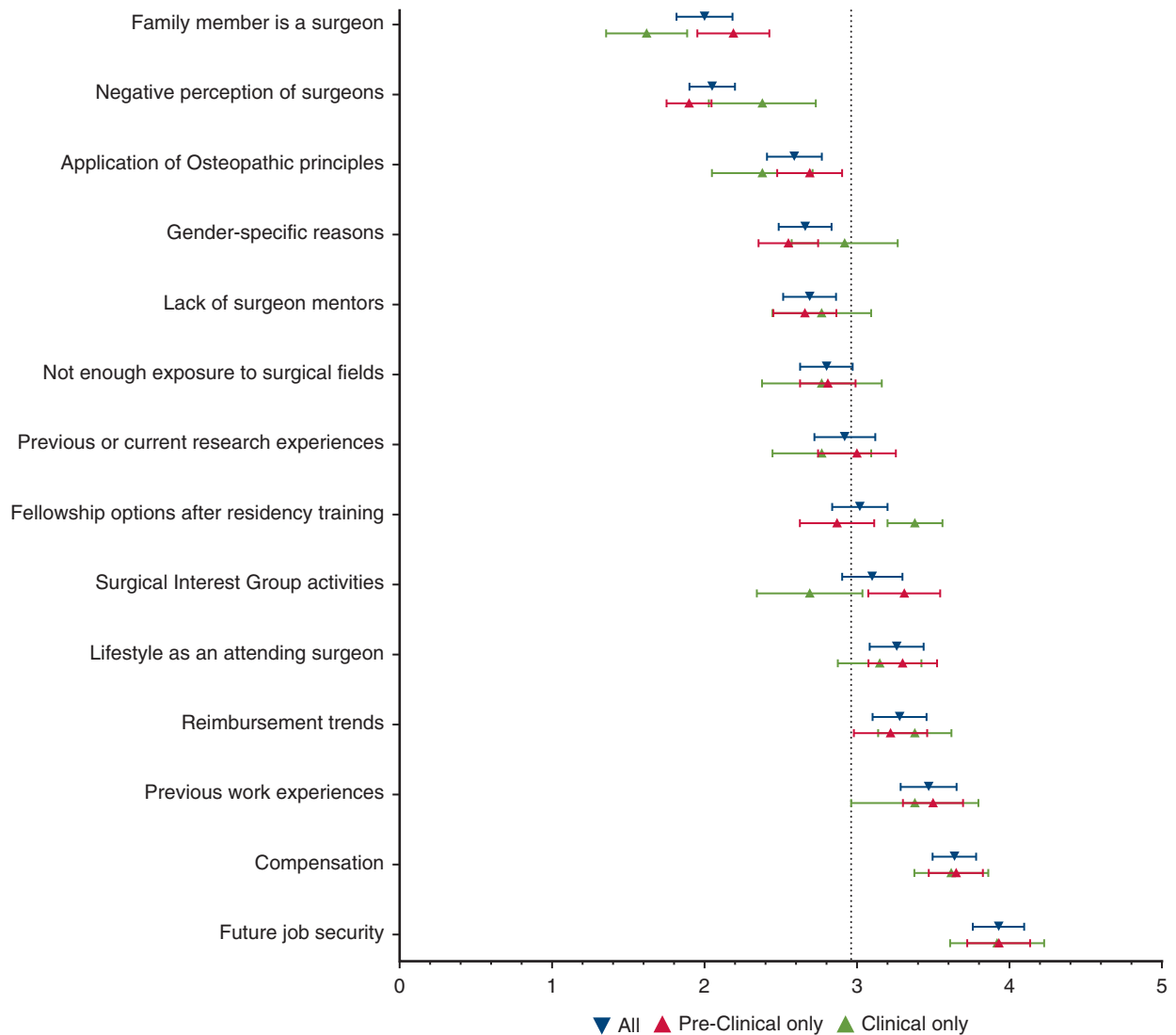


FIGURE 3. Factors influencing decision to pursue surgery. Ranked responses for the factors influencing respondents’ decision to pursue surgery are depicted in the graph above. Mean ranks for all respondents (*blue*), the preclinical population (*red*), and the clinical population (*green*) are depicted for each question. Error bars are indicative of the standard error of the mean. Differences between the mean ranks in the preclinical and clinical populations were compared with a Kruskal–Wallis Test, and significance ($P < .05$) denoted by an asterisk (*). ACOM, Alabama College of Osteopathic Medicine; OMS, Osteopathic Medical Student.

3.93, clinical students rated it 3.92, and the overall rating was 3.93. Compensation was rated 3.65 by preclinical students, 3.62 by clinical students, and an overall rating of 3.64. Preclinical students differed slightly for previous work experiences at 3.5 compared with clinical students at 3.38, with the overall rating at 3.47.

Factors Developing Interest in a Particular Field

For both preclinical and clinical students, clinical exposure before medical school, shadowing before medical school, mentorship before medical school, and events conducted by interest groups at the school during preclinical years were considered the most important factors, selected by more than 30% of students, when given questions

regarding what influenced their decision to consider their field of interest (Figure 4, A). Another large contributor for preclinical student interest in their field was significant personal/life events before medical school, with 37 (37.76%) preclinical students considering this statement important compared with 19 (27.94%) clinical students. Clinical exposure, clinical rotations, and mentorship during clinical years were selected by 27 (39.71%), 33 (48.53%), and 30 (44.12%) clinical students, respectively. Of clinical students, 41 (60.29%) considered research before medical school in a particular field an important factor. One area of significant difference ($P < .05$) was volunteering before medical school. Of preclinical students, 34 (34.69%) found this statement important to developing interest in a

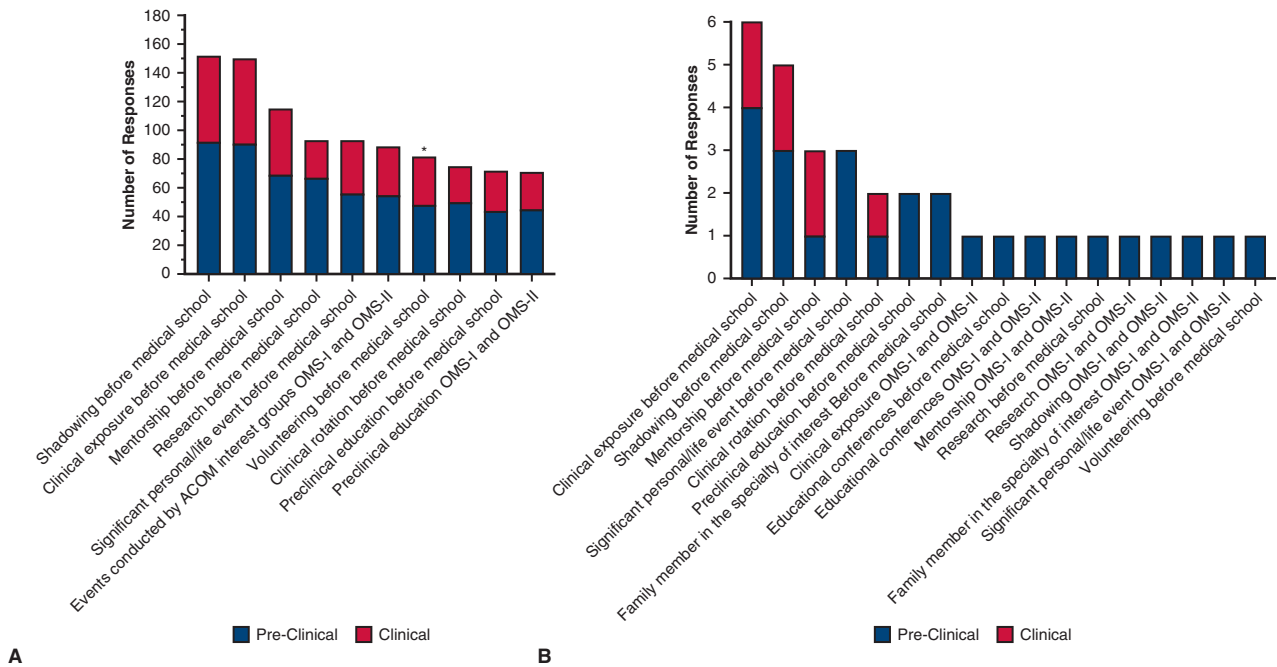


FIGURE 4. Factors that started and continued interest in specialties and CT surgery. The total number of survey responses for the factors that started/continued student interest in their specialty for preclinical (blue) and clinical (red) students are depicted in graph (A). For survey participants who indicated an interest in CT surgery, the factors that started/continued their interest are denoted in graph (B). Differences between the proportion of preclinical and clinical student responses were assessed via chi-square analyses, and significance ($P < .05$) depicted with an asterisk (*). *OMS-I*, First-year osteopathic medical student; *OMS-II*, second-year osteopathic medical student.

particular field, and 14 (20.59%) clinical students agreed. Of note, due to the large number of factors included for this survey question group, only the factors with a response selection rate of greater than 25% are depicted in Figure 4, A.

Clinical exposure before medical school, mentorship before medical school, shadowing before medical school, and significant personal/life events before medical school were primary reasons for pursuing CT surgery when given a question regarding what influenced their interest when exposed to preclinical and clinical environments (Figure 4, B). This question was given to any participant who selected CT surgery as an interest.

Perceptions of Cardiothoracic Surgery and Preclinical Exposure

Students were asked to rate predetermined perceptions of CT surgery and preclinical exposure (Figure 5). Preclinical students considered CT surgeons leaders of the healthcare team at a higher rate than clinical students, 3.61 versus 3.19 ($P = .049$). Preclinical students also considered CT surgeons to be appropriately compensated for their work at a higher rate than clinical students, 3.94 versus 3.54 ($P = .029$).

The biggest differences were seen when asked if interest groups played a role in elective selection and specifically

for CT surgery. Interest group involvement during preclinical years could be impacting elective choices. Preclinical students rated this 3.47 compared with 2.52 ($P < .001$) for clinical students. When asked to rate if more exposure to surgery during preclinical years would increase interest in surgical fields, preclinical students rated this 3.78 compared with 2.9 ($P < .001$) for clinical students. Last, students were asked if more exposure to CT surgery during preclinical years would increase interest in the field, which preclinical students rated 3.39 compared with 2.69 ($P = .008$) for clinical students.

As summarized in Figure 6, the preclinical years seem to be a malleable time for medical students as they explore different specialties in medicine. These 2 years could be paramount to the field of CT surgery.

DISCUSSION

Although osteopathic surgery residents represent a minority of surgery residents, it does not correlate to their lack of success. Recent work demonstrates that most programs consider that osteopathic surgery residents are competitive with allopathic residents when applying to fellowship programs.¹⁰ In addition, a recent study noted that allopathic and osteopathic orthopedic surgery residents scored similarly on in-training examinations.¹¹ Osteopathic medical students and residents may be a market of untapped

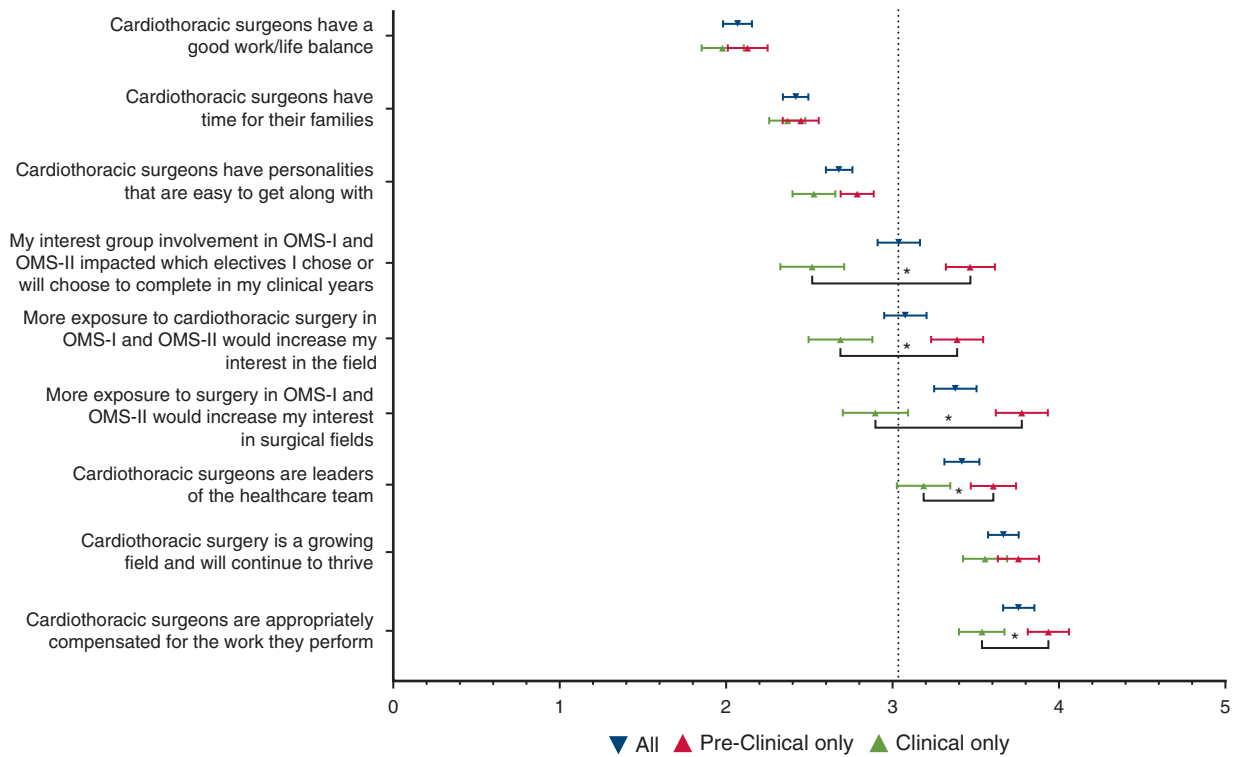


FIGURE 5. Perceptions regarding CT surgery and preclinical exposure. Likert scale responses were collected for questions pertaining to participant perceptions regarding CT surgery and preclinical exposure. Mean ranks for all respondents (*blue*), preclinical respondents (*red*), and clinical respondents (*green*) are depicted for each question. Error bars are indicative of standard error of the means, and the differences between the mean ranks in the preclinical and clinical populations were compared with a Kruskal–Wallis test. Significance ($P < .05$) is denoted by an asterisk (*). *OMS-I*, First-year osteopathic medical student; *OMS-II*, second-year osteopathic medical student.

potential that may be worth exploring as more surgeons are needed in the workforce. Currently, 2% of the CT surgery field is composed of osteopathic surgeons.¹² As more CT surgery integrated programs are developed, it has become instrumental for the field to determine how to increase interest in CT surgery and what factors contribute to a medical student’s interest or lack thereof in the field and other surgical subspecialties. The most recent National Resident Match Program (NRMP) match data demonstrate that osteopathic seniors matching into surgery has not continued to increase as surgical residency spots have in comparison with their allopathic counterparts.¹³ In continuation, osteopathic seniors matching into CT surgery have remained at 1 person for the past 3 years as CT surgery integrated positions have increased.¹³ It is worth noting that there are only 47 spots currently available for CT surgery residency. Only 4 osteopathic medical students applied for the 2022 NRMP match, demonstrating a 25% match rate. On the other hand, 76 allopathic students applied for a CT surgery residency in the 2022 NRMP match, demonstrating a 53.9% match rate.¹³ It is well established that integrated CT surgery programs attract those with peer-reviewed publications, stellar academics, and an evident dedication to the

field.¹⁴ This means that students interested in the field should be starting as early as possible to prepare themselves to be competitive for the match.¹⁴ The traditional pathway remains an option to produce more CT surgeons as well. However, Kilcoyne and colleagues¹⁵ demonstrated that although there is a traditional pathway, general surgery residents are receiving limited exposure to CT surgery, which may be depreciating interest in the field. Other studies from academic institutions have demonstrated that a lack of exposure and interaction with surgical subspecialties, and in accordance with CT surgery, has led to a lack of interest in these fields.^{4-7,16} This study attempted to determine factors and experiences that preemptively propel medical students to surgery and CT surgery while also identifying factors and perceptions that alienate medical students from these fields. By defining these metrics, this study hopes to suggest solutions that may ameliorate these factors, increase exposure, and ultimately increase interest in the field of CT surgery.

Our data, in accordance with Grover and colleagues,⁹ suggest that lifestyle as a resident, hours associated with residency training, lifestyle as an attending surgeon, length of training to become an attending surgeon, malignant

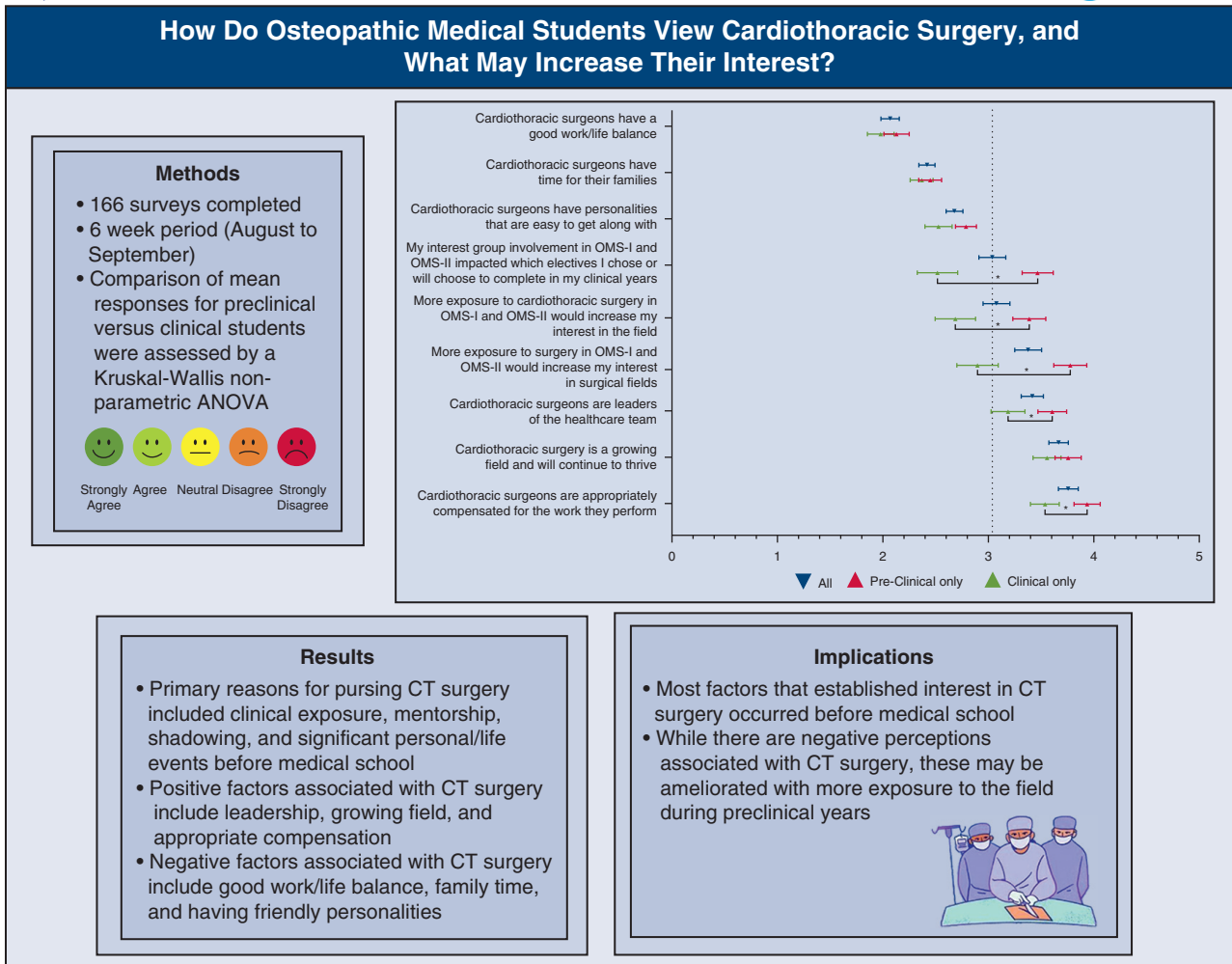


FIGURE 6. A summary of the key findings found in this study. *OMS-I*, First-year osteopathic medical student; *OMS-II*, second-year osteopathic medical student; *CT*, cardiothoracic.

environment of the workplace, and personality of those in the field were factors that repelled students from surgical subspecialties. Although the length of training to become an attending surgeon and the hours associated with residency training are more absolute factors based on the measurement of time, all other factors are based on the perception of students toward the specialty. As demonstrated in other studies, this may be an opportunity for the field of CT surgery to improve the perceptions of medical students.^{4,6,9} Furthermore, factors such as previous work experiences deserve further inquiry.

Our study aimed to assess experiences and when they occurred in a student’s journey before and during medical school to demonstrate when may be the best time to expose students to specialty fields. On the basis of all respondents, preclinical students developed interest in their specialty of choice predominately from clinical exposure, mentorship,

shadowing, volunteering, and significant personal/life experiences that occurred before medical school. These results are similar to clinical students’ experiences with the addition of clinical exposure, clinical rotations, and mentorship experiences that occurred during their clinical years as well as research experiences that occurred before medical school. In addition, 33% of all respondents noted that events conducted by the institution’s interest groups during their preclinical years did play a role in their specialty selection. Interest groups may help start and continue interest for preclinical students, whereas clinical rotations and exposure further increase interest for clinical students. Although these data are compelling, we hoped to further analyze the factors and experiences of those who are compelled to pursue CT surgery. Of the 12 students interested in CT surgery at our institution, the most significant experiences that sparked their interest included clinical exposure,

mentorship, shadowing, and significant personal/life events, all of which occurred before medical school. This suggests a strong correlation between specialty of interest and experiences that occurred before a student enters medical school. Furthermore, of the 12 students who selected CT surgery, 10 are preclinical students and 2 are clinical students. This demonstrates an interesting phenomenon where interest and curiosity may be high at the beginning of medical school. However, because of lack of exposure and engagement, interest is slowly lost over a medical student's career.

As demonstrated by Coyan and colleagues,⁴ it is essential to determine what perceptions are negatively impacting the field of CT surgery. Based on all respondents, work/life balance, personality of CT surgeons, and lack of family time were negative factors associated with CT surgery. Although other factors demonstrated a positive correlation, these factors ultimately deter students from considering a career in CT surgery. Improvements in students' perceptions of the field can be made by addressing the negative perceptions uncovered by our research. Further exposure to CT surgeons may allow students to formulate more well-informed opinions of the field. On the basis of students' perceptions of preclinical exposure to the field of surgery and CT surgery, preclinical students want more exposure and believe it will increase their interest in these fields.

Study Limitations

The current study has important limitations to consider. This study was conducted at a single osteopathic medical school that places emphasis on producing primary care physicians who serve the medically underserved areas of Alabama, the Tri-State area, and the nation. With a 22% response rate, this study may not capture the opinion of the conglomerate even though this survey was distributed to the entire institution. In addition, a response bias may be possible. However, our survey demonstrates similar results in comparison with other limited survey studies conducted at allopathic medical schools connected to large academic institutions with ease of access to CT surgery departments and residency programs.³⁻⁶ Our institution, along with all other osteopathic institutions, is not connected to a CT surgery program. This is unique to the field of CT surgery because other surgical subspecialties, although extremely few, are connected to an osteopathic institution.¹⁷ Although this may be viewed as a limitation to the study, it demonstrates the different path osteopathic students and residents must take to be successful in this field. Furthermore, students were not allowed on campus or able to participate in interest groups during the COVID-19 pandemic. This may have changed the outcome of how clinical students perceive interest groups as impacting their decision to pursue a specific field.

Our data suggest that engaging students early on in their preclinical years may help facilitate continued interest and

even spark interest in the specialty they choose to pursue. Previous trials have suggested that the field of CT surgery start exposing future physicians during their premedical years.^{3,18-20} Although it may be difficult for the field to impact experiences that occurred before students started classwork, they do have more of an opportunity to positively impact medical students during their preclinical years, which may start interest in the field or continue their interest. Furthermore, our study suggests that clinical students may positively correlate their clinical rotations to what specialties interest them most. This may be difficult for surgical subspecialties such as CT surgery that may not receive a core rotation during a student's clinical years at certain institutions. However, clinical students may have the opportunity to select electives during their clinical years, and this may be where previous interests developed before medical school or during their preclinical years may drive their choice. This presents an opportunity for the field of CT surgery to expose and engage students early during their preclinical years of medical school.

CONCLUSIONS

This study demonstrates the continued need for the field of CT surgery to engage and invest in future physicians during the preclinical years of medical school. This can be completed in a multitude of ways, but the best may be developing a CT surgery interest group or entity that serves as a platform for the field to interact with medical students.⁶ The better interactions and engagement students have with the field will allow negative perceptions and factors to slowly dissipate and hopefully spark interest in students who may never have considered the field. This study suggests the need for further research to explore how early exposure in preclinical years of medical school affects students' perceptions and ultimate interest in CT surgery. As exhibited in this study, further research to determine when and what experiences developed or continued interest in a medical student's path to becoming a physician is necessary. With future research, the field of CT surgery will not only be able to properly attract the best and brightest to join its ranks but also engage all medical students to defy negative perceptions and clear myths that have surrounded CT surgery for years.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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Key Words: cardiothoracic surgery, interest groups, medical students, osteopathic medicine, surgical education