

# The Kidney Disease Screening and Awareness Program (KDSAP): A Novel Translatable Model for Increasing Interest in Nephrology Careers

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## ABSTRACT

Despite the increasing prevalence of CKD in the United States, there is a declining interest among United States medical graduates in nephrology as a career choice. Effective programs are needed to generate interest at early educational stages when career choices can be influenced. The Kidney Disease Screening and Awareness Program (KDSAP) is a novel program initiated at Harvard College that increases student knowledge of and interest in kidney health and disease, interest in nephrology career paths, and participation in kidney disease research. This model, built on physician mentoring, kidney screening of underserved populations, direct interactions with kidney patients, and opportunities to participate in kidney research, can be reproduced and translated to other workforce-challenged subspecialties.

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The increasing prevalence and simultaneous low public awareness of CKD have become a public health crisis.<sup>1,2</sup> A 2013 study showed that over 27 million people have CKD in the United States.<sup>3–5</sup> The number of patients with CKD who will progress to ESRD is projected to increase because of an aging population and the increasing prevalence of CKD risk factors.<sup>6,7</sup>

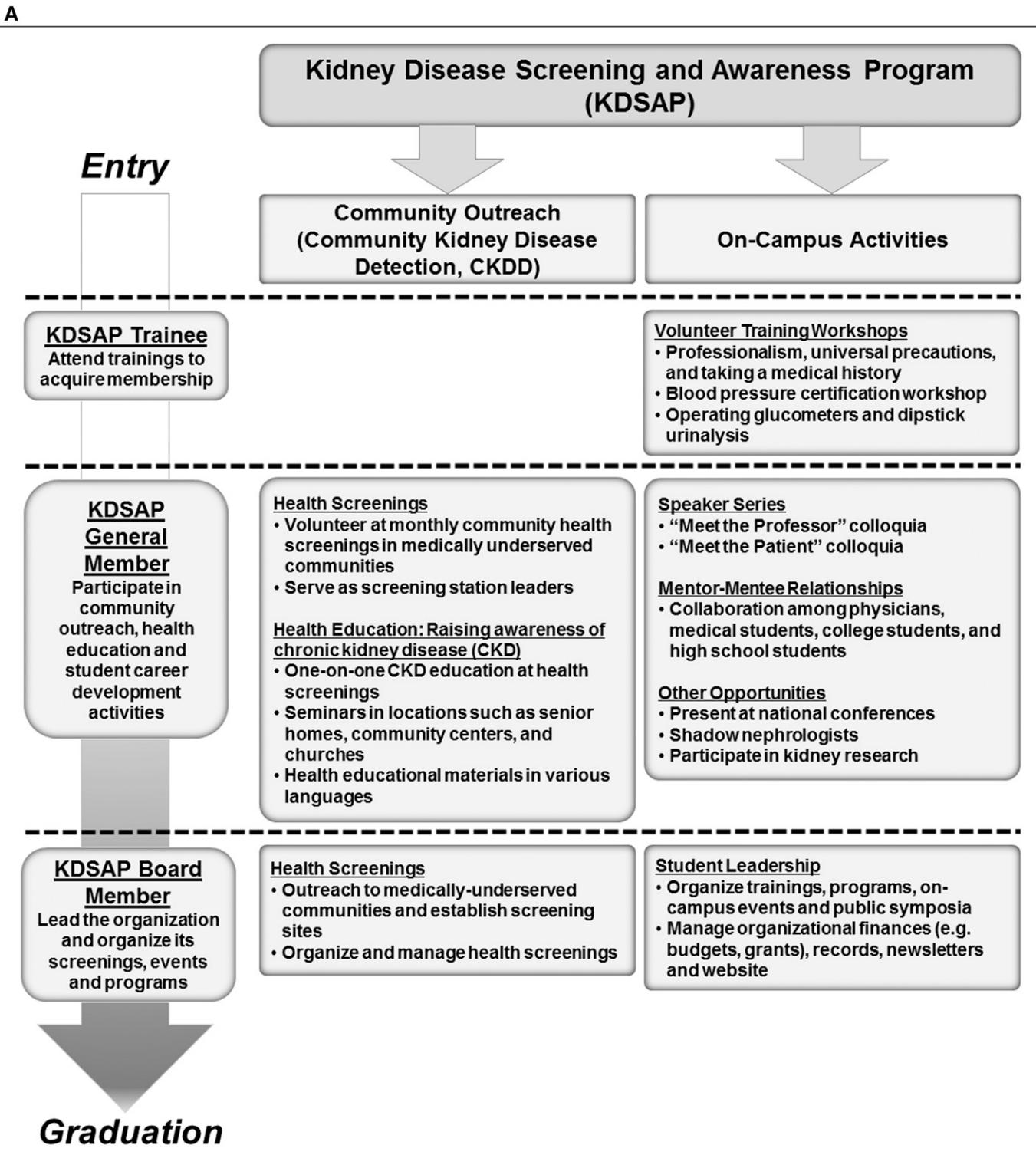
These epidemiologic trends in conjunction with the influx of new patients into the United States health care system under the 2010 Patient Protection and Affordable Care Act have created a strain on the nephrology workforce.<sup>8</sup> At the same time, scientific advances present enormous opportunities for better understanding of renal diseases and therapeutic innovation. Despite the growing demand for nephrologists, interest in nephrology as a career choice has waned among United States medical graduates (USMGs).<sup>8,9</sup> Reasons for this decline among trainees include the following: (1) minimal exposure to kidney physiology and pathophysiology during clinical rotations, (2) perceptions that the specialty is too complex, (3) perceived lack of new and effective therapies, and (4) perceptions that nephrologists are overworked and underpaid.<sup>8</sup>

Although nephrology training programs have increasingly relied on international medical graduates,<sup>10</sup> more stringent work visa requirements may limit the ability of international medical graduates to continue to offset the declining interest in nephrology among USMGs.<sup>8,11</sup> To stimulate interest in nephrology among students, the Asian Renal Clinic of the Renal Division at Brigham and Women's Hospital created the Kidney Disease Screening and Awareness Program (KDSAP) in 2008, establishing its founding chapter at Harvard College. A novel model, KDSAP targets primarily college students and interweaves educational and mentoring activities with community outreach to (1) cultivate the undergraduate's awareness of kidney disease and interest in nephrology as a potential career choice and (2) engage students directly in the enhancement of overall public awareness and early detection of kidney disease.

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**Figure 1.** Unique structure of KDSAP: bridging community outreach efforts and on-campus student career development activities. (A) Student career development: cultivation of interest in nephrology. KDSAP student members engage in activities that promote student career development contextualized by clinical exposure in underserved communities. This figure charts a sample flow of a student's involvement with KDSAP from entry to graduation. (B) Health screening structure: KDSAP's health screenings consist of eight stations. (1) Registration: KDSAP members greet clinic participants at the first station and provide an overview of the day. A questionnaire, in the appropriate language, is administered. (2) Participant questionnaire: students assist participants in filling out basic demographic information. Participants take questionnaires to each station where students collect and record screening data. (3) Health education: onsite

**B**

\* BMI= Body mass index

Figure 1. Continued.

## RESULTS

### The KDSAP Model at Harvard College: A Case Study

On KDSAP's inception in 2008, an official faculty advisor was identified to provide primary supervision and guidance for the program and its activities (Supplemental Table 1). Under the faculty advisor's guidance, KDSAP organized monthly community kidney health screening events in underserved communities. KDSAP also organized "Meet the Patient" and "Meet the Professor" events throughout the year. All KDSAP participants attended mandatory Universal Precaution and Professionalism seminars and BP measurement training workshops (Figure 1A).

### Physician Mentorship

KDSAP offers a speaker series known as "Meet the Professor" each year to enhance students' exposure to the medical profession and facilitate the development of mentor–mentee relationships. The colloquia provide students the opportunity to speak with nephrology clinicians, clinician–scientists, and basic

scientists about their work–life experiences as well as issues in health care, policy, and research. The speaker series is intended to help students form an overall impression of the field. Students meet potential role models and mentors through the speaker series and are encouraged to seek individual mentorship from nephrologists and PhD scientists studying the kidney. These relationships provide students with opportunities to shadow physicians in the clinical setting and work with nephrologists on scholarly activities, including clinical or basic science research.

### Volunteerism

Clinical and community outreach exposure to nephrology is the second critical component of the KDSAP model. KDSAP students contribute to the mission of increasing awareness of CKD by engaging firsthand at health screening events. These monthly events are held in underserved communities with ethnic minority groups that are at high risk for CKD, and priority is given to providing culturally and linguistically appropriate services. The health screening

events provide students with practical hands-on exposure to kidney medicine and an opportunity to perform community service. Under direct faculty supervision, students conduct laboratory tests, interact with community members, and provide education on basic health topics. After each health screening, the faculty member holds a debriefing and didactic session for student volunteers, during which time general nephrology topics and interesting cases of the day are discussed.

KDSAP students also meet patients with various kidney diseases in an annual "Meet the Patient" speaker series to learn about physician–patient relationships and the burdens of kidney disease. Overviews of the organizational structure of on- and off-campus events and the basic framework of health screening events are shown in Figure 1.

### Assessment of KDSAP's Impact on Students' Career Choices

#### *Student Demographics and Survey Results*

More than 200 high school, college, medical school, and other graduate school students have registered as members of KDSAP

physician presents an overview of basic determinants of kidney health, including basic nutrition. (4) Body mass index (BMI) and waist–hip circumference measurement: students measure height, weight, and waist circumference. (5) BP measurement: students who have attended BP training sessions take BP measurements. (6) Urinalysis: students perform the test on urine samples using urinalysis readers and test strips. (7) Blood glucose test: students perform finger-stick tests using lancets, glucose test strips, and glucometers. (8) Physician consultation: the physician reviews the questionnaire with participants, discusses results, and makes follow-up referrals to primary care physicians or nephrologists. The summary page of objective data is given to participants, whereas KDSAP retains the questionnaire. Participants complete a satisfaction survey.

**Table 1.** KDSAP member demographics

Characteristics of KDSAP Members	Number of Members (%)
Year of graduation (n=56) <sup>a</sup>	
2009	1 (1.8%)
2010	9 (16.1%)
2011	7 (12.5%)
2012	8 (14.3%)
2013	18 (32.1%)
2014	8 (14.3%)
2015	4 (7.1%)
2016	1 (1.8%)
Years in KDSAP (n=57)	
0–1	16 (28.1%)
1–2	17 (29.8%)
2–3	18 (31.6%)
3+	6 (10.5%)
Health screenings attended (n=57)	
0–1	13 (22.8%)
2–3	20 (35.1%)
4+	24 (42.1%)
Primary concentration (n=57)	
Sciences	50 (87.7%)
Nonsciences	7 (12.3%)
Research (n=59) <sup>b</sup>	
None	17 (28.8%)
Clinical/Epidemiology research	8 (13.6%)
Basic research	34 (57.6%)
Future career plan (n=57)	
Considering medicine	49 (86.0%)
Not considering medicine	8 (14.0%)

<sup>a</sup>Fifty-six of fifty-seven Harvard College participants were included, because one student did not respond to this question.

<sup>b</sup>An additional two responses were obtained, because two students participated in both basic and clinical research.

since its inception in 2008. Surveys collected from college students, the main constituency of the program, have provided preliminary data on KDSAP's impact on students' knowledge of, exposure to, and interest in nephrology and insight into the impact of KDSAP on the students' overall career development. Fifty-seven college students who attended at least one screening event completed the survey. Students' year of graduation, degree of involvement in KDSAP, exposure to research, and interest in medicine as a career are presented in Table 1; 72% and 42% of students participated in KDSAP for at least 1 year and >2 years, respectively, and 77% of students participated in two or more health screenings. Additionally, 88% of students studied natural science, 71% of students were actively involved in clinical and/or basic research, and 86% of students were considering medicine as a future career.

#### KDSAP Positively Influences Student Career Development in Medicine and Nephrology

Results from 57 KDSAP participant interviews, conducted by three KDSAP students, revealed that, before joining KDSAP, none of the students (1) had been aware of the high prevalence of CKD, (2) had considered a career in nephrology, or (3) were

aware of the projected nephrology workforce concerns and potential consequences for the CKD population (data not shown). A written survey regarding baseline knowledge of kidney disease before joining KDSAP was based on students' recall. Results from 56 KDSAP participant surveys (1 survey excluded because of missing data) showed that the majority of students indicated that KDSAP had a "strongly positive" impact on their interest in working with medically underserved communities, participation in public health-related projects, interest in nephrology, knowledge in nephrology, interest in medical research, and interest in a medical career (Figure 2). Specific student comments also reflect these results (Supplemental Table 2).

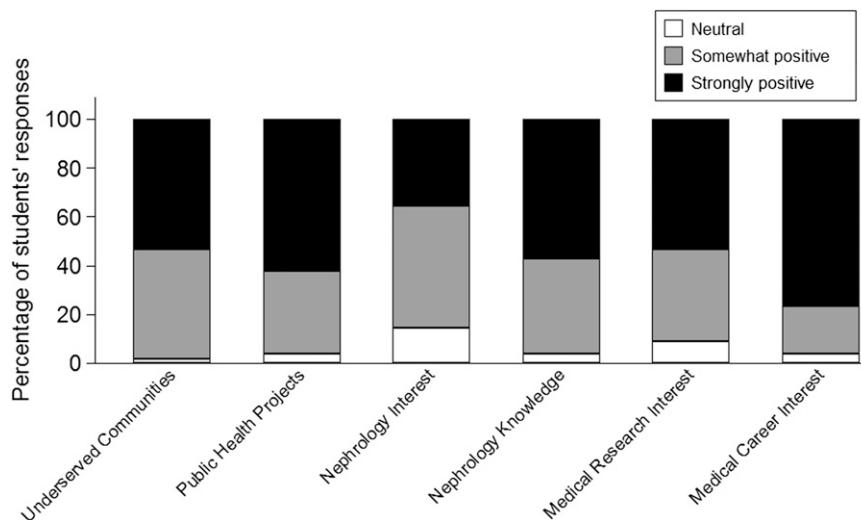
#### Career Trajectory of KDSAP Members

Follow-up of 51 KDSAP Harvard College alumni members' career trajectories revealed that 26 students have enrolled in medical school, 5 students have enrolled in graduate school in health-related disciplines, and 5 students are currently working in health-related research (Figure 3A). Among the alumni, two members are currently in internal medicine residency programs and have chosen nephrology as their career path. One member is currently attending medical school and plans to enter nephrology training (Figure 3B). Current members or alumni have taken the lead on successfully obtaining research grants, presenting abstracts and oral presentations at national scientific meetings, and preparing manuscripts for publication (Table 2).

## DISCUSSION

The number of nephrologists and nephrology fellow trainees has increased since 2000; however, the number of USMGs choosing to enter nephrology careers has steadily declined.<sup>12</sup> Furthermore, nephrology ranks second to last among all subspecialties in attracting USMGs.<sup>10</sup> The American Society of Nephrology (ASN) has called attention to this impending workforce crisis and has initiated several programs to increase interest in nephrology careers.<sup>8,12</sup> Previous efforts to address the decreasing interest in nephrology as a career choice have targeted students at the graduate and postgraduate level.<sup>12</sup> Many factors contribute to medical students' selection of career specialties, including medical clerkship experiences, financial considerations, and level of prestige associated with particular specialties.<sup>12,13</sup> Evidence suggests, however, that early educational experiences, particularly mentor–mentee relationships, play a significant role in students' career choices.<sup>14,15</sup> Although medical training formally begins in medical school, exploration of a career in medicine often begins as early as high school or college. In fact, mentors can play a highly influential role in the early years of students' growth, which was highlighted in an interview of a high school student who published a kidney-related article.<sup>16,17</sup>

We have introduced a novel educational model designed to promote interest in nephrology among undergraduate students, increase awareness of kidney disease, and provide exposure of



**Figure 2.** KDSAP has a positive influence on students' academic and career choices. Fifty-six undergraduate students evaluated KDSAP's impact on their (1) interest in working with medically underserved communities (1.8% neutral, 44.6% somewhat positive, and 53.6% strongly positive), (2) interest in participation in public health-related projects (3.6% neutral, 33.9% somewhat positive, and 62.5% strongly positive), (3) interest in nephrology (14.3% neutral, 50.0% somewhat positive, and 35.7% strongly positive), (4) knowledge in nephrology (3.6% neutral, 39.3% somewhat positive, and 57.1% strongly positive), (5) interest in medical research (8.9% neutral, 37.5% somewhat positive, and 53.6% strongly positive), and (6) interest in a medical career (3.6% neutral, 19.6% somewhat positive, and 76.8% strongly positive). For each category of interest, students responded using a 1–5 Likert item (exposure response set: 1, strongly negative; 2, somewhat negative; 3, neutral; 4, somewhat positive; 5, strongly positive). For all categories, there were no responses of strongly negative or somewhat negative. All students who joined KDSAP after April 30, 2009, were administered an entrance survey to assess their interest in nephrology and knowledge of kidney disease. Those students who joined before April 30, 2009, but had not yet graduated or departed from KDSAP were asked to complete the survey based on their recall of their interest and knowledge level before joining KDSAP. On graduation or departure from the organization, students were given an exit survey. On both surveys, students were asked to provide general demographic information and rate how participation in KDSAP impacted various aspects of their career development. The student survey was approved by Harvard College, Harvard Medical School, and the Partners Healthcare Institutional Research Boards. Analyses were performed using the statistical software package Stata, version 10.1 (StataCorp, College Station, TX).

students to the provision of medical services to underserved communities. Although medical students may participate in community outreach events in their first year of medical school, it is rare for college students to participate in clinical volunteerism. Through the use of community outreach, the KDSAP model focuses on the outpatient community as an experiential learning environment.

We have provided evidence at a proof-of-concept stage that KDSAP has been successful in achieving its goal to increase interest in and awareness of kidney disease among college undergraduates. The program relies on two critical components: (1) student volunteerism and (2) physician mentorship. To our knowledge, KDSAP is the first model to strategically target college undergraduate students to address nephrology

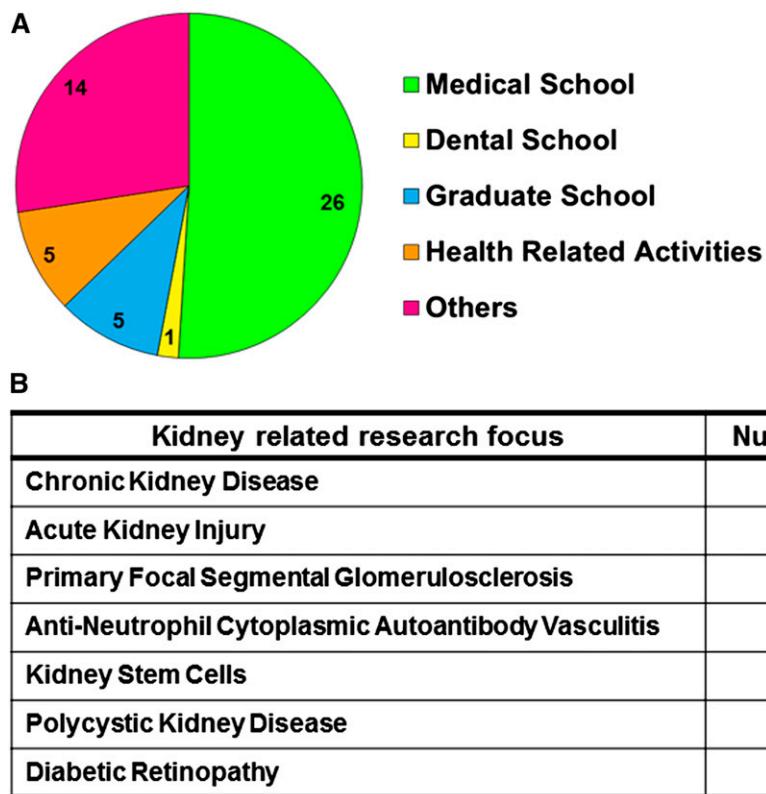
workforce concerns. By cultivating interest in nephrology at this early stage, KDSAP provides an opportunity for students to gain insight and exposure to kidney health and disease early in their training at a time when such exposures can have powerful effects on career choice.

Our enthusiasm for this program is supported by preliminary evidence of its effectiveness, although we acknowledge that interpretation of the survey data is limited by the retrospective nature of the students' self-assessments, the relatively small number of students surveyed, and the subjective self-appraisal of nephrology exposure and knowledge. Additional data are being collected to further assess the long-term impact of this program. It is important to recognize, however, that metrics of success extend beyond producing nephrologists, because the program is also expected to provide future allied health professionals, lawyers, politicians, entrepreneurs, and others with a better understanding of the kidney and the implications of kidney disease as a global health concern.

We have been fortunate to share our experience with other institutions to disseminate the program. KDSAP has established chapters at the University of Toronto and the Rutgers Robert Wood Johnson Medical School in New Jersey. The ASN has also formed a partnership with KDSAP to create a sister national initiative called the Kidney Mentoring and Assessment Program for Students to implement a similar approach.<sup>12</sup>

Staying true to its focus on volunteerism and physician mentorship, the KDSAP model can be improved in several ways. For example, having a mechanism for students to be involved longitudinally in patient care could make the volunteer experience more worthwhile and memorable for the student as well as more productive for the patient. Our current model identifies patients that require follow-up but does not necessarily keep track of each patient. Ideally, if a patient encountered during screening requires follow-up care but faces certain social barriers to care, the local KDSAP branch could train students to identify appropriate resources and empower them to work with the patient to take advantage of these resources. This process would require a significant amount of background research and partnership with local health care programs, but the benefit would be cumulative over time.

Emphasis on physician mentorship cannot be understated and can also be enhanced, although it would require the



**Figure 3.** Career trajectories: KDSAP is a model to cultivate interest in nephrology. (A) Survey responses of 51 Harvard College KDSAP graduates revealed that 26 students enrolled in medical school and 1 student enrolled in dental school. The five students enrolled in graduate school are pursuing studies in health-related disciplines; five students work in health-related activities. Among alumni, three individuals have decided to pursue nephrology as a career. This number is expected to increase as students move further along their educational trajectories. (B) Since the establishment of KDSAP in 2008, 10 students have engaged in kidney-related research.

commitment of nephrologists on a broader scale to invest in trainees at the premedical level. Because current nephrology programs are centered around hospital-based inpatient and ambulatory care, we hope that KDSAP's potential to contribute to the workforce would encourage leaders of nephrology training programs to encourage opportunities for fellows to engage in community outreach by integrating these activities into nephrology training curricula. Practicing nephrologists who have community-based practices should be encouraged to provide community outreach and mentorship for undergraduate college students. The leadership of national organizations, such as the ASN and the National Kidney Foundation, can be very influential in facilitating these initiatives.

In conclusion, we have introduced a novel, reproducible, and sustainable model—KDSAP—that has shown promising preliminary results in focusing on undergraduate students to address the problem of waning interest in careers in kidney research and nephrology. This program also raises awareness of kidney disease among underserved populations. The success of the KDSAP model is built on student volunteerism and mentor-mentee relationships, and it can be replicated in other undergraduate programs and institutions.

**Table 2.** Grants and publications obtained by KDSAP members

Grants	Presentations <sup>a</sup>	Manuscripts (in Preparation)	Interview
(1) Arnold Gold Foundation (2009)	National conferences	(1) Peer review articles	(1) Nephrology Times <sup>b</sup>
(2) Schweitzer Fellowship (two in 2009)	(1) National Kidney Foundation: 2009, one poster presentation	(2) Invited review articles	
(3) Office of Enrichment Programs, Harvard Medical School (two in 2010)	(2) ASN: 2010, one oral presentation; 2011, one oral presentation; 2012, two poster presentations; 2013, one poster presentation	(3) KDSAP handbook	
(4) The Next 36, Leadership Program, Canada (2011)			
(5) ASN student scholarship (2009 and 2012)			
(6) Minimal Viable Product Grant, Harvard Business School (2012)	Academic institutions (1) Grand Rounds, Renal Division, Brown University, February 2012		
(7) National Collegiate Inventors and Innovators Alliance (2012)	(2) Training program, Kidney Mentoring and Assessment Program for Students, ASN, October 2013		

<sup>a</sup>References 16–21.

<sup>b</sup>Available at [http://journals.lww.com/nephrologytimes/Fulltext/2012/10000/KDSAP\\_Mixes\\_Community\\_Screening\\_with\\_Student.8.aspx](http://journals.lww.com/nephrologytimes/Fulltext/2012/10000/KDSAP_Mixes_Community_Screening_with_Student.8.aspx).

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## DISCLOSURES

None.

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