The Student Navigator Project (SNaP): Preparing Students Through Longitudinal Learning

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Abstract

Introduction Early medical school education has historically focused on teaching basic medical sciences. More recently, medical schools are encouraged to incorporate health systems science (HSS) into early curricula. Addressing all of these components in an overcrowded curriculum remains challenging.

Methods We report on the Student Navigator Project (SNaP), a pre-clinical experience where students engage longitudinally with medically and socially complex patients. SNaP is built on a foundation of trust, responsibility, and ownership in the student-patient relationship. Early learners take an active role in navigating, advocating, and coaching for their patients. In addition, students are integrated as medical assistants into a primary care clinic; complete a mentored, team-based quality improvement project; and engage in evidence-based medicine, teaching, and handoff activities.

Results As a result of these activities, students learn firsthand about HSS, contribute meaningfully to their patients' care, and are immersed in a systems-based practice approach early in their medical school education. Preliminary outcomes (2016–2019) show satisfaction with the program and knowledge of program focus areas.

Conclusions The authors are engaged in improvement cycles to modify program structure and curriculum in order to promote dissemination in diverse clinical settings. Ultimately, we plan to measure longer-term outcomes, including clerkship and residency preparation, career choice, and practice setting.

Keywords Health systems science · Situated active learning · Pre-clinical integration

Introduction

Early medical education has a number of pedagogic challenges, namely the balance of teaching a vast amount of basic science knowledge, incorporating early authentic clinical experiences, and now including health systems science (HSS) as the newest pillar of medical education. HSS is the

understanding of how physicians deliver care to patients, how patients receive care, and how health systems function [1]. The study of HSS invites students to consider quality, value, and safety as they learn about health systems, care delivery, and payment strategies. HSS curricula build skills in leadership, teamwork, population health, and medical informatics and provide an opportunity for students to explore social determinants of health firsthand. Traditionally, knowledge of these domains was gained through observation and clinical practice, yet many medical school graduates have been unprepared for managing such issues on behalf of their patients. The community of medical educators is formalizing this as a component of a robust curriculum [1]. Medical schools are attempting to incorporate these educational themes at a time when few examples of feasible, effective, and acceptable HSS educational activities exist.

To fill this gap, medical schools have incorporated longitudinal integrated clerkships, individual shadowing experiences, and interprofessional simulation activities [2, 3]. At

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the authors' institution, HSS content is relayed via large-lecture didactics or tours through clinical areas to observe teamwork. However, passive experiences and simulated exercises are unlikely to encourage the desired level of HSS competency in students and have been shown to frustrate students as they do not see it as something necessary to their professional identity [4, 5]. Although challenging, creating value-added experiences that allow medical students to impact health outcomes while also enhancing student knowledge, attitudes, and skills has become a national topic of conversation with the American Medical Association providing guidance in 2016 at the Accelerating Change in Education Consortium [6]. This highlights the national movement towards creating better educational learning experiences to address the changing landscape of healthcare.

Stakeholder Issues

Education leaders and administrators are creating educational experiences that expose students to the basic tenets of HSS. As stakeholders in this effort, administrators have incorporated these concepts in the assessment of competencies, milestones, and entrustable professional activities (EPAs) [7, 8]. However, effective and feasible curricula remain sparse.

Additionally, students desire to engage with real patients in real clinical settings, and solve real problems within a complex environment [5, 9]. Students prefer to play a value-added, meaningful role in their education and clinical care, rather than a passive, observational role [5, 9]. Providing opportunities to meet these desires within a structured curricular experience could mutually benefit students, educators, clinics, and patients [6, 10]. Such curricula have shown potential to enhance student learning about patient perspectives, HSS, and clinical communication skills and to develop a professional identity as a change agent within the system [10, 11].

However, clinics at academic medical centers are often burdened by competing missions of providing clinical care and serving as a space for educating learners and may find it challenging to creatively incorporate students in meaningful clinical roles that enhance rather than hinder the processes of clinical care [1, 6, 11]. However, clinics can help improve clinical outcomes by providing enhanced support and coaching for patients with more complex needs. In this setting, students gain an understanding of healthcare delivery which may empower them to share ideas for improvement [4, 6, 8, 11].

Patients must also be considered stakeholders in HSS education. Patients who develop an independent relationship with a student will often appreciate the time and care demonstrated by the student [6, 8, 11, 12]. As mentioned previously, the student may be seen as an unwanted, non-value-added step between patient, provider, and the provision of medical care. Students may internalize this messaging and feel decreased

confidence [2, 13]. Engagement of patient stakeholders to view their student as an important contributor by providing opportunities for value-added roles may help elevate self-efficacy and internalized trust for the student and improve care for the patient [2].

Potential Solutions

With these competing interests, it seems a great challenge to meaningfully design a HSS curriculum to integrate students in an authentic, value-added manner to clinical care. Some promising approaches to meet this need include narrative medicine seminars as forums for reflection on clinical relationships and system impacts on practice [12]. Additionally, longitudinal clerkships allow students, faculty, and patients to collaborate over several months or years [2, 8]. These settings can meet many of the stakeholder interests, as long as the curriculum includes a critical exploration of HSS topics and active participation in a clinical setting. Penn State College of Medicine integrated HSS and patient navigation into their curriculum, and students describe their experience as both educationally valuable and value-added for their clinics and patients [10]. HSS curricula can be further optimized if space is protected for reflection and discussion, ideally in small, longitudinal cohorts that foster trust and permit expression of vulnerability. With these potential solutions in mind, the Student Navigator Project (SNaP) was conceived.

Methods and Curriculum Description

SNaP is an 18-month longitudinal pre-clinical program focused on comprehensively teaching patient navigation and HSS in clinical settings. It is an optional alternative preceptorship program that occurs during the preclinical phase of the medical program. Instead of a traditional preceptorship where students rotate between three 8-week long observerships with different physicians and clinical environments, SNaP students stay in the same primary care clinic longitudinally. The traditional preceptorship begins 6 months into the first year, while SNaP students begin in the second month of their first year. Both preceptorship experiences last until the end of their pre-clinical coursework (approximately 18 months after beginning medical school). The time commitment for both preceptorship types is 4 h per week. A visual overview of the overall medical school curriculum with comparison between the two types of preceptorships (SNaP and traditional observership) can be found in Electronic supplementary material 1.

Through participation in SNaP, students are expected to meet the following goals:

1. Patient navigation: establish meaningful relationships with medically and socially complex patients, improve

- communication skills, and experience the complexities of the medical system through the patient perspective;
2. Health systems science: become a member of the interprofessional team and actively engage in systems improvement processes; and
 3. Clinical skills: learn basic clinical skills and become comfortable working with a range of patients.

Overall, the program provides pre-clinical students with value-added, longitudinal relationships with medically and socially complex patients as they navigate the healthcare system together, along with developing interprofessional skills by training and working as a medical assistant (MA) and actively developing improvement science and evidence-based medicine skills. Beginning in 2016, incoming medical students (approximately 150–160 students) receive information about SNaP and are invited to apply. Selected students are placed in a participating primary care site, with a goal of 4 students per site. In 2019–2020, SNaP enrolled its fourth cohort, with eight students (four students in each site). SNaP currently exists in the two clinical sites where lead faculty members have a primary care practice, and will expand in 2020–2021 to accommodate two additional primary care sites. A timeline and description of formal and informal educational activities are outlined below and summarized visually in Fig. 1.

Formal Educational Activities

Clinical Skills

At the start of each academic year, first-year students are integrated into either the general internal medicine clinic or the general pediatrics clinic. These are academic primary care sites at Oregon Health & Science University (OHSU), a

tertiary care center in an urban metropolitan area. Students are embedded in the clinics with other trainees and interprofessional teams. During five 4-h-long sessions over 2 months in the clinics, SNaP students are trained by clinic MAs to independently initiate patient visits and collect standard information for each appointment, which includes taking vital signs, gathering chief concerns, performing basic procedures (immunizations, electrocardiograms), and completing medication reconciliation. By their 4th month of medical school, SNaP students independently perform MA roles at the clinics 4 h per week. In addition, every medical student receives access to the electronic health record (EHR) during the first week of medical school. Participating in SNaP gives students active experience using the EHR and allows them to write notes to document their patient interactions. Because of these roles, students gain an intimate understanding of clinic flow, work within an interprofessional team, and begin to develop clinical and patient-centered skills through full immersion into an established clinical setting. As MAs, students function as the first point of contact for patients in the primary care setting. As such, students in the first few months of medical school learn to integrate their interpersonal and clinical skills in a real-time (but relatively low-stakes) setting. SNaP students can also participate in optional one-on-one clinic-based sessions with faculty to practice history-taking, physical exams, and patient presentations.

Patient Navigation

Patient navigation is an integral part of the SNaP curriculum. Students gain an understanding of the patient's perspective of medicine and see firsthand the biopsychosocial challenges of the current healthcare system. SNaP students are assigned 1–3 patients over the course of 18 months by the program director.

Fig. 1 The Student Navigator Project (SNaP): educational activities timeline

Eligible patients are medically and psychosocially complex and are referred to the program director by their primary care providers. Eligibility criteria are outlined in Table 1.

Students receive training in patient navigation by participating in several didactic sessions organized by social workers in clinic, focusing on local health systems and insurance structure, mental healthcare system, and patient communication strategies. Students learn about clinic and community resources and access these as specific issues come up for their patients.

The student navigators help patients set and achieve personal medical goals, navigate the healthcare system, and connect them with social resources. Students maintain regular contact with patients via regular outreach calls, attending clinic appointments, and performing home visits. Home visits allow students to learn more about how to support and advocate for their patients by gaining a deeper understanding of the context and environment in which they live. Students are cleared to perform the home visit after completing a training approved by risk management. Students document their calls and in-person visits in the EHR with standard note formats. As navigators, students learn to build rapport and trust with patients, increase self-efficacy, and improve the care of their patients by navigating the health system.

Patient navigation training occurs via workshops focused on trauma-informed care and communication, motivational interviewing, and health coaching. These are organized in a sequential manner and provide opportunities for practice and reflection.

Improvement Science

Adopting a framework for continuous health systems improvement is critical, and the training should start early in undergraduate medical education. Students receive approximately 8 h of didactics from trained faculty, followed by clinic-specific planning sessions. Students spend curricular time undertaking their improvement project, with embedded

time for reflection and planning Plan-Do-Study-Act (PDSA) cycles. SNaP students utilize their in-depth understanding of clinical roles and processes to implement impactful improvement work. The Institute for Healthcare Improvement Open School Quality Improvement Practicum teaches improvement science theory, methodology, and practice. Through the practicum, students participate in three modules, craft a project charter, generate a cause-and-effect diagram, implement at least two PDSA cycles, analyze and visualize data, and create a project summary report. Project topics have included decreasing clinic wait times, standardizing the medication reconciliation, and improving food insecurity screening. Regardless of the success of their change ideas, lessons learned from these PDSA cycles provide valuable information to clinic stakeholders. Students culminate their experience by submitting posters to various conferences and delivering an oral presentation to clinic staff.

Evidence-Based Medicine

The SNaP curriculum also teaches the application of evidence-based medicine (EBM) to patient care. Students ask questions related to their SNaP patients and use the evidence-based practice cycle (i.e., assess, ask, acquire, appraise, and apply) to present findings to their peers. This exercise supplements the medical school's EBM training with the opportunity to effectively implement EBM practices in real patient scenarios.

Teaching and Handoffs

In the 18-month curriculum, both first- and second-year students participate in SNaP each fall. This overlap allows the second-year students to teach the new cohort basic clinical skills, how to use the EHR, and how to function effectively in clinical teams. This teaching includes practice in initiating a clinic visit and gathering standard information needed for a visit. In addition, students formally hand off their patients to

Table 1 Patient eligibility criteria

Criterion	Additional information
Primary care in participating clinic site	Current sites: internal medicine, pediatrics, family medicine (beginning Fall 2020)
At least 3 clinic visit in the last 12 months	
Multiple comorbidities: 3 or more "systems" of the body involved	Ideally has seen at least 2 specialists or other health professionals in the last 12 months, but not necessary if multi-system issues managed by PCP
Low-moderate health literacy and lack of home/family/caregiver support	Demonstrated need for additional clinic support
Patient able to express needs, communicate with clinic independently	Patients with mild dementia/cognitive impairment who are able to communicate are assessed on a case-by-case basis
Patient willing to work with a student navigator	

the new student navigator. This handoff is both verbal and documented in the EHR using a standardized format.

Informal Educational Activities

Barriers to Care

The structural competency movement in healthcare education encourages students to recognize how upstream socioeconomic, cultural, political, and economic structures affect downstream health outcomes [14]. Instead of the traditionally passive form of learning about health systems barriers through formal didactics, SNaP students experience structural barriers by attempting to overcome them. By working as a liaison between clinic-based care and community-based support, students gain an intimate understanding of the community, social, and structural forces affecting a patient's health and healthcare access.

Interprofessional Team

SNaP students are integrated as part of the interprofessional team. As MAs and patient navigators in the clinic, they naturally interact with social workers, nurses, pharmacists, MAs, primary care physicians, specialists, and therapists. Assessment and feedback tools have been developed to gather input on student progress from members of the interprofessional team. Students have the opportunity to meaningfully contribute as a team member and deepen their appreciation of the various roles in healthcare.

Real, Authentic Experiences

In both their roles as MAs and patient navigators, SNaP students learn through “legitimate peripheral participation” rather than traditional unidirectional instructor-to-student guided learning [15]. Through genuine engagement in clinical settings, students' roles in teams are practice- and experience-based. SNaP students learn about specific treatment plans and then apply this learning by helping their assigned patient understand and adhere to their prescribed plans. When providers recommend community-based intervention, SNaP students can facilitate resource connection and thereby add value to patient care and understand these additional resources.

Ownership and Responsibility

One-on-one communication with patients and professional interactions with the patient's care team, including documentation in the EHR, helps students take ownership and responsibility. Facilitating adherence to appointments and therapies, mitigating barriers to care, and setting appropriate health goals are all within the scope of the student navigator role. These

responsibilities cultivate emotional intelligence, foster self-efficacy, and are foundational for success in clinical years.

Implementation

The previously outlined curriculum describes the current state of the program in which the fourth cohort of students is currently enrolled. Over the last 4 years of development and implementation, SNaP has been modified to meet the needs of students, clinics, and patients. We hold a continuous improvement framework in the implementation of key curricular components such as improvement science (IS), trauma-informed care, motivational interviewing, and EBM. Program leadership is responsive to student input, and feedback guides subsequent iterations of learning activities. Examples of responsiveness include further defining patient inclusion criteria and eliminating the panel coordinator role, revision and shortening of didactic parts of the orientation in favor of more hands-on experience, increased time for improvement science project planning and reflection, development of a more comprehensive communication curriculum (including health coaching), and more guidance for patient navigation activities.

SNaP was originally funded by a School of Medicine Dean's Office Educational Innovation Mini-Grant. This grant funded motivational interviewing training, focus groups with student and clinic stakeholders for program development, and tokens of appreciation for those helping teach and mentor the initial cohort of students. Grant funding did not include time or salary support for faculty to administer or teach this program. After original funding, this program operates without a budget. We estimate this program requires approximately 4 h per week for the program director to administer, and 2 h per week for clinic physician champion involvement. This curriculum has been implemented collaboratively in the general internal medicine and general pediatrics academic clinics. An internal medicine-based education coordinator assists with logistics such as booking rooms for small-group sessions. A clinic-based physician champion assists with mentoring and guiding students in each clinic. The course director helps plan and organize the curriculum and its implementation.

Curriculum Evaluation

The following evaluations were deemed non-human subjects research and exempt from IRB oversight. Students complete a curriculum evaluation survey yearly at the conclusion of the program. This is a 38-question survey to assess each student's self-reported skills in several domains: clinical skills, patient navigation, IS, EBM, patient handoffs, and interprofessional teamwork. Students were asked about confidence in a number of domains, with five possible responses: strongly disagree, disagree, neutral, agree, and strongly agree. These were quantified

by assigning points ranging from 1 to 5, respectively, to each category. We also evaluate their overall experience in the program, including SNaP's influence on their sense of worth as a medical student, preparation for clinical rotations, and perceptions of primary care. Each domain has space for free-response comments as well. This survey is anonymous and voluntary. A focus group was also conducted with members of the first cohort, prior to graduation in Spring 2020. Three faculty/staff members participated in the conduct and transcription of the focus group, and an exploratory thematic analysis was undertaken. This served as a reflective experience for the graduating students to discuss how SNaP influenced their subsequent clinical medical education. All surveys and focus group questionnaires were developed by course faculty and are available upon request and reproduced in part in Table 3. In the long term, this program will also study student outcomes in choice of residency specialty and ultimate practice setting.

Results

Thirty-one students have enrolled in the program over the initial four cohorts. Most students successfully completed the program, two students who opted out of the program after 4 months in the third cohort (Table 2). In the initial year, four times as many students applied as the number of available positions; in the last 2 years, approximately the same number of applications as available positions was received due to a change in application process.

Curriculum Evaluation

Table 3 outlines quantitative and qualitative results of the curriculum evaluation survey completed by cohorts 2 and 3 of this program. Universally, the students reported confidence in their abilities and effectiveness with respect to the primary domains of the program: Clinical Skills, Patient Navigation, Improvement Science, Handoff/Teaching, and Evidence-Based Medicine. Students report that SNaP prepared them for their clinical rotations and impacted their long-term plans for practicing medicine, and several students completed the program considering primary care. Importantly, students also report that they feel like they can

add value to a clinical setting and that SNaP was a valuable experience. The lowest area of feedback that students provided was for the documentation of a handoff in the medical record.

Focus Group Results

There were seven main themes extracted from the pre-graduation focus group with the first graduating cohort. These included comfort with basic clinical skills going into clerkship, strong understanding of the patient perspective, understanding system and clinical processes, having a framework for the system of healthcare delivery, ease with interprofessionalism, joy in longitudinal care, and the benefits of active learning. Overall, students felt that they were well prepared with basic clinical skills and felt this experience was more valuable than their peers' preceptorship experiences when reflecting upon their clinical rotation experiences. Students felt that the longitudinal care aspect of this program was invaluable going into clinical rotations. One student who did not pursue primary care still felt that the experience helped them understand healthcare systems in a more nuanced and interprofessional manner.

Discussion

We report on an innovative preclinical longitudinal patient navigation experience that incorporates experiential learning of health systems science concepts. Over the last 4 years this program has expanded in the number of sites and students, and we hope that other institutions will seek to replicate our experience. Our curriculum evaluation demonstrates that this program is acceptable and valuable to students in the short and medium terms (immediate at the end of program and prior to medical school graduation), specifically with respect to achievement of set competencies in domains associated with the program. Students feel well prepared and comfortable in the clinical setting and have firsthand knowledge of interprofessional teamwork and conducting an improvement project.

Our research team is also currently investigating other related outcomes, including self-efficacy and patient-centeredness evolution in medical students participating in

Table 2 Student enrollment and number of clinical sites, Student Navigator Project (2016–2020)

	No. of applicants	No. of selected students	No. of students who completed program	No. of clinical sites
2016–2017	28	6	6	1
2017–2018	10	7	7	1
2018–2019	12	10	8	2
2019–2020	8	8	8	2
2020–2021	Pending	Pending	Pending	4

Table 3 Curriculum evaluation results from the 2nd and 3rd participating cohorts, Student Navigator Project (2017–2019)

	Average (<i>n</i> = 12)	Comments
Clinical skills: I am confident in my ability to...		
Use a patient-centered communication style in a patient interaction	4.7	“Getting to work as a [medical assistant] gave me a greater appreciation of everyone’s roles, the team based dynamic, and distribution of responsibilities. It gives me an idea of how best to leverage everyone’s strengths and lead an effective team one day.”
Measure vital signs in a patient (BP, P, T, O ₂ sat)	4.5	
Administer an intramuscular injection	4.5	“Learning about clinic workflow and understanding the roles of everyone in the clinic was helpful. Medical assistants do so much and I appreciate them even more!!”
Use the electronic health record to facilitate patient flow through clinic	4.8	
Function effectively within an interprofessional team	4.7	
Patient navigation: I am confident in my ability to...		
Identify social factors that impact a patient’s health and well-being	4.7	“The navigation experience trained me to look behind patients’ stories and figure out their motivations and barriers. I feel like I have the tools to truly understand my patients and foster meaningful relationships.”
Outline barriers to care for a patient with psychosocial complexity	4.4	
Identify community resources that allow a patient to achieve optimal health and well-being	4.3	“It is valuable having a longitudinal relationship that mimicked being a primary care physician. I realized that most of the factors in my patients health wasn’t anything medical at all, but social and cultural and emotional and economical. I wish there was more I could’ve done for my patients, but the experience was valuable for developing the patience required to stick with patients even when things do not seem to be improving. It’s natural for med students to see quick fixes, but the reality is that it takes time.”
Work with various members of the interprofessional team to identify resources and break down barriers to patient care	4.5	
Describe the central role of a patient-centered medical home in care coordination	4.2	
Use a trauma-informed approach in interacting with a patient	4.2	
Use basic principles of motivational interviewing to encourage behavior change	4.4	“My experience with my patient was very educational and will shape how I interact with all of my future patients. He was a difficult guy to get along with at times and he challenged me in many areas, but this made me better as a student doctor in my ability to communicate, understand, empathize and in my ability to create a plan that was in accordance with what the patient wanted but also promoted and improved the patient’s health.”
Perform a chart review and document patient encounters in the electronic medical record	4.7	
Improvement science: I am confident in my ability to...		
Identify an improvement need in a clinical setting	4.3	“[The most valuable thing was] the hands on experience of actually conducting the project. Regardless of outcome, the knowledge of how to do this will stay with us forever.”
Develop an aim for a quality improvement (QI) project	4.3	
Define measures (process, outcome, balancing) in a QI project	4.4	“Improvement science was a really valuable experience because I think this is something we will be engaging with every day as future physicians and to get hands on experience about how to actually conduct one of these projects as a medical student will be invaluable in the future.”
Collaborate with staff members, providers, and other stakeholders on improvement work	4.6	
Handoff and teaching: I am confident in my ability to...		
Communicate pertinent patient information to another care provider	4.1	“It was valuable to have the independence to decide what we thought was appropriate for training. For example, it was valuable for us to re-write the dot phrases with the information that we thought should be included.”
Document a handoff in the medical record	3.7	
Teach new learners basic clinical skills and use of the EHR	4.5	
Evidence-based medicine: I am confident in my ability to...*		
Perform a literature review to answer a question pertinent to my patient	4.3	“I would highly recommend integrating more EBM into the curriculum. Wonderful experience, and far superior to the EBM training we receive in our didactic education.”
Present results from a literature review in a concise manner to my peers	4.5	
Please indicate to what extent you agree or disagree with each statement:		
I can add value in a clinical setting as a medical student	4.6	“[The most valuable thing was] helping patients realize their internal strengths and motivations. Seeing how a solid support network can really influence a patient’s health outcome. Creating professional boundaries and learning what it means to be in a therapeutic relationship. Going on a home visit and learning more about how environment can affect health. Learning how to work with patients that have cognitive differences and how to rebuild trust with patients who have experienced systemic trauma.”
My experiences during the foundations phase prepared me for my third-year rotations	4.3	
By working with patients, I was able to experience the complexity of the healthcare system and its impact on patient health and well-being	4.4	“I feel very confident now in identifying personal/structural barriers to patient care. I feel far less confident in my ability to overcome these barriers. Perhaps this will be a career-long challenge...”
My SNaP experience has impacted my long-term plans for practicing medicine (specialty, location, patient population, etc.)	4.2	
I am considering pursuing a residency that will allow me to practice primary care	4.2	“I believe I did not gain as much clinical knowledge as other students in non-SNaP preceptorship slots. However, I believe the clinical skills gained are much more important as I continue my clinical rotations.”
Overall, SNaP was a valuable experience	4.8	

*Only 4 students completed the EBM component in the first cohort

early longitudinal experiences, ideal ways to teach improvement science to medical school learners, impact of being paired with a SNaP student on patients, and longer-term outcomes such as residency choice and practice setting after residency graduation for students who participate in SNaP. These related investigations are ongoing. With early exposure to high-functioning primary care settings, longitudinal relationships with patients and interprofessional team members, knowledge of goal setting, health system navigation, and care coordination, we hope that students may feel motivated to enter primary care during their careers.

SNaP, by nature of its many components, is a high-intensity program that requires significant administrative coordination. This is difficult to accomplish at scale without a full-time administrator and dedicated faculty and has been achieved in our setting with unfunded time from faculty and administrators for a small number of students. At least one faculty champion per clinic is required to guide and mentor the students, as well as individuals with expertise in IS, the social context of medicine, and the ability to lead small groups. Currently, this program exists in two clinics, with planned expansion to two additional sites in 2020–2021. Each clinic faculty champion manages identification of appropriate patients, faculty involvement, and clinical processes for student onboarding and participation in clinical and IS work. Clinic leadership and stakeholders must also be identified and lend their support to this work. Scaling this program to accommodate an entire class of medical students would require a major institutional investment, as SNaP's success is dependent on individualized patient- and clinic-based activities and uniformity in expectations and educational goals across all clinics. Increasing the number of faculty involved and creating opportunities for development and ownership of each clinic's student experience is the foundation for scalability.

Student engagement is an additional-issue affecting program scalability. At our institution, students' self-select into the program and students are engaged, motivated, and eager to participate. Student investment is critical to development of meaningful relationships with patients; therefore, scaling SNaP to an entire class of students may pose new, unforeseen challenges related to inclusion of students who may not desire a longitudinal, in-depth experience. For this reason, we feel that SNaP optimally exists as one of a menu of options for students, realizing the benefit of the program to even the small number of students that self-select into it. Participating students indicate that the program helped them form their professional identity and develop a greater understanding of health systems.

We do note that four students from the surveyed cohorts did not participate in this survey. It is possible that our survey results are biased by their lack of participation, especially given our small sample size. Regardless, we feel confident in our data as it is consistent with reports from the pre-graduation

focus group with cohort 1 students. Similar to the limitations of scalability, faculty buy-in and administrative support are essential to generalizing SNaP to other institutions. This program requires medical schools to prioritize HSS as a key part of its pre-clinical curriculum. In prioritizing HSS, a core difference of SNaP compared to traditional preceptorship is the relative lack of students' one-on-one time with physicians; rather, the patient and clinic team are the student's primary mentors. Even with optional history and physical examination practice sessions, SNaP students likely receive less practice presenting patients. However, SNaP students cultivate invaluable skills that are typically not attainable in a traditional preceptorship: building a longitudinal, intimate relationship with patients; learning and applying clinical skills independently; and communicating value-added information about care coordination with patients and care teams.

Conclusion

SNaP is a novel, longitudinal program aimed at integrating pre-clinical medical students into clinical teams to help navigate the healthcare system. Students gain practical skills and comfort in clinical settings through their medical assistant training. Students have the opportunity to effect real change in their clinic by designing and leading quality improvement as a team. With these aims, SNaP provides a myriad of unique, health systems-focused experiences for students, including patient navigation, IS, EBM, and interprofessional teamwork. Our work indicates students rate themselves highly in all domains of the program: clinical skills, patient navigation, improvement science, handoffs/teaching, and evidence-based medicine. Upon completing this program, students feel equipped to navigate the healthcare system on behalf of patients, express insight into the complexities of the medical system, and progress in their training with a heightened ability to identify and address structural barriers underlying healthcare outcomes.

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Compliance and Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval This work is determined to be exempt from IRB at OHSU.

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