



Utilization of a Ride-Share Application and Patient Navigation Program for Promoting Colonoscopy Among High-Risk Adults

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Abstract

Colonoscopy screening starting at age 50 is key for the early detection and prevention of colorectal cancer (CRC). Barriers to care, such as lack of insurance, transportation, and healthcare literacy, can deter a patient from completing a screening colonoscopy. Delayed CRC screening results in missed opportunities for detecting disease at an earlier stage, ultimately leading to increased healthcare costs and morbidity. We implemented a pilot program that combines student-led patient navigation with ride-share services to promote colonoscopy screening among at-risk populations in Harrisburg, Pennsylvania, United States, at no cost to patients. During the first year of the program, the rate of adequate colonoscopy preparation was 77% (10 out of 13 patients), and the attendance rate was 100% for all scheduled appointments. While this study analyzed a small cohort of participants, it demonstrates how a colonoscopy screening program can be organized and conducted successfully through collaboration among multiple stakeholders. Future aims include expanding the program and assessing its receptiveness via post-procedure surveys for patients, patient navigators, and healthcare providers.

Introduction

Although colorectal cancer (CRC) is the third most common type of malignancy in the United States, early detection can significantly improve health outcomes in those affected.¹ The United States Preventive Services Task Force recommends screening for adults between the ages of 50 and 75, and the American Cancer Society recommends starting screenings even earlier at age 45. Colorectal cancer screening can be completed with yearly fecal immunochemical tests (FIT) or screening colonoscopies every ten years amongst other options¹. However, several socioeconomic barriers deter individuals from obtaining regular screenings, including lack of awareness regarding timing of and rationale for CRC screening as well as underinsurance or lack of

insurance, transportation, and healthcare literacy.² Unfortunately, these deterrents disproportionately affect low-income communities composed of racial and ethnic minorities. For instance, national CRC screening rates for underinsured patients are 19% to 25% whereas rates are 45% to 61% in their insured counterparts.² Furthermore, African Americans and Latinos are more likely to be diagnosed with late-stage disease than Caucasians, which results in poor health outcomes among these groups.³ Similar trends can be seen in communities of central Pennsylvania (PA), particularly in Harrisburg.⁴ Lower educational levels coupled with low-income levels further exacerbate this issue. Furthermore, colorectal cancer accounts for the second highest number of deaths in PA, second only to lung and bronchus cancer.⁴ In this article, we

describe the logistics of a colorectal cancer screening program developed by medical students at the Pennsylvania State University College of Medicine (PSCOM) to help at-risk populations in Harrisburg, PA.

Identifying Barriers to CRC Screening

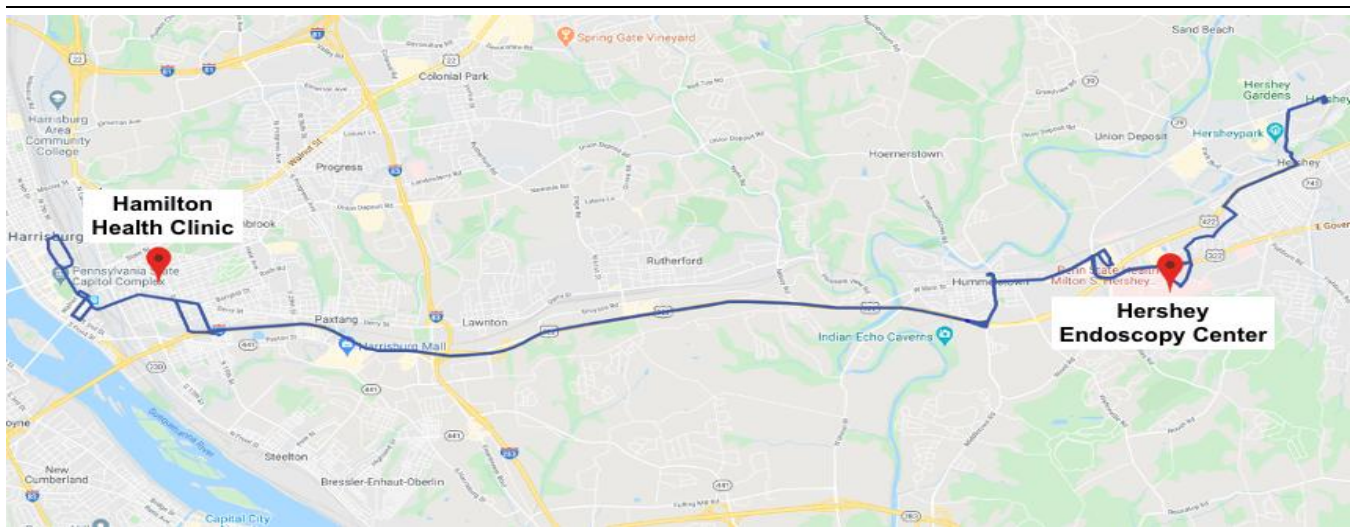
The Hamilton Health Center is the main Federally Qualified Health Center (FQHC) in Harrisburg, PA. This health center provides a variety of medical services to patients regardless of their income. However, patients with a positive at-home FIT often do not proceed to receiving a screening colonoscopy due to a lack of resources.⁵ To increase access to screening colonoscopies in this area, the Hershey Endoscopy Center offers free colonoscopies to these patients. Apart from finances, two additional obstacles faced by patients are inadequate transportation and low health literacy rates. For the former deterrent, Figure 1 demonstrates that the distance between the Hamilton Health Center and the Hershey Endoscopy Center is 11.2 miles, and patients can commute via the Capital Area Transit bus system route 322.⁶ However, the bus schedule is often unpredictable and requires multiple transfers, which makes the public transportation system tough to utilize.

Collaboration Among Stakeholders

Every month, members of the Student-Run

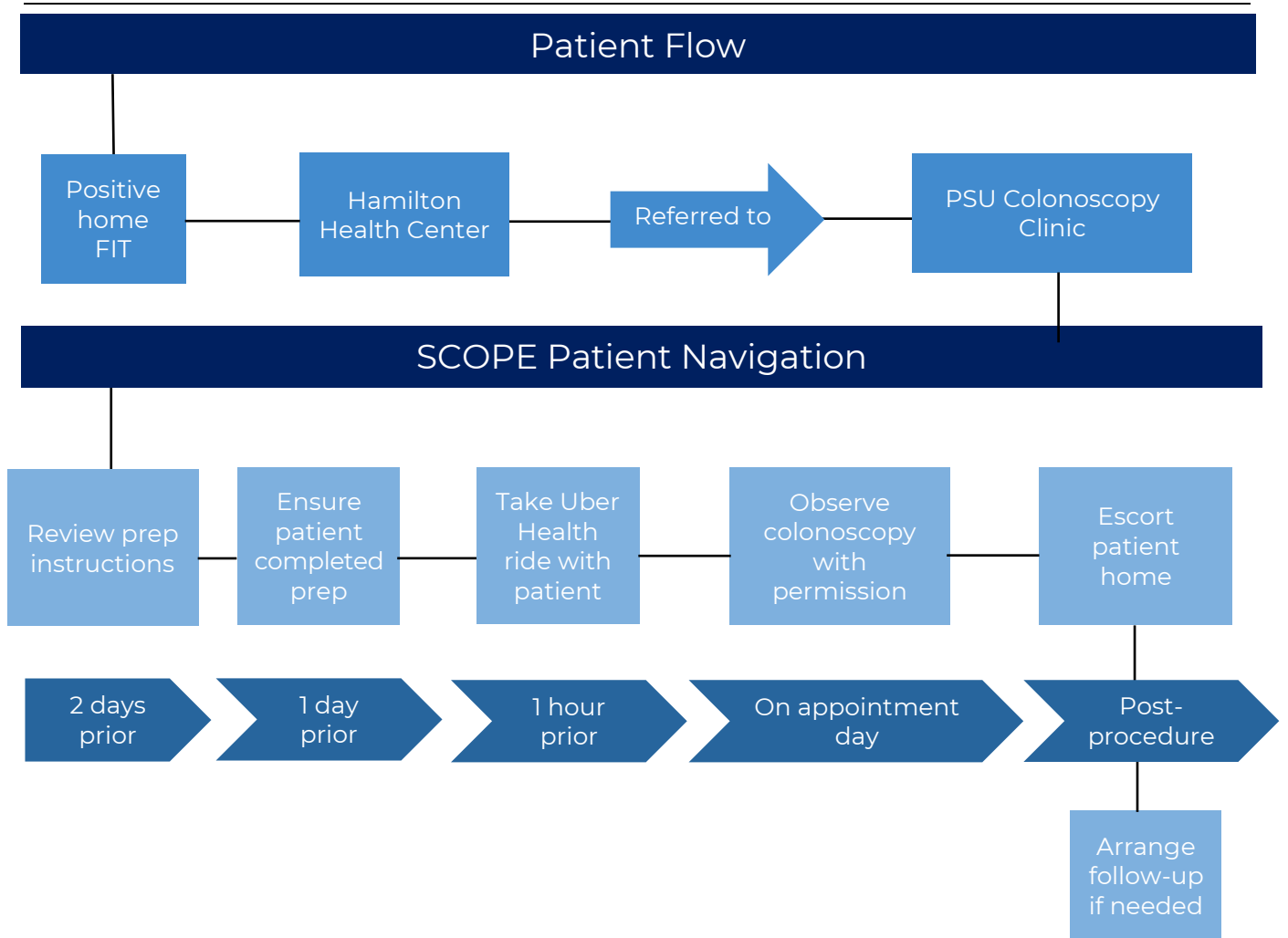
Collaborative Outreach Program for Health Equity (SCOPE) participate in roundtable discussions with the PSCOM Community Health Team, in which team members share the needs that they identify in communities surrounding the Hershey Medical Center. During one of these meetings, SCOPE was introduced to the work being done by the Hamilton Health Center and learned about how their patients are facing barriers to completing screening colonoscopies. As a result, SCOPE brainstormed a potential solution to this problem and reached out to the Hamilton Health Center to establish a relationship between multiple stakeholders, including SCOPE, the Hamilton Health Center, and the Hershey Endoscopy Center. SCOPE piloted the use of a grant-funded Uber Health ride-share program to provide free and reliable transportation for patients needing screening colonoscopies at the Hershey Endoscopy Center. SCOPE also developed a patient navigation program with medical student patient navigators to help with patient adherence to pre- and post-procedure instructions and escort the patient to and from the procedure via an Uber Health ride. The main goals of this pilot project are to develop a continuum of care for patients who have an initial positive FIT, improve patient health literacy, examine the efficiency and cost-effectiveness of grant-funded Uber Health rides, increase engagement in central PA communities, and enhance pre-clinical medical

Figure 1. Bus route between Hamilton Health Center and Hershey Endoscopy Center



The distance via public transit from Hamilton Health Clinic to Hershey Endoscopy Center is 11.2 miles. 1 inch = 2.49 miles.

Figure 2. Schematic of the Uber Health colonoscopy protocol



FIT: fecal immunochemical tests; PSU: Pennsylvania State University; SCOPE: Student-Run Collaborative Outreach Program for Health Equity.

education experiences of first- and second-year students at PSCOM.

Methods

Developing the Colonoscopy Program Workflow

Initially, the Hamilton Health Center disperses FIT kits for patients to independently complete at home. After patients send the specimen to the appropriate labs, a report is generated and the FQHC notifies the patient whether the test was positive or negative. If a patient has a positive FIT, the Hamilton Health Center communicates with PSCOM's Department of Family and Community Medicine and Gastrointestinal Medicine Department to schedule a free diagnostic colonoscopy.

The colonoscopies are conducted at the Hershey Endoscopy Center. Once the procedure is scheduled and pertinent patient information is inputted into PSCOM's electronic health record systems, first- and second-year medical students are given the opportunity to sign up to volunteer as patient navigators during those appointments. If a student navigator is not available, a case worker is given advance notice to perform the role of the patient navigator. The patient and patient navigator workflows are shown in Figure 2 above.

Two days before the procedure date, an assigned patient navigator calls the patient to confirm the procedure date and time and review the colonoscopy preparation instructions. The

following day, the patient navigator calls again to ensure proper completion of If the preparation is not adequately completed, the volunteer helps the patient reschedule the procedure. Subsequently, the day of the procedure, SCOPE members order an Uber Health ride for the patient via a Health Insurance Portability and Accountability Act (HIPAA)-secure online platform.⁷ HIPAA compliance is maintained since only the patient's name is used to request the ride and no other patient information is recorded on the Uber Health server. The ride-share service only requires the patient having access to a landline or cell phone, and ride information is communicated via call, text, or through the Uber app. The medical student then drives to the patient's home one hour prior to the appointment to escort the patient to the appointment via the Uber Health ride. During the colonoscopy, with the patient's permission, the patient navigator may observe the entire procedure. Upon completion of the colonoscopy, results are shared with the patient and further follow-up is discussed as needed. The patient navigator then accompanies the patient home on a return Uber Health ride. After dropping the patient home and ensuring that they can safely mobilize, the medical student picks up his/her/their car. These rides are funded by grants and are therefore free of charge to patients. SCOPE members, who are also medical students at PSCOM, maintain secure records of the diagnostic colonoscopy appointment dates and times.

Obtaining Funding

SCOPE secured initial funding for patient transportation through the Penn State Health's Community Relations Grant, which consists of a \$3,500 award to fund the Uber Health Colonoscopy project for 2019. The grant supports Uber rides for patients who indicate a lack of access to transportation. In addition, the Penn State Clinical and Translational Institute's Bridges to Translation Pilot Grant Program awarded \$50,000 to the program, with SCOPE's faculty advisor as principal investigator.

In terms of the cost of each colonoscopy, if it is fully covered by the patient's insurance, the screening colonoscopy is billed accordingly. However, if the patient is unable to cover the out-of-pocket costs after insurance reimbursement

or if the patient does not have insurance, Penn State Health covers the cost of the colonoscopy as well as anesthesia, pathology, and the potential costs of treatment, such as oncological and/or surgical services based on the findings of the diagnostic colonoscopy.

Results

Patient Outcomes

The pilot Uber Health Colonoscopy project took place from September 2019 to August 2020. A total of thirteen patients participated in the colonoscopy screening program. There were seven males and six females. The average age of participants was 52.2 with a range from 33 to 64. The racial and ethnic composition consisted of five Black/African Americans, three Hispanic/Latinos, three White/Caucasians, one other/mixed, and one unknown. In addition, five (38.5%) of the patients utilized the Uber Health ride and patient navigation services whereas eight (61.5%) of the patients opted for a colonoscopy only. Table 1 compares the demographics and characteristics of the patients in these two groups.

The results above show that four out of five (80%) of patients who used the Uber Health ride with patient navigation services had either good or adequate bowel preparations. In this group, one patient had an inadequate bowel preparation and was instructed to complete an additional day of bowel preparation with supplemental formulary. Despite additional steps taken, repeat colonoscopy on the following day showed inadequate preparation again. Of the patients who opted for a colonoscopy alone, about six out of eight (75%) had good or adequate bowel preparations. Two patients in this group had poor or inadequate bowel preparations, and one of those patients had to repeat the colonoscopy within three months.

Cost Analysis

The average roundtrip travel cost of an Uber Health ride from a patient's home located in Harrisburg, PA, to the Hershey Endoscopy Center was \$45 per patient. A FIT kit cost \$49 per patient. The time volunteered by the Hamilton Health staff, members of SCOPE, medical student navigators, and gastroenterologists at the Hershey

Table 1. Demographics and characteristics of colonoscopy only versus colonoscopy with Uber Health ride and patient navigation patients

Characteristics	Total, n (%)	Colonoscopy Only, n (%)	Colonoscopy with Uber Health Ride with Patient Navigation, n (%)
Sex			
Male	7 (53.8%)	4 (50%)	3 (60%)
Female	6 (46.2%)	4 (50%)	2 (40%)
Age (Mean ± Standard Deviation)	52.2 ± 7.7	53.4 ± 8.8	50.4 ± 3.4
Race/Ethnicity			
Black/African American	5 (38.5%)	3 (37.5%)	2 (40%)
Hispanic/Latino	3 (23.1%)	2 (25%)	1 (20%)
Other/Mixed Ethnicity	1 (7.7%)	1 (12.5%)	0
Unknown	1 (7.7%)	1 (12.5%)	0
Bowel Preparation			
Good/Adequate	10 (76.9%)	6 (75%)	4 (80%)
Poor/Inadequate	3 (23.1%)	2 (25%)	1 (20%)

The results above show that almost 80% of patients who used the Uber Health ride with patient navigation services had either good or adequate bowel preparations. In this group, one patient had inadequate bowel preparation and was instructed to complete an additional day of bowel preparation with supplemental formulary. Despite additional steps taken, repeat colonoscopy on the following day showed inadequate preparation. Of the patients who opted for a colonoscopy alone, 75% had good or adequate bowel preparations. Two patients in this group had poor or inadequate bowel preparations, and one of those patients had to repeat the colonoscopy within three months.

Endoscopy Center was not quantified for this pilot program. The expected number of patients for the pilot year from September 2019 to August 2020 was four patients per month for a total of 48 patients. Given the average roundtrip travel cost, funding for 100% of patients for the pilot year were expected to be covered by the Community Relations Grant. However, due to COVID-19 pandemic resulting in temporary suspension of all non-emergency procedures, the Uber Health colonoscopy program was paused from March 2020 to August 2020.

Discussion

The results of this pilot study add to the growing literature supporting the use of patient navigation to aid cancer screening practices. In particular, the study's findings provide insight into the costs and benefits of implementing a ride-share application coupled with patient navigation for colorectal cancer screening.

Collaboration between multiple stakeholders was crucial for initiating this pilot colonoscopy program. While each medical school has unique capabilities within different communities,

regular meetings between student groups, community health teams and leaders, and community members themselves were key in developing and testing out this program. Through these meetings, stakeholders were able to match the capabilities of PSCOM and Hershey Medical Center with the needs of the Hamilton Health Center's patients.

Overcoming Logistical Challenges

Ride-share-based transportation has been essential for the success of this pilot program. Within the Harrisburg metropolitan area, patients have very few public transportation options. Buses from Harrisburg to the Hershey Medical Center are an inexpensive option. However, the buses run every one to two hours, take 44 to 47 minutes in transit, and only follow the one route shown in Figure 2. These reasons make it difficult and impractical to utilize the buses.⁸ Taxi services are considerably faster, but they cost \$40-55 and are difficult to schedule due to a limited supply of taxi companies. In contrast, since there are many dispersed drivers in the area, Uber Health rides can be ordered on-demand to suit the patient's timing needs. Through grant

funding, the rides can be provided free of cost to patients as well. Working with Uber Health in particular allowed SCOPE members to order and monitor rides from a centralized location (the Hershey Medical Center), pre-pay for the round-trip rides, and protect patient privacy on a HIPAA-secure platform. However, setting up the Uber Health account came with its own administrative challenges. Some of the obstacles included accessing the grant to fund the rides, communicating only necessary patient information among collaborators, and recording event data. To address these challenges, SCOPE established a non-profit bank account, linked it to the Uber Health app account, established concrete protocols for collaborator communication, and created a HIPAA-compliant paper file system to keep track of event data.

Benefits of Patient Navigation in CRC Screening

Patient navigation also proved to be an essential component of addressing barriers to completing CRC screening in our pilot program. First and foremost, patient navigators are necessary to accompany the patient home after a screening colonoscopy due to the sedation used during the procedure.⁹ Several patients who participated in this program either lived alone or did not have someone who could take time from their lives to accompany the patient after a colonoscopy. Therefore, these patients would forgo having a CRC screen colonoscopy altogether. The medical student patient navigators in our program successfully resolved this issue. Secondly, inadequate bowel preparation is commonly observed in more than 25% of all colonoscopies. These rates are even higher among the elderly and people with single relationship status, low educational attainment, or low income.¹⁰ The most recent guidelines by the United States Multi-Society Task Force state that examinations with poor preparation should be repeated within one year.¹¹

Additionally, it is important to note that inadequate bowel preparations can be influenced by patient-related risk factors, such as advanced age, male sex, polypharmacy, and chronic diseases like diabetes.¹² Patients with risk factors who have inadequate preparation for a colonoscopy are suggested to repeat the preparation the same day and repeat the colonoscopy the

following day.¹² One of the patients in this study was found to have inadequate bowel preparation despite reviewing bowel preparation compliance with a medical student patient navigator. Therefore, this patient repeated the preparation and was set up for a colonoscopy the next day. Ultimately, the preparation was inadequate again, and as a result, computed tomography (CT) colonography had to be arranged. This study did not collect information on any patient's chronic conditions and/or medication use or stratify his/her risk factors that can contribute to increased likelihood of poor colonoscopy bowel preparations. However, in the future, it would be useful to analyze this information because it would allow both patients and providers to be better prepared about possibly needing a repeat colonoscopy the next day or a CT colonography in the future. Since most of the risk factors are nonmodifiable and proper compliance with bowel preparations does impact the quality of colonoscopies, patient navigators are a useful tool to help ensure that all patients adhere to preparation instructions. By calling patients ahead of their appointments, reviewing preparation instructions, and confirming completion of the preparations, patient navigators can increase patient compliance rates by providing accountability. In the short-term, this initiative can lead to higher quality colonoscopy results. In the long-term, it can reduce the number of rescheduled appointments and the need for early re-screening.

The Impact of Patient Navigation on Medical Education

The range of activities performed by patient navigators enhances medical education through early pre-clinical exposure. For instance, this pilot program teaches medical student patient navigators about value-based care, by demonstrating how adequate colonoscopy preparation yields higher quality screening results and therefore, re-screening does not need to be done earlier. These practices then help both patients and healthcare institutions save time and money. At the same time, medical students not only learn about barriers patients face when accessing healthcare, but they witness the barriers firsthand. These experiences may spark new ideas in the future

generations of medical professionals to come up with solutions to address these barriers. Medical students also experience how healthcare systems operate and deliver care through interprofessional collaboration with different types of healthcare providers, including nurses, social workers, and insurance agents.¹³ Furthermore, early patient contact has been shown to promote empathy among medical students.¹⁴ At PSCOM, all first-year medical students participate a Patient Navigation Program with multiple sites. Through this colonoscopy screening program, SCOPE was able to provide an additional clinical site for the larger Patient Navigation Program. Medical students were able to shadow gastroenterologists, strengthen their interpersonal skills, and learn about health disparities while meeting patients from diverse backgrounds.

Student Feedback

In addition, medical students who participated in the pilot colonoscopy screen program were asked to take the time to reflect on their experiences to gain insight into how the program was impacting their medical education. Below are reflections from two of the student participants.

Benjamin Watt, second-year medical student stated:

“On a holiday in January 2020, I accompanied one patient to the med center for a colonoscopy and was struck by how hard this patient and those who cared for him had to work to coordinate transportation and to pay for appropriate products from the pharmacy. Despite the patient fasting and students managing the logistics of the long day, the procedure prep was inadequate, and a repeat had to be planned. The experience aided my first-year education by illustrating concretely how mental health, family, neighborhood, and purchasing power all influence access to basic preventative healthcare. Patients are complex people living in a complex world.”

An anonymous, second-year medical student shared:

“I think the patient who was enrolled in the program is heavily benefited, considering the possible consequences if they

had not gotten the screening. My patient is within the age group who by guidelines are recommended to get regular screening. She lives in the inner city, and has some alarming risk factors, such as smoking. As the patient was prepped and sent to have her procedure done, I was able to observe the colonoscopy, and the attending discovered some polyps that were sent for pathology studies, which he suspected were signs of adenocarcinoma. Had the patient not been offered to have the colonoscopy done, it may have progressed to a more dire prognosis later in life. Overall, I had a positive volunteering experience with SCOPE. Not only was I able to observe a colonoscopy procedure for the first time, but I also got to spend enough time with the patient to learn about her risk factors.”

In summary, the student feedback shows that by interacting with a diverse patient population face-to-face, medical students obtained a glimpse into the complexities of our current healthcare delivery system and the effects on patient outcomes.

Provider Feedback

Furthermore, although there was limited feedback taken from healthcare providers, the comments received were positive. During one colonoscopy for a patient who used the Uber Health ride and patient navigation service, the physician stated, “This is the best prep of the day.” Overall, diligent oversight by medical student patient navigators ensured a high level of adherence to the bowel preparation protocol, which resulted in more efficient utilization of appointment time and reduced the need for repeat appointments.

Limitations of the Colonoscopy Program

Although this pilot study demonstrates several benefits, it also has limitations. Formal post-colonoscopy surveys were not obtained from patients, patient navigators, or providers as the need for these surveys was not included in the Internal Review Board. Moving forward, it would be highly useful to collect written and/or electronic surveys from all parties involved to assess for satisfaction, evaluate the current program protocols,

and identify improvements. The study's sample size was also small (n=13), which could introduce voluntary bias, inflate findings, and inaccurately predict the estimated costs of future Uber Health rides. Nevertheless, it is worth noting that this descriptive article highlights the process of combining a ride-sharing program with a patient navigation program to promote CRC screening in an underserved community.

Translating this pilot program to much a larger scale using the same model may come with various obstacles. While this program is successful in its current state and maintained by a team of willing medical students, the number of patients who need screening colonoscopies with transportation and patient navigation could easily exceed the number of volunteers available. This issue can arise from a lack of volunteers due to the rigorous academic demands of medical school or because of unforeseen restrictions, as precipitated by the COVID-19 pandemic. However, the utilization of Uber Health ride-sharing services would not be a barrier to expanding this program to a larger scale. As the number of participants in this program increases, the demand for Uber Health rides will increase, and in turn, the ride-share system will need more drivers to supply the demand. As a result, more jobs may become available in the Harrisburg community, which would provide more employment opportunities to its residents.

In summary, this pilot study demonstrates how patients and medical students have been receptive to a novel screening colonoscopy program that combines the use of a ride-share transportation system with patient navigation. The program can be replicated on a larger scaled to improve appointment adherence for high-risk patients who lack transportation. Concurrently, this initiative provides education about different health topics to patients with health literacy barriers and enhances the medical education by increasing pre-clinical exposure.

Future Goals for the Colonoscopy Program

Future aims include refining the program's workflow from start to finish. The updated workflow would include formal surveys for patients, providers, and students before and after the screening colonoscopy procedures. From the

survey responses, SCOPE members would continue to fine-tune the program's workflow. Another future aim is to establish a post-colonoscopy follow-up protocol to assess whether patients complied with instructions given after the procedure, such as scheduling necessary follow-up appointments. Ultimately, the long-term goal for this pilot program is to continuously assess its feasibility, maintain the current program, and expand it to neighboring communities to benefit as many patients as possible. The one-year plan is to analyze the outcomes for the patients who participated in this pilot and establish the longitudinal impacts of the program. We will use that data to support creating additional community partnerships and setting up more programs to reach more patients in Central PA. The five-year plan is to introduce this novel screening colonoscopy program to other medical institutions by providing an optimized process protocol and training to establish the program in different regions.

Disclosures

The authors have no conflicts of interest to disclose.

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