

Introducing High School Students to Careers in Osteopathic Medicine

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An aging population and expansion of health care coverage under the Patient Protection and Affordable Care Act have led to a predicted deficit of primary care physicians by 2025. In response, medical schools must develop new strategies to identify students early in their educational pathways to encourage exploration of careers in science, technology, engineering, and mathematics (STEM) fields, especially medicine. Oklahoma State University Center for Health Sciences developed 2 internship programs, Oklahoma Science Training and Research Students (OKStars) and Native OKStars, to introduce high school students to osteopathic medicine. Native OKStars was designed to encourage Native American students, who are underrepresented in STEM fields, to pursue osteopathic medicine. These programs provided students with a 6-week immersion in biomedical research, along with weekly discussion groups with mentors. Participant questionnaire responses suggested that these programs were effective in introducing them to careers in osteopathic medicine as well as other STEM fields.

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The United States is facing a shortage of physicians, especially in rural areas.¹ A 2012 report¹ estimates a need for an additional 52,000 primary care physicians by 2025. The looming deficit is compounded by the increase in access to insured health care as a result of the Patient Protection and Affordable Care Act.¹ The need for additional physicians is especially critical for people who reside in geographic locations that have limited access to health care. In Oklahoma, approximately 35% of the population resides in rural regions, most of which lack health care services.²

To help address the growing physician shortage, medical schools should identify mechanisms to encourage students in their states to pursue science, technology, engineering, and mathematics (STEM) careers, especially within health care fields. More importantly, medical schools need to increase the number of students who are willing to practice primary care in rural areas. Medical students from rural areas are more likely to return to and stay in rural communities as practicing physicians.³ In addition, medical schools should recruit a student population that reflects the diversity of their state population. The benefits of a diverse student body include students who are comfortable interacting with patients of different cultural backgrounds and ethnicities. Also, patients are more likely to seek health care from physicians of the same race or culture.⁴⁻⁶ In Oklahoma, 9% of the population identify themselves as Native American (including Alaskan) compared with a population of 0.7% in the United States.⁷ Oklahoma has 39 federally recognized and

distinct Native American tribes and the largest number of Native Americans per capita of any continental state.^{7,8}

Over the past several decades, efforts to increase diversity in allied health fields have resulted in a steady increase in the numbers of underrepresented minorities.⁹ This success in increasing diversity in health care professionals, however, has not resulted in a substantial increase in the recruitment of Native American students into the allopathic medical profession.¹⁰ Numerous studies suggest that Native American students are frequently discouraged in the higher education process.¹¹⁻¹³ Although 71% of Native American students graduate from high school, only 11% earn a bachelor's degree.¹⁴ Data collected from 2013 to 2015 reveal that Native Americans represent 0.22% of all applicants to US allopathic medical schools.¹⁵ Of those applicants, less than 50% are accepted.¹⁵ In 2015, 0.1% of the total allopathic graduates were Native American.¹⁵ Similar results are seen in the number of Native Americans who become osteopathic physicians.¹⁶ In both osteopathic and allopathic professions, 0.2% of the total number of physicians is Native American.¹⁷

Medical schools have developed effective mechanisms for recruitment of students at the undergraduate phase of their education. The current need for more physicians suggests, however, that student recruitment must begin at earlier stages of education. Oklahoma State University Center for Health Sciences (OSU-CHS) has developed a number of educational outreach programs designed to introduce osteopathic medicine as a career to high school students, especially Native American students. In this article, we describe the development of 2 programs, Oklahoma Science Training and Research Students (OKStars) and Native OKStars, implemented between 2013 and 2015.

2013: OKStars

In 2013, OKStars was implemented as a 6-week research internship for promising high school students.

To introduce OKStars to area high schools, science and math teachers, counselors, and principals were contacted via e-mail. A presentation at each school was given to interested students (10th to 12th grade) about the program and research opportunities. Applicants were selected based on a grade point average of 3.0 or better out of 4.0, a demonstrated interest in biology, and their written description of how participation in OKStars would aid their career goals.

Four faculty members from 3 departments at OSU-CHS were identified to mentor students. In designing the framework for the summer internship program, 6 core goals were identified: (1) implement a minimum of 20 training hours per week; (2) recruit ethnically diverse students that reflect the population in Oklahoma; (3) recruit a geographically diverse student population; (4) encourage interactions between high school students and undergraduate medical students and graduate students; (5) provide information regarding college application, financing, and strategies for success; and (6) identify educational objectives.

We focused on 3 factors (low self-efficacy, lack of peer support, and lack of role models or mentors) associated with the high attrition rate seen in students who are interested in STEM fields.¹⁸ To this end, we chose participation in original biomedical research as the heart of the OKStars program. Students who participate in research develop an increased persistence in completion of STEM majors.^{19,20} Faculty mentors designed research projects appropriate for high school students. To develop an atmosphere of peer support, we promoted opportunities for interactions with undergraduate medical and graduate students. OKStars coincided with preexisting programs for undergraduate and medical student summer research. The co-occurrence of these programs provided unique opportunities to encourage interactions with peers and undergraduate medical and graduate students. For example, high school students were placed into laboratories with staff who mentor undergraduate, graduate, or medical students.

Additionally, all summer researchers were invited to attend weekly luncheon and discussion sessions. Topics covered during these sessions included the following: (1) introduction to research ethics; (2) question and answer session with OSU-CHS medical and graduate students; (3) strategies for successful transitioning to and success in undergraduate, graduate, and medical school; (4) STEM careers panel; (5) pathways to medical or graduate school; (6) current research occurring at OSU-CHS; and (7) participant and mentor evaluation of summer research programs. The following educational goals were identified for participants: (1) acquire information about STEM careers; (2) develop confidence to pursue a STEM career; (3) understand research ethics; and (4) acquire information on preparing for and applying to medical or graduate school.

At the conclusion of OKStars, participants were encouraged to present their research at local STEM conferences (eg, Tulsa Citywide Research Day, OSU in Tulsa Research Day) and international professional meetings (eg, Society for the Study of Ingestive Behaviors).

2014 to 2015: OKStars and Native OKStars

In 2014, the number of host laboratories and OKStars participants doubled. Because no Native American students participated in OKStars in 2013, a Native American-focused program, Native OKStars, was implemented in 2014. This additional program was designed to run concurrently with OKStars and other summer research programs. Although the program design for Native OKStars was similar to that of OKStars, important differences existed. All participants of Native OKStars were matched 1 to 1 with a Native American medical student who had completed the first year of school. In the human anatomy laboratory, participants identified a clinical disease or disorder relevant to their particular tribe, and the anatomy associated with their chosen disease or disorder was then examined using human cadavers. During their time in the cadaver laboratory, the high school students could directly

interact with their mentors as well as other medical students. This daily interaction with medical students allowed the Native American students numerous opportunities to learn firsthand about different paths to medical school, the realities of medical school, and why OSU students chose to pursue osteopathic medicine.

In 2015, the OKStars programs were further expanded with the addition of more host laboratories and mentors. OKStars and Native OKStars typically accepted up to 25 and 10 students, respectively, per year. Several students who had previously participated in OKStars expressed interest in continuing their participation in these programs. These students were invited to return as mentors for incoming OKStars and Native OKStars participants. Students who were no longer eligible to participate in OKStars because of education level (eg, they had graduated from high school and completed at least 1 year of undergraduate studies) could continue their previous research project and instruct the incoming students on various laboratory and troubleshooting techniques. In doing so, these previous OKStars students developed leadership skills and were able to further network with osteopathic medical students.

Evaluation of Programs

OKStars and Native OKStars were designed to recruit an ethnically and geographically diverse group of students. To this end, students were asked to identify their ethnic background. Of 46 participants from 2013 to 2015, 23 (50%) were white; 13 (28%), Asian American; 2 (4%), Hispanic; 1 (2%), black; 5 (11%), Native American; and 2 (4%), multiracial (*Table 1*). Among the Native American students, 3 different tribes were represented (*Table 1*). Although all participants in 2013 and 2014 resided in the Tulsa area, a geographically diverse group of students participated in 2015. Participants came from both urban and rural communities across Oklahoma. Twenty-one of 24 students resided in a region of Oklahoma where 10% or more of the population live in poverty¹⁴ and are considered to reside in a region that is medically underserved.²¹

Table 1.
Demographics of Participants in OKStars and Native OKStars Internship Programs for High School Students

Year	Program	Interns, No.	Sex	Ethnicity (#)	Home Town	Currently Enrolled in High School	Currently Enrolled in College	Professional Presentations	Career Goals
2013	OKStars	6	F (5) M (1)	Asian (1) White (4) Hispanic (1)	Tulsa (6)	0	6	Local (2)	Biomedical engineering (1) Osteopathic medicine (1) Allopathic medicine (2) Veterinary medicine (1)
2014	OKStars	14	F (12) M (2)	Asian (6) Black (1) White (7)	Tulsa (14)	0	14	Local (6) National (1)	Biomedical engineering (1) Osteopathic medicine (9) Allopathic medicine (3) STEM (1)
	Native OKStars	2	F (1) M (1)	Cherokee (2)	Tulsa (2)	0	2	NA	Osteopathic medicine (2)
2015	OKStars	21	F (10) M (11)	Asian (6) White (12) Hispanic (1) Multiple ^a (2)	Bartlesville (1) Grove (1) Henryetta (1) Oklahoma City (2) Owasso (2) Sand Springs (1) Tulsa (12) Verdigris (1)	10	10	Local (7) National (2)	Osteopathic medicine (11) Allopathic medicine (9) STEM (1)
	Native OKStars	3	F (2) M (1)	Choctaw (1) Cherokee (1) Ponca (1)	Durant (1) Tulsa (2)	2	1	NA	Osteopathic medicine (3)

^a Multiple indicates 2 or more ethnicities.

Abbreviations: NA, not applicable; OKStars, Oklahoma Science Training and Research Students; STEM, science, technology, engineering, and mathematics.

Table 2.
Students' Ranking of OKStars and Native
OKStars Internship Programs for High School
Students^a

Statement	Mean Rank
This program helped me develop problem-solving skills.	4.3
I obtained information about medical and graduate school.	4.6
This program provided opportunities to interact with my near peers.	4.7
This program provided information to help me meet my career goals.	4.4
This program helped me develop the confidence to pursue a career in a STEM field.	4.5
This program introduced me to research ethics.	4.4
This program introduced me to the various paths to medical school.	4.4
I enjoyed the lunch with medical/graduate students and the discussion on successfully successful transitioning to college/medical school	4.8

^a Students ranked each item on a scale from 1 (ineffective) to 5 (highly effective).

Abbreviations: OKStars, Oklahoma Science Training and Research Students; STEM, science, technology, engineering, and mathematics.

The effectiveness in meeting the educational goals of the programs was determined by the administration of an exit questionnaire. Participants were asked to use a scale from 1 (ineffective) to 5 (highly effective) to rank various aspects of the programs. The educational goals for these programs were largely met (Table 2). The mean scores for the various goals of the programs ranged from 4.3 to 4.8. The lowest score (4.3) was observed for the statement, “This program helped us develop problem-solving skills.” This score most likely represents the disparate levels of experience of students entering the program.

OKStars and Native OKStars were designed to help students develop confidence to pursue a STEM career.

One of the leading reported causes of the progressive decline in students enrolled in premedical studies is low self-efficacy.¹⁸ OKStars and Native OKStars participants scored “helped me develop the confidence to pursue a STEM career” highly. This observation should be considered when developing similar programs. The students who participated in the 2 OKStars programs had grade point averages that ranged from 3.7 to 4.0, scored in the advanced range on state End of Instruction examinations, and scored high on college admission tests. The observation that students had an increased level of self-confidence at the end of the programs suggests that students who are highly successful still may have low self-efficacy. Moreover, this lack of confidence was not restricted to a particular sex or ethnic group. As one participant (who ended up matriculating into a 4-year university) stated, “I was accepted into the Freshman Research Program...probably never would have applied if the OKStar Program...was not such an encouraging experience.” Taken together, these observations suggest that even the most promising students benefit by having opportunities such as those provided by the OKStar programs.

The highest score (4.8) was received for the statement, “I enjoyed the lunch with medical/graduate students and the successful transitioning to college/medical school discussion.” During this lunch, medical and graduate students at OSU-CHS were asked to lead discussions on issues that could affect high school and undergraduate students successfully transitioning into undergraduate and then into medical or graduate school. The medical and graduate students were specifically asked to provide the OKStars participants with advice they wish they had received. For example, they discussed whether students who are considering a career in medicine should shadow physicians in high school or wait until college. The students also discussed how many extracurricular activities demonstrate a well-rounded student and how many suggest a lack of focus. Although faculty provided the same advice, it seemed to be more meaningful coming from

a “near peer.” Almost all participants suggested adding additional lunch and discussion sessions with the OSU-CHS medical and graduate students. This observation provides further evidence of the importance of facilitating interactions between near peers.

Future Directions

To ensure the high quality of our internship programs, we plan to maintain the number of participants at 20 to 25 for OKStars and 5 to 10 for Native OKStars annually. The majority of students who have participated in the OKStars and Native OKStars programs to date have indicated an interest in pursuing a career in medicine. To address this favorable response, we will be incorporating interviewing and clinical skills workshops into the programs. Additionally, we are recruiting clinical faculty to act as mentors. To date, all of the participants have either advanced or graduated high school on time. Those students who have graduated have matriculated into either a community college or a 4-year university. We will be tracking the educational progress and career choices of the participants as they continue their education to determine the effectiveness of our programs.

References

- Petterson SM, Liaw WR, Phillips RL Jr, Rabin DL, Meyers DS, Bazemore AW. Projecting US primary care physician workforce needs: 2010-2025. *Ann Fam Med*. 2012;10(6):503-509. doi:10.1370/afm.1431
- U.S. Census Bureau. *2010 Census of Population and Housing. Population and Housing Unit Counts, CPH-2-38, Oklahoma*. Washington, DC: US Dept of Commerce; 2012. <https://www.census.gov/prod/cen2010/cph-2-38.pdf>.
- Rural origins and choosing family medicine predict future rural practice. *Am Fam Physician*. 2007;76(2):207.
- Cooper LA, Roter DL, Johnson RL, Ford DE, Steinwachs DM, Powe NR. Patient-centered communication, ratings of care, and concordance of patient and physician race. *Ann Intern Med*. 2003;139(11):907-915.
- Saha S, Shipman S. The rationale for diversity in the health professions: a review of the evidence. Washington DC: US Dept of Health and Human Services, Health Resources Administration, Bureau of Health Professions; 2006. <https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/diversityushealthoccupations.pdf>. Accessed April 5, 2017.
- Groman R, Ginsburg J. American College of Physicians. Racial and ethnic disparities in health care: a position paper of the American College of Physicians. *Ann Intern Med*. 2004;141(3):226-232.
- 2010 census interactive population search. United States Census 2010 website. <http://www.census.gov/2010census/popmap/ipmtext.php?fl=04:37:40>. Accessed March 23, 2017.
- Indian Affairs Bureau. *Indian Entities Recognized and Eligible To Receive Services From the United States Bureau of Indian Affairs*. Washington, DC: Bureau of Indian Affairs; 2016.
- Xierali I, Castillo-Page L, Zhang K, Gampfer K, Nivet M. Ensuring a diverse physician workforce: progress but more to be done. *JAMA Intern Med*. 2015;175(10):1708-1709.
- Diversity in Medical Education: Facts and Figures 2012*. Washington, DC: Association of American Medical Colleges, Diversity Policy and Programs; 2012.
- Guillory R, Wolverton M. It's about family: Native American student persistence in higher education. *J Higher Educ*. 2008;79(1): 58-87. doi:10.1353/jhe.2008.0001
- Heavy Runner I, DeCelles R. Family education model: meeting the student retention challenge. *J Am Indian Educ*. 2002;25(2):32-38.
- Mosholder R, Goslin C. Native American college student persistence. *J Coll Student Retention: Res Theory Prac*. 2013;15(3):305-327.
- Bauman KJ, Graf NL. *Educational Attainment: 2000*. Washington, DC: US Dept of Commerce; 2003.
- Diversity in the Physician Workforce: Facts & Figures 2014*. Washington, DC: Association of American Medical Colleges, Diversity Policy and Programs; 2014.
- 2016-17 osteopathic medical college total enrollment by gender and race/ethnicity. American Association of Colleges of Osteopathic Medicine website. <http://www.aacom.org/data>. Accessed March 24, 2017.
- US Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, and National Center for Health Workforce Analysis. *Sex, Race, and Ethnic Diversity of U.S. Health Occupations (2010-2012): Technical Documentation*. Rockville, MD: US Dept of Health and Human Services Health Resources and Services Administration; 2014.
- Chen X, Soldner M. *STEM Attrition: College Students' Paths Into and Out of STEM Fields: Statistical Analysis Report*. Washington, DC: US Dept of Education and the National Center for Education Statistics; 2013.
- Reinventing Undergraduate Education: A Blueprint for America's Research Universities*. Stony Brook, NY: Boyer Commission on Educating Undergraduates in the Research University; 1998.
- Lopatto D. Survey of undergraduate research experiences (SURE): first findings. *Cell Biol Educ*. 2004;3(4):270-277. doi:10.1187/cbe.04-07-0045
- American fact finder. United States Census Bureau website. <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>. Accessed March 23, 2017.

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