MEDICAL STUDENTS MAKING AN IMPACT

Submissions to the Accelerating Change in Medical Education Health Systems Science Student Impact Competition

Foreword

In 2013, the American Medical Association launched its "Accelerating Change in Medical Education" initiative with the aim of creating the medical schools of the future. It was one of three strategic efforts introduced by the AMA—the other two being the "Improving Health Outcomes" initiative and the "Practice Sustainability and Physician Satisfaction" initiative. All three were developed with the intent of significantly bettering the lives of patients and physicians.

Six years later, our analysis of the effects of the AMA "Accelerating Change in Medical Education" initiative clearly shows it has had a significant impact on medical students who are well on their way to becoming excellent physicians. An outgrowth of the initiative, the AMA Accelerating Change in Medical Education Consortium now includes a total of 37 schools (20% of all eligible U.S. allopathic and osteopathic medical schools) that are working together to transform medical education. These schools are educating nearly 24,000 students who will one day care for more than 41 million patients annually.

Our intent with the 2018 Accelerating Change in Medical Education Health Systems Science Student Impact Competition was to determine if the medical students from our consortium schools were improving health outcomes, practice sustainability and the lives of patients and physicians before they even graduated from medical school. What kind of impact could a medical student have if they were armed with health systems science, the emerging third pillar of medical education, along with the other two pillars—clinical and basic sciences?

The entries we received far exceeded our expectations. This book showcases these remarkable submissions covering a variety of topics. From devising ways to reduce the risk of health care workers in Africa contracting Ebola and developing mentorship programs to nurture people underrepresented in medicine, to using mathematical models to improve cholera control in Haiti—these are just a few of the huge accomplishments made by medical students who set out to—and succeeded in—improving the lives of others.

Maya Angelou said, "When you learn, teach. When you get, give."

We are very proud that, not only did the AMA "Accelerating Change in Medical Education" initiative make a difference in medical education, it made a difference in medical students' lives. These medical students, in turn, even before finishing school, made a difference in the lives of patients, physicians and their communities.

Susan E. Skochelak, MD, MPH
Group vice president, Medical Education
AMA

Preface

Tell us how you've made an impact on health systems.

In 2018, we launched the Accelerating Change in Medical Education Health Systems Science Student Impact Competition with that prompt. The competition was open to all medical students at member schools of the AMA Accelerating Change in Medical Education Consortium.

We asked for students to think impactful, think innovative, think inspirational. Eligible projects addressed one of the health systems science domains, such as leadership, patient safety, quality improvement or population health.

We were not disappointed. Actually, we were *astounded* by the impact medical students have had on the lives of patients around the world, their fellow students and future physicians. The submissions were evidence of the anecdotes that medical school faculty had long been sharing about how students make a huge difference in their health systems.

We awarded the most impressive submission the first-place prize of $3,000, the second-place winner $2,000 and the third-place winner $1,000. Three honorable mentions received $500 each. Winners were selected because of their project's measurable impact on the health system, the scope of the impact and the student's personal contribution to the project, but the decisions were not easy. All the entries were of such high caliber.

In this book, you will find the abstracts for the submissions. We hope you will be as impressed as we were.

Maya M. Hammoud, MD, MBA
Senior adviser
AMA "Accelerating Change in Medical Education" initiative

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Winning abstracts

Colorful Decontamination with Highlight—Protecting Patients and Health Workers from the Ebola Epidemic and Health Care-Associated Infections

Medical Student
Kevin Tyan, Harvard Medical School

Teammates
Katherine Jin and Jason Kang

Faculty Mentor
Jennifer Potter, MD, Advisory Dean and Director

Abstract

At the peak of the 2014 Ebola outbreak in West Africa, during my junior undergraduate year at Columbia, my friends and I were eager to contribute solutions to this crisis. We listened to first responders and infectious disease experts describe the problems they were facing, and chief among them was the high rate of infection caused by ineffective decontamination. To address this problem, I co-invented Highlight, an additive for disinfectants that colorizes them blue to ensure full coverage on surfaces and then fades to clear to indicate in real-time when decontamination is complete. Highlight ensures proper disinfection practices and empowers workers and patients to be confident in their safety. We recognized the potential this had not only for epidemic outbreaks, but for all health care settings, and the three of us founded Kinnos Inc. to bring Highlight to the world. After securing a $650K grant from the U.S. Agency for International Development (USAID), I traveled to Liberia and Guinea to field-test with Ebola aid workers and helped implement Highlight in non-governmental organizations (NGOs), laboratories, government agencies and hospitals for training and routine disinfection. Highlight Sprays has currently been deployed by Doctors Without Borders to combat the current Ebola outbreak in DR Congo.

Project addressed/Problem discovered

After speaking with Ebola aid workers during the outbreak, I discovered that inadequate disinfection was driving the disproportionately high rate of health care worker infections. The current practice was crude and imprecise. Workers would use a contractor sprayer with bleach and spray each other before doffing their personal protective equipment (PPE). The problem is that disinfectants like bleach are transparent, making it easy to miss spots. Bleach solutions also form droplets on waterproof PPE material, covering less than 33% of a sprayed surface. Disinfectants need to fully cover and remain wet on surfaces for specific contact times to fully inactivate pathogens, but this is difficult to enforce in practice as workers are unaware or fail to adhere to protocol. The result was that West African Ebola workers were 21-32x more likely to be infected than the general adult population. I soon realized that the problem of inadequate decontamination was not limited to the Ebola epidemic. In the United States, health care-associated infections (HAIs) exact a heavy toll on the health care system, killing more than 99,000 people and resulting in direct costs of up to $45 billion every year. In the case of an environmental services (EVS) worker at a hospital, disinfection serves as the first line of defense against nosocomial infection. EVS workers must wipe down all surfaces in acute patient rooms daily. Unfortunately, using disinfectants is difficult as human error can render disinfectants ineffective, and studies have shown that 50% of surfaces in health care settings are not properly cleaned.

Approach

To address human error during disinfection, I came up with a simple solution: why not make disinfection visible to the naked eye? My team and I soon developed a chemical additive, Highlight, that colorizes bleach disinfectants blue to ensure no spots on a surface are missed and which then fades from blue to clear to indicate in real-time when the contact time has been met and decontamination is complete. After developing an initial prototype for the Fire Department of New York, which they implemented after a physician in the city contracted the virus, we were awarded a $650K grant from the USAID Fighting Ebola Grand Challenge. I spent the next year leading the effort to optimize the chemistry such that Highlight would confer at least 99.9% surface coverage on sprayed surfaces, fade in the correct contact time to signal Ebola deactivation, and be compatible for end users in West Africa. We then traveled to Ebola Treatment Units in Liberia and Guinea from 2015-2016 to conduct field tests, collect feedback and finalize the product. Next, we sought to address the high rates of HAIs in the United States by improving the way bleach disinfectant wipes are utilized in hospitals. After raising a $1 million seed round in 2017, I helped develop the Highlight Wipes system, which consists of 1) a reusable lid compatible with commercially available bleach wipe containers and 2) disposable cartridges containing liquid Highlight additive and fresh batteries to power the lid. When wipes are dispensed through the lid, the Highlight color is administered onto each wipe. The system allows even untrained personnel to immediately use a disinfectant correctly: simply ensure the entire surface is blue and once the color is gone, disinfection is complete.

Outcomes

During our field-testing in West Africa, the color-changing properties of Highlight revealed grave errors in protocol that had undoubtedly contributed to transmissions during the outbreak. At one Ebola Treatment Unit in Ganta, Liberia, I was surprised to find that Highlight was not properly fading away in the bleach solution prepared for us by the local health care workers. This led to our discovery that because the workers had been given incorrect measuring utensils, the bleach had been improperly prepared at less than half of the intended concentration.

This meant that throughout the entire outbreak, workers had been attempting decontamination with ineffective, overly diluted bleach. Without the introduction of Highlight to quality control the efficacy of the bleach, this problem would not have been diagnosed. Our field-testing at a major Ebola Treatment Center in Monrovia, Liberia yielded another sobering finding. When workers sprayed each other with Highlight, they found that the blue indicator had penetrated their PPE suits and stained their underclothing. This led to our discovery that throughout the outbreak, staff had been issued inadequate PPE suits they assumed to be waterproof, thus unknowingly exposing themselves to the virus. This center had seen some of the highest rates of health care worker infections in Liberia. Due to our discovery, we were able to alert the proper officials to procure the correct PPE for their staff. I co-authored a publication to share these findings in the *Journal of Hospital Infection* and bring attention to the breakdowns in infection control protocols that led to mortality during the Ebola outbreak.

Impact on the health system

After field-testing with end users in Liberia and Guinea, we used the remainder of the USAID grant to validate the technology and bring Highlight to a deployable state. I was the lead author on research in the *American Journal of Infection Control* (AJIC) demonstrating that Highlight could enhance sprayed bleach to cover over 99.9% of a surface for at least 15 minutes, compared to standard bleach that covered only between 14%-33% of a surface. Through objective third-party labs, we tested on four pathogens to confirm that Highlight could be added to bleach solutions without adversely affecting efficacy and published these results in AJIC as well. Currently, we have commercialized Highlight Sprays to VIA Global Health, a distribution and logistics platform for developing countries and international sales. We have expanded our adoption to over a dozen institutional customers with presence in six developing countries, including Haiti for the cholera outbreak and Uganda and Zimbabwe for Ebola preparedness. This year, I helped negotiate a purchase order of Highlight by Doctors Without Borders (MSF) and managed the rapid production of thousands of Highlight units. During the recent Ebola outbreak in DR Congo, MSF was able to deploy its entire stockpile of Highlight to aid in the response. My current focus is implementing Highlight Wipes to combat HAIs in hospitals around the country. This year, I helped initiate pilot studies in over 8 major hospitals, including Boston Medical Center, Emory University, Case Western Reserve University School of Medicine and NewYork-Presbyterian Hospital, with the goal of commercially launching Highlight Wipes in early 2019.

Personal Impact

My experience as an inventor and founder of Kinnos has been intensely formative. From working to protect Ebola fighters to expanding our business, this experience has given me the chance to learn and grow beyond the traditional classroom. I have traveled around the world to field-test Highlight, meet with stakeholders and pitch to investors. From the gruff Belgian infection control specialist at MSF who could barely contain his glee when he sprayed Highlight for the first time, to the outspoken Guinean hygienist who visited local community elders to help us assess potential cultural barriers of using a bright blue disinfectant, the people I met left a lasting impression. In Liberia, I found myself getting to know the health workers by sharing a meal of cassava root dipped in goat stew. In front of a World Health Organization panel in Geneva, I made the case for Highlight to be adopted for future outbreaks. My travels taught me how to interact and collaborate with people across different cultures and backgrounds, and I hope to apply these experiences to effectively care for a diverse set of patients. Starting a business also required me to extend my knowledge into areas beyond medicine. From writing grant proposals to delivering pitches, I learned how to clearly communicate my product and business plan. Filing multiple patents gave me insight into the world of intellectual property, while publishing multiple papers allowed me to contribute to the field of infection control. I learned to collaborate on a large scale through partnering with international NGOs and research agencies. Finally, being an entrepreneur has given me an appreciation of self-direction and autonomy. In the future, I hope to combine my entrepreneurial spirit with rigorous training in medicine to continue to innovate and improve the lives of those in low-resource settings. While Highlight is being used for many purposes, our impact in Liberia and Guinea for the Ebola outbreak was particularly meaningful to me. Ebola was so stigmatized in West Africa that health workers were ostracized by friends and could no longer live with their families. These health workers were risking their lives to protect others at the expense of so much. After the health workers used Highlight, they told us they felt confident in their safety for the first time since the outbreak began. The ability to protect and empower health workers is something that continues to motivate me today.

Improving Teamwork in Medical Education: A Student-Veteran Inspired Initiative to Improve Behaviors and Understand Barriers

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Faculty Mentors
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Abstract

Comprehensive research supports the need for teamwork training within health care education. Teamwork training has been shown to decrease preventable medical errors and increase patient safety. Despite these findings, academic institutions have found varying success in attempts to implement teamwork training into graduate health care curriculums. There remains little guidance on how to most effectively conduct teamwork training within this setting. Many institutions have attempted to ingrain teamwork through 'exposure-based' curriculums. The primary objective of this project was to increase teamwork behaviors of medical students. The secondary objective was to identify and understand barriers to training implementation within medical education—enabling program improvement and interactive curriculum development. Our study indicates that exposure-based teamwork curriculums result in improper teamwork habit pattern formation, shows how student-led faculty-supported teamwork training programs can assist in overcoming the teamwork training gaps in medical education and utilizes study results to propose a model for graduate health care teamwork training.

Project addressed/Problem discovered

Failures in teamwork and communication continue to remain as top causal factors for preventable medical error and compromised patient safety within health care. The call for teamwork training at all levels of medical education has been repeatedly documented as a mechanism to decrease preventable error rates; however, little evidence-based consensus exists about the most effective ways to achieve this training. In the absence of literature consensus, interprofessional institutions have had varying results with attempts to integrate teamwork training into their curriculums—with many relying on exposure-based curriculums (events in which students get exposure to team/group events without incorporation of formal teamwork training). The clinical reflections of two Robert Wood Johnson Medical School (RWJMS) students with prior military backgrounds in Naval Aviation and Army Special Forces respectively led to the identification of multiple teamwork training deficiencies with the RWJMS curriculum. Through analysis of the existing RWJMS curriculum, engagement with student and faculty champions and survey of baseline student teamwork behaviors via their constructed IRB-approved study, the following curricular problems were identified:

- The existing RWJMS curriculum lacked incorporation of an evidence-based teamwork training model
- RWJMS students within the existing exposure-based curriculum had multiple deficiencies within teamwork competency domains that have been correlated with increased patient safety

Approach

Our hypothesis was that a military veteran-inspired, student-led and faculty-supported teamwork training program could significantly increase teamwork behaviors among Rutgers RWJMS students. The primary objective was to develop a curricular innovation that would increase teamwork behaviors of medical students. The secondary objective was to identify and understand barriers to program success, thereby enabling iterative program improvement and a model for overcoming the teamwork training gap within graduate health education. It was also believed that this initiative might serve as the spark for cultural transformation within an academic health center. We obtained project support from core faculty champions and assembled a student-faculty implementation team whose approach comprised:

- Identification of teamwork training deficiencies within existing curriculum
- Drafting an IRB-approved study and associated survey instrument to understand student teamwork behaviors
- Completion of the Agency for Healthcare Research and Quality (AHRQ) TeamSTEPPS (Team Strategies and Tools for Enhanced Performance and Patient Safety) Master Trainer Course by four students
- Design of TeamSTEPPS-based teamwork training curricular intervention with approval of RWJMS Curriculum Committee
- Student-led instruction of TeamSTEPPS intervention to 650 medical, nursing and pharmacy students during academic year 2017-2018
- Construction of a single-sheet TeamSTEPPS reference to promote use of teamwork tools by students in clinical team settings
- Pre- and post-intervention survey assessment of teamwork behaviors with quantitative and qualitative data analysis

- Routing of results, lessons learned and identified barriers to RWJMS curriculum faculty to enable iterative improvement of the RWJMS training program

Outcomes

Analysis of pre-intervention (control group) survey results indicated consistent deficiencies in teamwork behaviors across all studied team environments—most notably in leadership, team set-up/structure and communication behaviors (3 of the 5 core competencies of the TeamSTEPPS teamwork training model). The most concerning findings showed that 60% of medical students did not routinely 'brief' or 'debrief' during team encounters—two teamwork skills that have been shown to have a dose-response relationship to decreased patient mortality. Results of the pre-intervention survey indicate that attempts to train teamwork through exposure-based curriculums result in improper teamwork behaviors. Through quantitative and qualitative analysis, post-intervention results included the following:

- Statistically significant teamwork behavioral improvements across all targeted teamwork competency domains within all studied groups
- Cohens-D effect size (magnitude of change) for frequency of briefing and debriefing behaviors reached a medium and high effect in all studied groups
- Identification of multiple initially unexpected/unforeseen programmatic and institutional barriers that limited teamwork training program effectiveness

Impact on the health system

The implementation of this student-led initiative resulted in the training of 650 medical, nursing and pharmacy students within the Rutgers Schools of Biomedical Health Sciences (RBHS). Student enthusiasm for teamwork training and use of TeamSTEPPS tools in the clinical environment resulted in RWJMS hosting an AHRQ-instructed two-day TeamSTEPPS Master Trainer course at the Robert Wood Johnson University Hospital which was attended by 80 clinical faculty from multiple health care specialties. In addition, 12 medical students also voluntarily enrolled and completed the TeamSTEPPS Master Trainer course. The revised intervention, based upon iterative feedback and lessons learned from the initial study, has expanded throughout the medical school curriculum—and expanded to inclusion within interprofessional curricular events within RBHS. The student-led initiative inspired the drafting and routing of two additional IRB proposals within the medical school and academic health center focused on improving patient outcomes via the implementation of TeamSTEPPS-based training programs. Student leaders of the project were invited to assist in development and instruction of TeamSTEPPS initiatives within the RWJMS Family Medicine Residency Program and RWJUH OB/GYN departments. Student leaders were also asked to present project results to the academic medical center executive council and the RWJ/Barnabas Chief Medical Officer for discussion on how the project can be expanded to increase teamwork behaviors within the RWJ/Barnabas health system. Their work has been highlighted as one of three selected institutional case studies by the American Medical Association Accelerating Change in Medical Education Consortium.

Personal Impact

The success of our project highlighted the magnitude of impact that a well-synchronized student-led initiative, supported by key faculty champions, can have on a medical school and academic health system. While our project has shown much initial promise, our work has only just begun. We aim to improve our processes at the RWJMS level, continue to integrate and expand through the academic health center and use our lessons learned to aid others in designing and building teamwork training models that can improve foundational teamwork behaviors of interprofessional health care providers. As student leaders, this project has given us the opportunity to embrace our passion to aid in overcoming the teamwork training deficiencies within medical and interprofessional education—with the goal of empowering all of those we train to provide higher quality and safer health care to all of the patients that we have the opportunity to serve.

Mentorship As Professional Development and Empowerment

Medical Student

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Faculty Mentor

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Abstract

Despite the known benefits of diversifying the health care workforce, progress in recruiting and retaining a diverse workforce has been stagnant. Recruiting, training and retaining underrepresented in medicine (URM) students requires approaches that engage URM and non-URM allies in these efforts. The Future Physician Summit is an outreach program in which URM undergraduate premedical students implement a day of college and medical events for URM youth under the guidance of URM medical students. It provides professional development related to clinical skills, college readiness, as well as mission and vision driven empowerment activities. A complimentary project, Mpact Mentorship Training, is a course open to all medical students that provides students with guidance on: mentorship best practices, implicit bias, intersectionality of personal and professional identities, and inclusive mentoring strategies. This curriculum was designed to increase confidence in and effectiveness of cross-cultural mentorship relationships and promote a more inclusive academic climate.

Project addressed/Problem discovered

For decades, national and institutional efforts have attempted to engage prospective learners from URM backgrounds. However, recruitment efforts traditionally rely on the efforts of URM faculty and students. Evidence supports value in having URM role models for URM students in the formation of professional identities. However, this approach creates an undue burden for the committed URM faculty and students whose limited supply inherently makes it challenging to meet the demand. This practice may also have unintended consequences of ill-preparing pre-medical students from URM backgrounds for a career in medicine. This practice promotes interactions with a narrow group of individuals who are readily accessible and fully support the students emotional and academic needs, yet fails to equip URM students for the hidden social networking and mentorship curriculum of the academic medicine environment. Students from URM backgrounds are more likely to cite inadequate access to guidance, mentorship and institutional resources as reasons for leaving the pre-medical track. Therefore, it is crucial for pipeline programs to integrate professional development activities that not only excite pre-medical students from URM backgrounds about a career in medicine, but also enhance the development of interpersonal skills to navigate the landscape of medical school. Lastly, the impact of pipeline program initiatives is also likely limited due to the lack of attention to addressing the organizational barriers in the academic environment. Therefore, it is also essential to integrate strategies that influence the broader medical community in ways that create shared awareness and collective responsibility for promoting inclusive climates.

Approach

The Summit is an outreach program designed to empower URM undergraduates and youth (middle and high school students) interested in medical careers using a multi-tiered peer-mentoring approach. Medical student "coaches" (n=2) guide a team of undergraduate premedical students (n=5) in planning and executing the one-day Summit. The programming is geared toward increasing exposure to the medical field, enhancing college readiness and building self-awareness through curated interactive activities. Students are instructed on: college readiness (game), the pre-med to medical career pipeline (panel) and emphasizing the importance of mission and vision (workshop). Undergraduate pre-medical students are trained by medical students to lead the clinical skills workshops and teach the youth learners about the physical exam and pathophysiology, particularly related to diseases disproportionately affecting persons from URM backgrounds. The Mpact Mentorship Training program consists of 6 one-hour long seminars open to all medical students, especially those interested in mentoring URM learners. The lectures are designed to create transparency around mentorship best practices, as well as promote discussions related to personal (i.e., race, gender, religion, ability, sexual orientation, etc.) and professional identity and unconscious bias. This co-curriculum activity aims to promote inclusivity by providing a forum for students and faculty to engage in often difficult, but necessary conversations to increase self-awareness and shared responsibility for supporting students from diverse backgrounds. This initiative provides the undergraduate medical education community with strategies to mitigate potential cross-cultural/identity barriers. Students participate in a total of 10 hours, which include lunch seminars, implicit bias testing with action-oriented interventions, and peer-accountability partnerships.

Outcomes

In 2018, 28 URM middle and high school students attended the Future Physician Summit. Pre-post survey design was used to assess primary outcomes related to: confidence in pursuing a career in medicine (likert scale 0-5), medical/pipeline knowledge (objective score 0-6) and perceptions about the value of diversity in medicine (likert scale 0-5). Participation was voluntary, and responses were anonymous. The response rate was 79%. Participants reported an increase in confidence to pursue a career in medicine (t=4.42 vs. t=4.77, p=.04), increase in their medical/pipeline knowledge (t=2.21 vs. t=4.36, p =.005) and an increase in their belief that diversity in medicine is important (t=4.65 vs. t=4.91, p= .051). As for the secondary outcomes, participation in the Summit led to the undergraduate team members (n=5) first abstract and published manuscript. One of the undergraduate students, who has since been accepted to medical school, remarked on her sense of

empowerment in talking about the Summit during her interview process. The medical student volunteers (n=4) reported increased dedication to: mentorship, community outreach and medical education through the valued experience of teaching clinical skills to junior students. The Mpact Mentorship Training program is in its inaugural year and has 73 medical student participants. At the time of this application, preliminary survey results are limited to the first lecture, Mentorship Best Practices. 82% completed the survey. Primary outcomes were related to knowledge and skill acquisition. All respondents reported that they agreed that the lecture improved their understanding of the mentor role, and they were better able to identify positive and negative examples of mentorship.

Impact on the health system

These two programs fit well within the current campus-wide diversity, equity and inclusion strategic plan. The Future Physician Summit is a collaborative approach to recruiting URM and providing them tools to succeed in their higher education pursuits. The Summit leverages peer support from multiple organizations: University of Michigan Medical School Black Medical Association, the Black Undergraduate Medical Association, the Michigan Medicine Office of Health Equity and Inclusion, the University of Michigan Stephen M. Ross School of Business and the undergraduate outreach program, Wolverine Pathways. This multidisciplinary approach expands the social and professional network for the URM participants. This cooperative approach also engages diverse perspectives to weigh in on strategies to better support students from diverse backgrounds. Partnering in this way could foster a more sustainable outreach program by maximizing the financial and people resources across schools. At the university level, the Summit creates opportunities for further reaching discussions about campus diversity climate and inclusiveness. The programing can also be disseminated to other institutions. The Mpact Mentorship Program is envisioned to improve medical students ability to engage with diverse learners and expand the pool of future doctors equipped to support and guide diverse mentees. Given that 36% of the first-year class is taking this course, it shifts the discourse of underrepresentation from the shadows to a broader audience. Upper-level medical students have also requested access to recorded lectures. Engaging more of the community in this discussion will hopefully lead to individual-level and collective approaches to creating a more supportive climate.

Personal Impact

It is my mission to ensure that students from URM backgrounds are granted opportunities to pursue any career they desire. I remember the deterrents I faced when I arrived at the University of Michigan. A college adviser told me not to pursue medicine due to my "background." Although, I refused to let that adviser change my career path, I realize that many URM youth may need encouragement to counter such advice. During the Summit, it was empowering for me to see youth from my hometown using the stethoscopes, penlights and reflex hammers. It was humbling to witness the undergraduates enhance their leadership skills and strengthen their commitment to medicine throughout the semester. I have learned that a vision combined with a dedicated team can produce unimaginable results. As a future pediatric resident, I plan to continue these efforts to increase the health care workforce and expand this framework to include initiatives that empower adolescents vulnerable to incarceration. It is energizing to see the interest my peers and faculty have for the Mpact Curriculum. Their openness to seeing mentorship through a social justice lens and interest in learning strategies to improve the academic environment inspires me, particularly as a Black, queer woman. I am excited to play a role in preparing my peers to serve as leaders and hopefully shape academia in ways that support the rights and professional development of all students, patients and communities.

Controlling Cholera in the West Department of Haiti using Oral Cholera Vaccines

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Teammates
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Faculty Mentor
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Abstract

After the introduction of toxigenic Vibrio cholerae O1 to the Caribbean nation of Haiti in 2010, the country experienced the largest national cholera outbreak in recent history. With the help of the international community, over $500,000,000 USD was pledged to finance massive improvements in drinking water and sanitation infrastructure with the goal of eliminating cholera transmission by 2023. Over six years later, cholera transmission continued, with little evidence that any such improvements had been made. In this project, the use of oral cholera vaccines (OCVs) to reduce the spread of the initial outbreak and to eliminate future transmission was investigated using a novel mathematical modeling framework. Critical parameters including vaccine efficacy, vaccine administration rates and duration of protective immunity were evaluated to provide scientific evidence to justify funding from donors such as the World Bank and Global Alliance for Vaccine Immunization (GAVI) and support the implementation of a National Cholera Vaccine Program in Haiti.

Project addressed/Problem discovered

Following the 2010 cholera outbreak in Haiti, a plan was initiated to provide massive improvements to the sanitation and drinking water infrastructure in order to eliminate cholera from the island of Hispaniola by 2023. Six years later, there was little evidence that any substantial improvements had been implemented. In the absence of a complete overhaul of the nation's drinking water and sanitation infrastructure, it was suggested that mass vaccinations by oral inactivated whole-cell cholera vaccine (OCV) could have prevented the ongoing epidemic and be used to mitigate future transmission of cholera in Haiti. OCVs have demonstrated considerable protective efficacy (approximately 65%) in rigorously designed clinical trials conducted in India, Bangladesh and Vietnam. Despite their efficacy, any large-scale vaccination campaign at the beginning of the Haitian outbreak was not feasible due to the limited supply of OCVs, which at that time were not prequalified by the World Health Organization (WHO) for the control of cholera outbreaks. At that time, the position of the WHO was that vaccination should be an effective component of control strategies in cholera-endemic countries, which they define as countries where culture-confirmed cholera has been detected in three of the past five years with an incidence of at least 1/1000 population members in any of those years; all of which now apply to Haiti. With ongoing transmission of cholera more than six years after the initial outbreak and epidemiological characteristic that resemble an endemic rather than epidemic state, the use of OCVs to control cholera in Haiti warranted further investigation.

Approach

In the current project we have used mathematical models to accomplish three objectives: determine the effect that a reactive vaccination campaign would have had on the initial outbreak, use historical meteorological measurements and a recently developed data-driven model to simulate future cholera outbreaks, and explore the potential benefits of mass immunization programs on simulated future outbreaks of cholera. The intervention model facilitates the movement of humans between the susceptible and infected compartments with human-to-human transmission route representing the direct contact between humans and the environment-to-human route representing transmission via consumption of surface water contaminated by V. cholerae O1. The concentration of bacteria in the environment is influenced by the influx of V. cholerae O1 from the feces of infected humans, bacterial proliferation and survival in response to environmental factors, and bacterial death. After exposure, infected humans move into either asymptomatic or symptomatic compartments that correspond to different levels of infectivity and course of illness. All previous models assume that the bacterium in the aquatic environment will decay at a natural rate; we have built a novel model to allow for growth in response to environmental conditions (i.e. rainfall), which overflow sewage into rivers and provide nutrients. Three main simulation scenarios were considered for the project: no intervention was implemented; a reactive vaccination campaign was implemented five weeks after the initial 2010 outbreak; an OCV intervention campaign was started on January 1, 2017. Extensive sensitivity analyses with different vaccination strategies and vaccine efficacy parameters were performed based on this scenario.

Outcomes

The actual incidence was well captured by the model and illustrated the utility of the novel environmental compartment. With the addition of the vaccinated compartment to the model, the effect of a reactive vaccination campaign initiated five weeks after the beginning of the outbreak with an average time to be vaccinated of 50 weeks, vaccine efficacy of 60%, and protective immunity of three years suggested that the epidemic could have been controlled by August 5, 2012 (95% CI: March 11, 2012; December 16, 2012). Additionally, these simulations allowed the estimation of the effect of herd immunity where unvaccinated individuals had a lower risk of infection due to fewer human hosts and a decrease in the environmental concentrations of V. cholerae. Another benefit of using the data driven model validated by empiric

findings of V. cholerae in the environment, was the ability to use seasonal averages of environmental data collected remotely from near Earth satellites to construct virtual epidemics and simulate vaccination campaigns to eliminate cholera. The first scenario was a vaccination campaign started January 1, 2017, which completely eliminated by May 20, 2018 (95% CI: January 7, 2018; September 30, 2018). Two additional vaccination strategies were created that assumed either only 60% of vaccines were administered (non-perfect vaccine delivery) or delayed start date (September 3, 2017) with subsequent sensitivity analysis. Both models indicated the current oral cholera vaccine could be used to eliminate future cholera epidemics over a wide range of implementation parameters and at a lower cost than previously expected.

Impact on the health system

Key questions that prevented reactive vaccination in Haiti during the beginning of the outbreak were answered by this study, including the effect of a reactive vaccination program at the beginning of the 2010 outbreak, which was not endorsed by the WHO at that time. Additionally, the findings from this study support the use of vaccines in response to outbreaks in other countries such as Sudan, and the WHO has recently chosen to endorse reactive vaccine campaigns in nonendemic countries. With a detailed sensitivity analysis of vaccination strategies in Haiti to eliminate cholera, we were able to demonstrate that cholera elimination could be possible with the currently available vaccine by 2023 under a robust set of circumstances. These simulations allowed the estimation of the effect of herd immunity in the population during mass vaccination campaigns, suggesting that not all individuals would need to be vaccinated; thus the actual cost of elimination would be lower than expected. Our results were presented in Washington, DC during a meeting of the Special Consulting Group of the Minister of Health and Population of Haiti where they were used to provide scientific evidence to support a National Cholera Vaccine Program in Haiti and to secure millions of dollars in funding to purchase oral cholera vaccines. Finally, summary conclusions from the meeting were published in a perspective in the *New England Journal of Medicine*, bringing international attention to the elimination of cholera in Haiti using vaccines.

Personal Impact

Prior to medical school, I completed a Doctorate of Philosophy (PhD) in global health studying infectious diseases in Haiti. While I was there conducting drinking water research during the cholera epidemic, I had the opportunity to visit a local cholera treatment center. I realized that although population-based research had the potential to create profound and lasting impacts, I could do nothing to stop children from dying in front of my eyes. The experience moved me deeply, and I vowed to learn the practice of medicine to allow me to make a difference in individual lives as well. My passion has driven me to continue the pursuit of research that strengthens the national public health system in Haiti. While in medical school, I have contributed by providing seminal works related to malaria, dengue, West Nile and melioidosis and even developed a novel method to treat cholera infections using synthetic microparticles as an oral solution. It is my goal provide critical research to support Haiti's health infrastructures and to inspire others to help improve both individual and population health in Haiti. This project, which started as a humble idea, has helped to support the foundation of a National Cholera Vaccination Program that will hopefully, finally eliminate cholera in Haiti. After graduation, I plan to study internal medicine and complete a fellowship in infectious diseases with training in tropical medicine, then continue my pursuit of global health in other impoverished countries around the world.

Improving Pediatric Asthma Care at Burlington Community Health Center

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Teammates
Sarah Stephens, MD

Faculty Mentor
Amy Shaheen, MD, MSc, Professor of Medicine

Abstract

Asthma is the most common chronic pediatric disease in the U.S. Despite the significant morbidity and mortality of this illness, many patients do not adhere to long-term asthma control regimens. Thus, during my clerkship at Burlington Community Health Center (BCHC), I implemented a quality improvement initiative with the primary objective of improving follow-up rates among pediatric patients with highly symptomatic asthma. Additional interventions aimed to educate clinical staff about asthma care and to develop a process map for asthma visits at BCHC. Thirty-six patients were subjected to stepwise interventions including a letter and two follow-up phone calls, which resulted in 55% of patients scheduling asthma follow-up visits. To enhance the quality of those visits, we held a train the trainer session after which clinical staff reported a significant improvement in their ability to educate patients about asthma-related topics. Thereafter, medical assistants provided inhaler education at the conclusion of patient visits. Drawing upon staff feedback, we drafted a process map to guide pediatric asthma visits at BCHC. Future directions include creating a database to track pediatric asthma measures, further refinement of the proposed process map and developing an asthma patient education module using clinic tablet computers.

Project addressed/Problem discovered

Asthma is the most common chronic pediatric disease in the United States, affecting over 6 million children nationally. The highly variable clinical course of this disease coupled with poor understanding of the proper usage of asthma medications causes many families to adopt a symptom-based treatment approach, rather than adhering to a long-term control regimen. As a result, many patients suffer from frequent asthma exacerbations. Asthma attacks cause missed days of school, emergency department visits and hospitalizations and can even be fatal. Furthermore, emergency treatment often includes the use of oral corticosteroids, which can have detrimental effects on a child's health, including slowed growth rate, obesity, adrenal suppression and behavioral problems. My preceptor noticed that poor asthma control was particularly prevalent among the pediatric population at BCHC, a federally qualified health center (FQHC) in North Carolina. We hypothesized that negative asthma-related outcomes could be reduced by regular visits with primary care physicians and other health care professionals. At these visits, physicians and other health care professionals can assess asthma control, modify medication regimens and educate patients and their parents about the proper use of asthma controller medications by developing individualized asthma action plans. Thus, we designed a quality improvement project with the primary objective of improving regular follow-up rates among pediatric patients with highly symptomatic asthma. Secondary goals of the project were to teach clinical staff members about the causes, symptoms and treatment of asthma so that they can better educate patients and to develop a standardized process map for asthma clinic visits at BCHC.

Approach

Improving follow-up rates using a combination of electronic health record (EHR) queries and chart review, I identified pediatric patients with an active asthma-related ICD-10 code who had not had a clinic visit in over three months and met one or more of the following inclusion criteria:

- 1+ asthma exacerbation(s) requiring an emergency department visit or hospitalization within the last 5 years
- A diagnosis of persistent asthma
- Currently prescribed an inhaled corticosteroid
- Patients who had no-showed an asthma follow-up visit within the last month

We then implemented the following interventions using Plan-Do-Study-Act (PDSA) cycles:

- PDSA #1: Designed a letter (in both English and Spanish) explaining the importance of regular follow-up visits for asthma patients and requesting that parents call to schedule a follow-up for their child. Mailed letter to all patients meeting criteria.
- PDSA #2: Phone call to all patients who remained to be scheduled.
- PDSA #3: Phone call #2 to all patients who remained to be scheduled.
- Staff education PDSA #4: We hosted an educational in-service about pediatric asthma for all clinical staff. I distributed written surveys to staff members before and after the talk to assess the intervention.

- Developing a process map for clinic visits PDSA #5: Drawing from input from my pediatric preceptor at BCHC, I drafted a process map for a pediatric asthma visit. I then posted this process map in the break room and asked all staff members to add sticky notes with feedback. Using this feedback, I refined the proposed process map.

Outcomes

Improving follow-up rates: 121 pediatric patients with asthma-related diagnoses were identified, and of these, 36 patients met inclusion criteria. For both English and Spanish-speaking patients, phone call #1 was the most effective, resulting in the highest percentage of scheduled appointments. Combined, all three interventions resulted in 20 scheduled appointments (20/36 = 55% success) and 16 remaining to be scheduled.

Staff education: Before the asthma education in-service, participating clinical staff members gave an average confidence rating of 2.69 on a 5-point Likert scale across all topic areas. After the in-service, participants gave an average confidence rating of 4.71. Furthermore, after the in-service all participants indicated that, overall, they felt confident in answering a patient's questions about asthma.

Developing a process map: A process map was developed based on staff feedback.

Impact on the health system

Improving follow-up rates: Both the letter and phone call effectively facilitated scheduling patient follow-up visits. While phone call #1 was the most effective intervention, sending out the follow-up request letter was only slightly less effective. Letters can be sent out en masse, requiring less time per patient, and thus may be less disruptive to clinic workflow. Close follow-up for asthma patients not only improves patient care and disease outcomes, but it can also be financially beneficial. According to Piedmont Health System data, BCHC is reimbursed on average $118 from Medicaid, $130 from private insurance, $107 from NC Health Choice or $25 from self-pay for each 20-30-minute pediatric office visit. Sending a letter or making a phone call generally takes only 2-5 minutes of a paid staff member's time and thus has the potential to generate positive revenue for the clinic.

Staff education: The one-hour in-service resulted in significant improvements in staff members' perceived confidence in providing asthma education to patients. After the in-service, medical assistants began providing post-encounter metered dose inhaler and mask and spacer education to patients when requested by the provider. This has improved workflow by decreasing provider in-room time.

Process map: Based on staff input I revised the asthma visit process map. This map can be referenced by all staff to guide care of pediatric asthma patients. However, staff feedback pointed out additional flaws in the system that must be worked out before the map is finalized.

Next steps: Future directions for this quality improvement project include the following:

- Determining the percentage of patients who attended their scheduled asthma follow-up appointments
- Developing a database of all pediatric asthma patients so that follow-up rates can be tracked more efficiently and high risk patients targeted for an intervention to improve follow-up rates
- Further refinement of the proposed process map by targeting flaws identified from staff input
- Using clinic table computers to design an asthma patient education module to be played during clinic wait times. This could be followed by a teach-back assessment to ensure patient and parent understanding of key asthma care topics
- Establishing a method to track asthma education in the EHR
- Generating a system to track inhaled corticosteroid refills and report back to the physician or other health care professional if prescriptions are not refilled regularly.

Personal Impact

This project constituted my first attempt at a quality improvement project. As I planned and executed this project I learned a great deal about quality improvement techniques and the challenges inherent in these processes. For example, I learned to implement small changes and to use process measures to modify future directions. My project changed direction many times during my rotation at BCHC, and it is continuing to evolve with succeeding cohorts of students. Furthermore, I learned how challenging it can be to implement sustainable changes in the established workflow of a busy clinic. By addressing these challenges, I learned effective leadership and communication techniques. Even more importantly, I learned about many obstacles physicians must address to provide holistic, high quality health care to their patients. I began to recognize the impact of many socioeconomic challenges patients face when receiving health care. Many of the patients we cared for at BCHC were from underprivileged backgrounds. Despite the clinic's efforts to provide affordable care, many patients struggled to afford medications and clinic visits, moved frequently making communication difficult, and often they could not attend scheduled visits due to lack of reliable transportation. I also learned about the challenges of providing effective health education to patients and their parents. Though asthma care regimens may seem simple to practitioners who have completed many years of medical training, they can be quite complex to the patients we serve, many of whom did not complete a formal high school education. I learned the value of patience, providing simple explanations, repetition and utilizing teach-back methods to assess understanding. This can substantially improve patient outcomes but can often be a challenge with hectic clinic schedules and short visit times. Overall, this project renewed my interest in public health. I hope to continue learning about how to provide high quality care to all patients, despite substantial socioeconomic obstacles and to draw upon my quality improvement experience to improve the health care system one small measure at a time.

Post-Operative Outpatient Opioid Prescription After Minimally Invasive Gynecologic Oncology Surgery

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Abstract

This quality improvement project focused on optimizing outpatient opioid prescriptions for pain management after minimally invasive gynecologic oncology surgery. To determine baseline prescription patterns, we surveyed 23 patients about their post-operative pain management and reviewed their medical records. After surveying seven providers to determine the cause of over-prescription, we standardized post-operative pain management guidelines to 20 5mg oxycodone pills in the enhanced recovery after surgery (ERAS) pathway. Post-intervention, we surveyed 41 patients about their post-operative pain management and reviewed their medical records. Pre-intervention, an average of 24 5mg oxycodone pills were prescribed per patient, and 52% of patients received > 20 5mg oxycodone pills. Post-intervention, an average of 17 5mg oxycodone pills were prescribed per patient (30% decrease, p = 0.035), and 15% of patients received > 20 5mg oxycodone pills (37% decrease, p = 0.004). Decreasing opioid prescriptions did not affect the quality of pain management.

Project addressed/Problem discovered

Opioid over-prescription has contributed to a national opioid epidemic. Every day, 115 people die from an opioid overdose, and 20% of patients who are prescribed opioids misuse them (11 million per year) (HHS, Vowles et al. 2015, CDC). Since 2014, the UCSF Gynecologic Oncology Department has used the ERAS pathway to increase multimodal analgesia and reduce post-surgical opioid prescriptions. Studies show that patients only consume 20-50% of their prescribed opioids (Fujii et al. 2018, Tan et al. 2018). There are no national guidelines regarding appropriate post-surgical opioid prescription practices, but studies indicate that 10-15 5mg oxycodone pills are sufficient for post-surgical pain relief for minimally invasive surgeries. At the beginning of this project, it was unclear what quantity of opioids were being prescribed to University of California, San Francisco (UCSF) gynecologic oncology patients. From January 2018 to March 2018, we studied baseline opioid prescription habits and patient awareness of safe opioid disposal. A post-operative patient-specific survey was created and administered to 23 patients who had undergone minimally invasive gynecologic oncology surgery. This survey was administered during the patient's first post-operative follow-up visit. Metrics assessed in these surveys included the quantity of opioids consumed by patients, patient perceptions of the quantity of opioids they were prescribed and patient knowledge of how to safely dispose of unused opioid pills. The number of opioid pills prescribed was determined from a retrospective chart review. If patients received an opioid other than oxycodone, the dose was converted into equivalent mg of oxycodone. All oxycodone pills referred to in this study are 5mg. The following baseline characteristics were determined from this data. Patients were prescribed an average of 24 ± 14.1 oxycodone pills and 57% of patients reported receiving more opioids prescribed than needed. Furthermore, 52% of patients received more than 20 oxycodone pills. Although an overwhelming majority (96%) of patients were prescribed an opioid, only 48% of patients reported knowing how to safely dispose of unused opioid pills. It was concluded that patients were prescribed more than two times the amount of opioids as currently indicated by published literature, and that most patients did not know how to safely dispose of unused opioids.

Approach

To learn more about prescription habits and the cause of over-prescription, a provider-specific survey was created and administered to seven gynecologic oncology attendings, residents, fellows, nurse practitioners and nurses. The results from the survey showed that providers were unaware that they were overprescribing opioids, and many did not adhere to the ERAS pathway medication recommendations. Providers were also concerned that under-prescribing opioids would create logistical problems concerning medication refills, compromising the quality of pain management and patient care. Furthermore, residents were unsure of how many opioids to prescribe. Based on this gap analysis and subsequent interprofessional meetings within the department, the ERAS pathway and patient discharge instructions were identified as tools to use in an intervention aimed at reducing opioid over-prescription and increasing patient awareness of safe opioid disposal. The intervention began April 3, 2018. The suggested oxycodone prescription in the ERAS pathway was lowered to a standard 20 pills. This amount was chosen in collaboration with providers to reduce over-prescription while maintaining adequate pain management. Safe opioid disposal information was provided in patient discharge instructions. In addition, flyers were posted around the clinic to increase provider adherence to the ERAS pathway, as well as to encourage the distribution of the new discharge instructions to patients. After implementing the intervention, the patient survey was distributed to 41 patients to assess their perceptions of the quantity of opioids they were prescribed, the average quantity of opioids they used, the quality of their pain control and their knowledge of safe opioid disposal. Quality of pain control

was determined by asking patients to report how well their pain was managed on a scale of 1-5, with "5" being perfect control. Post-intervention, the average amount of opioids prescribed was quantified from a retrospective chart review.

Outcomes

Pre- and post-intervention cohorts were similar regarding race, ethnicity, age, BMI, preferred language and the distribution of the type of minimally invasive gynecologic oncology surgeries performed. The number of patients receiving 20 or more oxycodone pills decreased from 52% to 15% (37% decrease, $p = 0.004$). The average number of oxycodone pills prescribed decreased from 24 ± 14.1 to 17 ± 11.9 (30% decrease, $p = 0.035$). This objective decrease in the number of opioids prescribed did not affect the quality of pain management for patients. On average, patients reported their pain control as 4.7 ± 0.5 out of 5. There was also no statistically significant change in patient perception of whether they received "more than enough," "less than enough" or "enough" opioids needed for pain management ($p = 0.2$). In fact, following the intervention, more patients reported receiving "more than enough" opioids than pre-intervention patients. Among pre- and post-intervention patients, there was no association between receiving 20 or fewer pills of oxycodone and reporting the amount of opioids prescribed was "less than enough" ($p = 0.27$). There was no association between receiving safe opioid disposal instructions and increased patient reported knowledge of safe opioid disposal (relative ratio = 0.82, $p = 0.8$).

Impact on the health system

We had a significant objective impact on the department by reducing the amount of opioids patients are prescribed. Outside of this quantifiable impact, we were able to educate providers on the importance of responsible opioid prescribing habits and help increase knowledge on what is an "appropriate" amount of opioids to prescribe after minimally invasive surgery. Beyond the scope of the UCSF Gynecologic Oncology Department, this project helped demonstrate that surgical pathways are promising strategies to reduce post-operative opioid prescriptions. These methods are general enough that they can be utilized by any other surgical clinic. While we were not able to show a statistical association between providing patients with safe opioid disposal instructions and patients knowing how to dispose of opioids safely, we were able to raise awareness among providers about the importance of the safe disposal of unused prescription opioids. Our results demonstrated that patient discharge instructions are not the most effective way to educate patients on safe opioid disposal. Our project was one of two showcased in the "Learning Health System" pillar of the Gynecologic Oncology department's True North Board to integrate education into quality improvement. One of our mentors described our work as "inspiring and motivating for others to continue to work on quality improvement, this showing the importance of training the trainees to impact …lifelong learning." Our impacts on the UCSF health system were recognized as "One of the Highest Rated Improvement Initiatives" in the hospital. We received the UCSF "Patient Safety Award" from the CEO of UCSF Health for our quality improvement work. We were selected by faculty to present our work to the UCSF School of Medicine deans and quality improvement leaders.

Personal Impact

Before beginning medical school, I had only heard about the opioid epidemic as an intangible public health concern. I then became a part of this project within two months of joining medical school. Early in my medical education, I was therefore able to witness and participate in the process of how we study dangerous epidemics on a large scale in order to subsequently address the problem on a local level. I learned how to be independent in my statistical analysis, and I gained a lot of satisfaction from determining what quantitative measures needed to be studied, determining which statistical test was appropriate for those measures, making those calculations myself, interpreting the results, and then putting the results together into a story that could be understood by others. I felt a lot of ownership over this project from the very beginning, and it was really rewarding to feel like my personal work was taking us one step closer toward addressing a national opioid epidemic. I also learned how to work with attending physicians, nurses and residents from various specialties, some of whom raised concerns over whether this project would negatively impact patient care or the clinic. Learning to advocate for this project while also ensuring that there was no compromise in patient care or staff burnout was a huge responsibility, but the promising results have been immensely gratifying.

Health policy and economics

Community Organizing for Medicaid Expansion in Idaho

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Abstract

Idaho is one of 17 states that did not expand its Medicaid program under the Patient Protection and Affordable Care Act (ACA). As a result, an estimated 62,000 Idahoans lack access to affordable health care, and up to 19 rural hospitals in the state are at risk of closure. In July 2017, we initiated a grassroots campaign to rally support behind Medicaid expansion, which would utilize federal funds to close Idaho's coverage gap. Between December 2017 and April 2019, I helped lead volunteers around the state to gather the 56,192 signatures required to put Medicaid expansion on the Nov. 6th ballot. As of the time of this submission, election results have yet to be released. If it passes, this project will create a more equitable health system, improve public health through increased access to health care and potentially save health systems that serve entire communities. [Editor's note: This ballot measure passed.]

Project addressed/Problem discovered

Idaho is one of 17 states that did not expand its Medicaid program under the ACA. As a result, an estimated 62,000 Idahoans lack access to affordable health care, and 19 rural hospitals in the state are running a net operating loss and are at risk of closure. A fiscal impact study commissioned by the Governor in 2014 indicated that Medicaid expansion would save an estimated $173 million in state and local spending over ten years and create 14,000 new jobs as a result of the influx of federal spending. Medicaid expansion offers a clear path to expand health care access in Idaho and promises fiscal savings to the state budget through reductions in spending on existing programs for the uninsured. According to a 2017 survey of 1,000 Idaho adults conducted by Boise State University, 70% of Idahoans support closing the health care coverage gap. Despite this overwhelming support, a bill to enact Medicaid expansion has failed to garner majority support in the Idaho legislature for the past 3 years.

Approach

The incongruence of broad popular support for closing the health care coverage gap paired with legislative inaction on the issue inspired us to launch a grassroots campaign to spread awareness and rally support for Medicaid expansion in Idaho. In the summer before starting medical school, my wife and I decided to refurbish our 1977 Dodge RV by painting it green and emblazoning the side with the words "Medicaid for Idaho." As if Medicaid expansion was a candidate running for office, we toured the state with my childhood friend and fellow advocate Luke Mayville. At each of 20 stops over a 2-week period, we rallied support for the cause and worked with eager supporters to form volunteer teams with the goal of advocating for Medicaid expansion in anticipation of the 2018 elections. As we toured the state and met people from diverse backgrounds, one thing became abundantly clear: there is a crisis of health care access in Idaho. Nearly everyone we talked to knew somebody who struggled to get health care and would benefit from Medicaid expansion. Separately, even among people without a personal connection to the crisis, we found overwhelming support for helping others by expanding health care access. Based on these findings, paired with the Boise State University study cited above, we decided to launch a petition drive to put Medicaid expansion on the ballot. Over the course of the next year, we re-engaged with local team leaders who we met on the road, and we formed teams in 25 different Idaho counties to start collecting signatures to satisfy Idaho's initiative requirement of signatures from 6% of registered voters. In Moscow, Idaho, where the University of Washington–Idaho WWAMI campus is located, we organized community members and medical students to collect the signatures that were required locally. On the May 1 deadline, we knew the signatures collected exceeded the necessary signatures for an Idaho ballot initiative. We regrouped and planned the next phase of the campaign. We partnered with local organizations including the Idaho Hospital Association and Idaho Medical Association, as well as an outside group called the Fairness Project, to form a coalition to support the ballot measure through paid advertisements and other publicity. In addition, we continued our work on the ground by organizing volunteers to knock on 30,000 doors and make phone calls to registered voters to make sure they knew about the importance of voting yes on Proposition 2.

Outcomes

Medicaid expansion under the ACA is on Idaho's November 6th ballot as Proposition 2. As of the time of this submission, the election results are not known. [Editor's note: This ballot measure passed.]

Impact on the health system

At this point, prior to passage and implementation of the ballot measure, we can only estimate what the impact will be on the health system if it passes. A recent estimate from an analysis commissioned by the Idaho Department of Health and Welfare suggests that Medicaid expansion will extend coverage to 62,000 Idahoans in the coverage gap, enabling access to reliable primary and preventive care. In theory, this will lead to increased access to primary care for Idaho's working poor and indigent populations and increased access to mental health services and substance abuse treatment. After Medicaid expansion in Ohio, for example, 96% of people in the program with opioid addiction got treatment, and 37% of smokers were able to quit. Our current system in Idaho forces those without insurance to wait until the breaking point and prioritizes inefficient critical care in the emergency department. This approach shifts costs to patients with private insurance and in

Idaho also puts a burden on state and local taxpayers through our state catastrophic care fund and county indigent funds. Furthermore, in rural areas with a high number of uninsured residents, hospitals write-off millions of dollars each year in uncompensated and charity care. According to a recent report from the *New York Times*, some 90% of the more than 80 U.S. hospital closures since 2010 have been in states that did not expand Medicaid under the ACA. Therefore, Medicaid expansion will almost certainly enable many Idaho hospitals to keep their doors open and resist the trend of rural hospital and clinic closures around the country, preserving access to care in rural Idaho.

Personal Impact

Today is November 5th, the day before the election. Earlier this evening I was calling supporters to remind them of the importance of tomorrow's election, and I was joined by Charlie, one of my classmates, as well as about a dozen other volunteers. After he completed his list of numbers to call, Charlie approached me and thanked me for the difference this campaign has made in his life. Charlie has been a part of this campaign from the beginning of the petition drive, and he told me that his involvement in this effort will make him a better doctor. He said it has made him more aware of the true struggles patients go through and just how difficult it is for many to access care. He is now committed to providing care to underserved populations. This campaign has transformed my life and career. It has given me an appreciation for the personal struggles of patients that I see in the clinic; it has taught me the basics of community organizing and how to work well with people; and most importantly, it helped me realize that I truly believe health care is a human right. Over the course of my career, I will continue to fight for the dignity of my patients and their ability to access the best possible care.

Informatics

Impact of Medical Scribes on Patient and Physician Satisfaction in Academic Primary Care

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Faculty Mentor

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Abstract

Use of electronic health records is associated with physician stress and burnout, however little is known about the impact of scribes in primary care. We developed a 3-month pilot at the University of Chicago to assess the impact of scribes on patient and physician satisfaction in academic primary care. Six physicians, 325 patients, and one scribe participated in the study. Physicians completed pre- and post-pilot satisfaction surveys and logged time spent on EHR documentation after clinic hours. A post-visit survey assessed patient satisfaction during visits with vs. without the scribe. Physician satisfaction with workflow and EHR use increased post-pilot (p=0.04 and 0.03). Mean time spent on post-clinic EHR documentation decreased from 99 to 46 minutes per clinic session (p=0.02). The scribe did not impact patient satisfaction or overall EHR note quality. Employment of a scribe was associated with improved physician satisfaction without compromising patient satisfaction.

Project addressed/Problem discovered

Electronic Health Record (EHR) use has sharply increased in the U.S. in recent years and so have concerns about the negative impact of the EHR on physician workplace satisfaction and burnout. A 2016 study showed that physicians spent 1.5 hours per day working after hours, most of which was spent on EHR documentation. To decrease EHR documentation burden on physicians, clinical practices have been employing medical scribes to help physicians with documentation tasks. While scribes have been shown to increase physician productivity and efficiency in the emergency department and outpatient clinic settings, as well as improve provider workplace satisfaction, little is known about scribes in academic primary care. A baseline survey of 35 University of Chicago general internal medicine (GIM) providers found that 79% reported insufficient time for documentation, 60% were not satisfied with EHR workflow and half (51%) expressed interest in working with a scribe. We chose to develop a scribe pilot in the University of Chicago GIM clinic to understand the impact of medical scribes on physician and patient satisfaction.

Approach

We developed a scribe pilot program at the University of Chicago GIM clinic between April and June 2017. We recruited six physicians and employed one professional full-time scribe through a scribe staffing company so that physicians had some scribed and some non-scribed clinic sessions. Physicians were surveyed before and after the intervention using 21-item pre- and 44-item post-pilot surveys which incorporated a validated single-item burnout assessment, questions adapted from the Consumer Assessment of Healthcare Physicians and Systems Clinician & Group Survey (CG-CAHPS) and questions about attitudes toward having a scribe. Physicians also completed exit interviews after the pilot and logged time spent on documentation after four scribed and four non-scribed visits. Patients who had scribed and non-scribed visits were surveyed on their experience using a 27-item survey which incorporated CG-CAHPS questions and included Likert and open-ended questions about attitudes toward scribes. Analyses were conducted in STATA 14, using standard descriptive statistics, Wilcoxon Signed Rank test, paired t-test, Wilcoxon Rank Sum test, Chi-squared test, and multiple logistic regression with subgroup analyses.

Outcomes

Six physicians and 325 of their patients participated in the pilot. Pre-pilot, all six physicians agreed that they felt rushed during clinic; all disagreed with this statement post-pilot (p=0.03). Only two (33%) were satisfied with clinic workflow pre-pilot, but all were satisfied post-pilot (p=0.04). There was no change in reported burnout; however, burnout was low at baseline. During the pilot, physicians spent less time on post-clinic EHR documentation per 4-hour clinic session (99±79 min with a scribe vs 46±46 min without a scribe, p=0.02). In exit interviews, physicians reported positive feedback, noting that they had "less sense of dread during busy clinics," and it was "great to […] have my notes done so I could go home and have dinner with my family." Patient satisfaction was high at baseline and was not impacted by the presence of a scribe. The majority of patients disagreed that the scribe was in the way, made them uncomfortable or that they did not like having the scribe at their visit (88%, 87%, and 85% respectively). Of the 39 comments about the scribe program, most (67%) were positive (e.g. "The program is a good idea").

Impact on the health system

The pilot was well-received by physicians and did not affect patient satisfaction with the doctor-patient relationship. Physicians reported feeling less rushed and spent less time on documentation at home, and it is possible that with longer duration of the program, a positive effect on burnout would be observed as well. The results of this pilot are important because they demonstrate that employing scribes at the GIM

clinic at our institution would benefit the physicians without negatively affecting patients. Larger future scribe programs involving more physicians and more scribes are currently in the works. Employing scribes may be one strategy to help achieve the Quadruple Aim by improving physician well-being, which may translate to improved patient outcomes.

Personal Impact

This project has had a significant impact on me. I felt very fortunate to be able to join a project at the early stages and be able to see it through completion. The project allowed me to hone my organizational skills and made me a better researcher. It also made me realize how fulfilling I find quality improvement projects with a tangible impact on health systems, inspired me to seek out additional projects I could participate in and start my own project. From a career development standpoint, this project was a turning point as it was the first step on my path toward a career where quality improvement work will play a major role.

Automating Physician Documentation

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Faculty Mentor
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Abstract
We have built a service for physicians that automatically documents patient encounters at the tap of a button. Our artificial intelligence (AI)-assisted scribes capture and structure data from the normal in-visit conversation. This frees doctors to focus on their patients while our system focuses on capturing high quality structured data that can be used for research and quality improvement. Health care lacks fundamental infrastructure to capture information from doctor-patient conversations to enable AI-insights in real-time, at the point of care. Our application relieves much of the documentation burden while laying the groundwork to bring AI to the bedside—where information is collected and care is delivered.

Project addressed/Problem discovered
The process of documenting and leveraging information from the doctor-patient conversation is burdensome and is holding back AI advances in medicine. The process of getting information into the electronic health record (EHR) is terrible—over 54% of doctors are experiencing burnout and the primary cause is documentation. Doctors can spend up to two hours on clerical work for each hour of direct patient care. Burnout costs the U.S. health system approximately $150 billion each year due to reduced patient safety, quality, productivity and physician retention (Blue Ridge Academic Health Group). Additionally, health systems and EHR companies are missing an opportunity to build an amazing dataset. Doctors' traditional narrative-text notes and limited structured templates leave out vital patient information or collect it with such variability that it is difficult to extract specific information. In addition, notes are often written hours or days later. We automate the process of capturing doctors' documentation more efficiently and at a much lower price point than a traditional human scribe. Our structured dataset, captured while the doctor speaks with the patient, can enable the application of machine learning in real-time to support the clinical workflow and learn from every patient to deliver the best care.

Approach
Our service automatically documents patient encounters for doctors at the tap of a button. It can run on a laptop or tablet, listens to patient-doctor conversations and converts audio to structured documentation using machine learning, natural language processing and remote human scribes. This can be done in near real-time at the point of care. Preprocessing and remote human curation of results enables supporting more physicians at a lower cost and on-demand. Notes and orders can be saved within the health system's EHR via the Redox integration layer. In addition, all code has been implemented within a HIPAA-compliant cloud service. Our AI-assisted scribes capture and structure the data as it is gathered. We can then use this dataset to further improve our preprocessing, automating more of the process and reducing human curation over time. This approach is a positive feedback loop. Doctors have us handle their documentation, our AI-assisted scribes generate better structured data, and we can use that data to improve health care and further automate documentation. Ravi and I have spent years during our research phase processing millions of patient records for use with machine learning. Current documentation quality and organization makes it difficult to answer many critical research questions for quality improvement and population health initiatives.

Outcomes
We performed a time-motion analysis with our first two users in family medicine at our initial pilot site and found the service enables our physicians to spend more time focused on their patients and saves them significant time on documentation each day. The percent of time spent interacting with the computer during the patient visit decreased by almost 80% for one of our doctors. This user especially appreciated the ability to focus on patients with serious conditions during which the patient-doctor relationship is so critical. The average time savings on documentation is approximately two hours per full clinic day. We achieved this with an early version of the service and we have several other features that we have already designed based on user feedback that should further reduce physician documentation time. We have four more sites that have agreed to pilot, giving us access to over 200 more potential users.

Impact on the health system
Our primary initial impact is reducing the amount of time each physician must spend doing documentation. For each hour of direct patient care, physicians will spend two on documentation and other clerical tasks. In addition, in some settings physicians are spending an additional 86 minutes each night catching up on documentation. Our early results show we can reduce documentation time by approximately two hours per full clinic day. This helps reduce the documentation burden that has been a primary contributor to physician burnout. In addition, physicians and patients have expressed during interviews that they appreciate the increased interaction without the distraction of information entry. Thus, this approach could lead to greater patient and physician satisfaction. We believe that combining physicians and AI can help ensure that every patient receives the best care, every time. However, AI can only assist physicians if it has up-to-date and properly structured

information. Capturing information from the patient-doctor conversation and generating documentation are two key initial steps to realizing this vision.

Personal Impact

This work has been the most intense and rapid learning experience yet. We learned valuable lessons on how to innovate in health care and iteratively develop software to improve health care for both patients and doctors. Launching, continually seeking physician and patient feedback, and quickly adapting has been key. One of the best aspects has been seeing our service restore more time for patient-doctor conversations. It's so motivating seeing something you have built positively impact others. In our case, we have been able to see our doctors focus more on their patients while also having more time available outside of work. Finally, our dream is to improve patient care by enabling physicians with useful AI tools. We recognize it is a huge challenge but getting to make steady progress toward that vision makes every day so exciting!

Leadership

Medical Educational Consulting Group ("Med ECG"): Providing Students Leadership and Business Opportunities While Positively Impacting the Community

Medical Student

Matthew Carey, University of Michigan Medical School

Teammates

Paige VonAchen, David Portney and Taylor Standiford

Faculty Mentor

Michael Englesbe, MD, Cyrenus G. Darling, Sr., MD and Cyrenus G. Darling, Jr., MD Professor of Surgery Section of Transplantation Surgery, Department of Surgery

Abstract

At the University of Michigan Medical School, the Medical Educational Consulting Group (Med ECG) was developed to mold future physicians for diverse leadership roles in a changing health system. Med ECG provides medical students with opportunities to develop leadership skills by completing consulting projects with local community clients. Med ECG addresses six health systems science domains, including two cross-cutting domains and the linking domain of systems thinking. Client feedback has pointed to the value of Med ECG's projects and their impact on the health care system through partner organizations. Overall, Med ECG's experiences show that a medical student-led project-based program is a novel way to train future physicians to become leaders who improve patient care and health care delivery. Students built concrete skills through practical problem solving and professional experiences. Efforts to replicate these types of programs can accelerate the development of physician leaders to help transform the future of health care.

Project addressed/Problem discovered

Many resident, faculty and medical student leadership programs have been established to provide physicians with essential leadership skills to help shape the future of health care (Awad, et al. 2004; Pradarelli, et al. 2016; Frich, et al 2015). Business and management skills are a key part of this leadership training. A survey from 18 medical schools showed that two-thirds of medical students perceived a background in management and business to be an important aspect of their roles as future physicians and were interested or highly interested in learning more about business in medicine (Wanke, et al. 2015). Many schools have implemented didactic leadership and business curricula, with varying levels of structure and success (Webb, et al. 2014; Agarwal, et al. 2015). There have also been successful extracurricular attempts to develop physician leaders, supporting the idea that project-based leadership development can improve leadership training and the health care system (Jorge, et al. 2014; Long JA, et al. 2012). However, developing business and management skills through practical experiences has been less explored. Most current programs are didactic, and it is unclear how effective a systems-perspective project-based program would be in teaching both leadership skills and health systems science.

Approach

We believe that medical student consulting groups can foster leadership development and health systems science by involving students in real-life projects, while simultaneously impacting the health care system in a positive way. Examples of these skills include interprofessional teamwork and communication and a more in depth knowledge base of issues facing the health system. At the University of Michigan Medical School, we founded the Medical Educational Consulting Group (Med ECG) in 2017 to bring benefits to both the medical students and the local health care system. In founding this group, we were able to draw on our previous experiences working at consulting firms and within the health care industry. Our organization's two-pronged mission is to (1) train medical students with tangible leadership skills through direct application of health systems science principles and (2) improve the health care system by providing pro-bono work for mission-minded health care organizations. One year after the founding, we assessed whether this model was indeed achieving the goals we had set out, namely, its positive effects on medical students and the health care system. We focus on three questions: (1) Do medical student consulting groups fit established guidelines and competencies for leadership and health systems science? (2) Is the work that medical student consulting groups produce valuable for their partners and the health care system? (3) Do medical students develop leadership skills through active participation in consulting projects?

Outcomes

Med ECG projects address six of the health systems science domains:

(1) Leadership and change agency
(2) Teamwork and interprofessional education
(3) Health care structures and processes
(4) Health care policy, economics and management
(5) Health system improvement
(6) Systems thinking

In the first few weeks of the project, each team is required to work with clients to scope the project and identify realistic contexts for change. Students develop (1) leadership and change agency and (2) teamwork and interprofessional education while learning to delegate their limited time between course work and their project obligations. They work with others, including pre-clinical and clinical students as well as interprofessional client partners, and they manage available resources and personal performance on all projects. The core of each consulting project involves solving a problem related to (3) health care structures and processes, (4) health care management, and/or (5) health system improvement. While working on these problems, students develop a (6) systems thinking approach as they engage in critical, innovative thinking and problem solving. Team members will work together to gather information and evidence to create informed, meaningful change within their client's organization. Ultimately, through final presentations and post-project surveys, team members have the opportunity to evaluate the impact their team created. Med ECG also performs post-project reflection surveys to enable self-improvement of internal organizational processes. Moreover, client partners also evaluated project team skill levels across a variety of communication and professionalism attributes.

Impact on the health system

Over the course of the 2017-18 academic year, Med ECG worked with three clients on four projects. All clients were local non-profits operating in health care-related roles. The clients included a local federally qualified health center, a local social services agency and a metropolitan community health council. Projects covered topics such as operational efficiency, value-based health care contracting and community health resource planning and provided a variety of deliverables, including automated reporting dashboards, board meeting recommendations and summarized analysis. Survey results from partner organizations (n=4) were used to identify the value of Med ECG's projects. Across eight measures of the value of Med ECG's deliverables, the average was 4.63 out of 5 with a standard deviation of 0.49. When asked about the likelihood of implementing the findings from the projects, the average likelihood was 4.67 out of 5 (n=3, 75%). Additionally, each of the four respondents stated that they would like to work with Med ECG on future projects. Each client noted the value of the deliverables and overall project in pushing key organizational initiatives forward. Qualitative feedback included the following: "I was very impressed with all the aspects of Med ECG's work. It exceeded my expectations, given that the team members are students. In fact, I think the value of Med ECG's work for us exceeded some of the products we have received in the past from professional consultants!" and "Very organized, great follow-up, project helped get approval for a key strategic partnership. Thank you for your help and really nice job!"

Personal Impact

In Med ECG's first year, there have been 14 members, including eight first-year students, two second-year students, three third-year students, and one fourth-year student. Of the 14 total members, five of the students are pursuing secondary graduate degrees, including three MBA students and two PhD students. In relation to prior business or health care experiences, five had a significant amount of experience, six had an intermediate amount (e.g., working on an undergraduate health policy research project), and three had very little or no prior experience. Follow-up surveys with members (n=14) indicated improvement across 10 leadership and business skills domains as a result of their work with Med ECG. Qualitatively, students reported a range of leadership skills learned through their projects, including professionalism and communication skills, understanding the issues that health care organizations face and leadership skills in managing a team. All student members rated their experience as valuable. As founders, all four of us perceive an improvement in our own leadership skills and an increased desire to pursue health care leadership roles that will enable us to improve patient care and health care delivery from a systems-level perspective. From observing leaders in the community organizations we partnered with, we have learned of the various ways these skills can be employed in a practical setting. We all hope to continue to develop our skillsets and look forward to putting them to use in our future careers as physician leaders in a changing health system.

MD Compass: A Co-curricular Career Development Program

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Teammates
Jessica Smith

Faculty Mentor
Kathryn Trayes, MD, Associate Dean, Student Affairs & Career Counseling

Abstract
MD Compass is a co-curricular career development program designed as a medical education advisory resource for students that spans throughout the four-year MD program. Under the advisement of the deans in the student affairs office, MD Compass is designed to introduce topics including career exploration, shadowing, summer planning, USMLE review, clinical scheduling and work-life balance. MD Compass is delivered through a combination of in-person sessions, online podcasts and a centralized website composed of resources that parallel the topics covered by the curriculum. Overall, we believe that through this method of centralized resource delivery and physician and peer mentorship, this program will place students in the driver's seat of their own medical education with the added benefit of promoting student balance and wellness. Additionally, with the shift to competency-based education, this program will give students the tools they need to develop leadership skills while cultivating a thoughtful journey in career development.

Project addressed/Problem discovered
The advent of JeffMD, a new, systems-based curriculum at Sidney Kimmel Medical College (SKMC), has provided many new opportunities for innovation and improvement in both curricular and cocurricular aspects. This exciting period of change and forward-thinking has provided motivation to further improve the experience of the medical students at SKMC. With improvement in mind, there became a clear need to provide an avenue for centralized resources to students to guide them in co-curricular focuses, such as leadership and career exploration. Therefore, this program provides a comprehensive layout of co-curricular avenues to help students take ownership of their career development and leadership opportunities, while still offering a sense of wellness and balance. By emphasizing a different goal for each of the four years, each year of a student's MD program can be clearly driven toward a specific co-curricular focus. Year 1 is "Introduction to Career in Medicine" with sessions on career discovery, shadowing and leadership development. Year 2 labeled "Career Exploration" allows students to reflect on the discoveries they made in the first year and prepare for their Step 1 Board Exam and transition to clinical rotations. Year 3, "Defining Your Career Interest," encourages students to take advantage of their exposure to specialties while in clinical rotations and begin preparing their residency application. Year 4, "Transitioning to a Career in Medicine," targets preparation for a successful residency match through interview guidance and mentorship as they prepare to become interns in their field of study.

Approach
MD Compass is delivered to students through a combination of in-person sessions, online podcasts and a centralized website with compiled resources from the curriculum. While this program features numerous in-person sessions, we will highlight the capstones of our program here. During year 1, we host the "Fall Career Fling," labeled a career fair where all 26 specialty organizations on campus represent their field alongside a practicing physician(s) to foster conversations with students. We are also hosting a "CV week" that will allow students to meet and have their CV critiqued by the deans. Year 2 begins with a 3-month dinner series entitled "Dinners with Doctors," where students can have informal and in-depth conversations with physicians in a casual dinner setting. Panels related to boards preparation will also be held. As students enter their clinical rotations in year 3, a series of workshops on making the most of clinical rotations will be offered. In year 4, in preparation to apply to residency, mock interview workshops will be held to allow students to complete one-on-one interviews with physicians with immediate feedback provided. Throughout the four years, two series of podcasts are also released. The "Specialty Spotlight" podcast series features Jefferson physicians speaking on behalf of their careers and work-life balance. The second podcast series is focused on financial concerns including sessions on budgeting, student loans and the Free Application for Federal Student Aid (FAFSA). As previously mentioned, all resources provided in the program are also available to students at any time through the MD Compass website.

Outcomes
We will obtain survey data from future workshops and conduct long-term assessments of students' readiness to navigate careers in medicine. The overarching goal of the program is to give students the tools they need to be successful and choose a label with confidence. The events implemented so far have been successful. The "Fall Career Fling" involved 40+ physicians, 50+ 2nd-year student interest group representatives, and 300+ SKMC attendees. We received overwhelmingly positive feedback from students following this event. The "Specialty Spotlights" podcast series will be released with the upcoming cardiopulmonary block and will feature a Jefferson electrophysiologist and a pulmonologist. The financial aid podcasts series will kick-off with a video on how to fill out the FAFSA and the benefits students can take advantage of to secure scholarships. The MD Compass model was presented at the AAMC Learn Serve Lead Conference in Austin, Texas on November 2, 2018. Our hope is that other medical schools will adopt this as a cohesive framework for student-driven, physician-guided mentoring. To sustain the program, two first-year medical students at SKMC were recently selected to join our team. Our long-term goal is to have this program incorporated into the curriculum as its own "thread." Threads (health systems science,

wellness, etc.) run longitudinally throughout the systems-based curriculum and produce their own learning objectives in the form of assessments and lecture materials. By making MD Compass its own thread, this would encourage longitudinal career navigation in parallel with the curriculum.

Impact on the health system

Physician wellness has become an increasingly prevalent issue in news and health reports on a national scale, with the idea that physician self-care is crucial to safe and effective patient care. We believe that wellness stems from the time a student begins medical school, with the mentality that they adopt in these early years of training. By introducing MD Compass from the beginning, we hope to dramatically reduce medical student burnout and stress regarding career navigation due to the guidance provided by physicians and peers, the centralized resource delivery, and the gradual immersion in career planning. Additionally, with the shift to competency-based education, this program would give students the tools they need to develop leadership while cultivating a thoughtful journey in career development. Networking with program directors early on will foster open communication between the students and those in control of residency training and education. This will allow students to become the ideal learners that program directors seek when filling residency positions. Additionally, providing an avenue for a closer working relationship will allow students to trust in the residency selection process, understand the nuanced considerations important for individual programs, and be more thoughtful about their applications and decisions with the best fit in mind. Addressing imposter syndrome in the UME to GME transition will also strengthen mental health during residency, building a foundation of wellness and confidence that will continue throughout a student's career.

Personal Impact

This program has been a true learning experience, fostering both creativity and practicality. Through identifying the needs of students and brainstorming ways to address these needs, it has stimulated creativity in finding new solutions to ongoing problems. Simultaneously, time and budget limitations have forced us to be realistic with our ideas, paring them down to those that are feasible with the materials available. The end result has been an ability to combine new and creative ideas with a concrete and practical plan to implement them, a skill that is extremely valuable and difficult to cultivate. It has also garnered a sense of leadership and ownership. Because we have built this program in collaboration with the deans, we take ownership of its implementation and future direction. That means the onus is placed on us to develop and help roll out this program to students, which has required self-sufficiency and initiative. Intertwined has been the development of organization and communication skills. Coordinating with 26 specialty organizations and 50+ physicians to host the "Fall Career Fling" or scheduling physicians to interview for podcast series, etc., has required communication and organization. Perhaps the most important impact of this program, however, has been the ability to work as a team, which requires patience, communication, compromise and support of the other members of your team; all skills we have strengthened immensely through the development of this program.

A Platform for Health Care Innovation

Medical Student
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Teammates
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Faculty Mentor
Paul Weber, MD, MBA, Associate Dean-Continuing Medical Education

Abstract
There is a disconnect between the management of health care and the needs of those on the front lines of care. Health care providers and students have unique insights to bring the focus back to what's most important: the patients. Providers, and even more so students, do not always have the logistical knowledge or means to bring their ideas to fruition. Our solution was to bring together key stakeholders in the health care entrepreneurial space to allow for a platform for students to learn from not only from experts but also each other. Students have differing backgrounds and experiences that can be pivotal in catalyzing the health innovation space. This solution took the form of a student-centered Healthcare Innovation Summit where students could learn, network regarding their own ideas and even compete for start-up funding to take their ideas to market.

Project addressed/Problem discovered
Physicians often feel frustrated and powerless when confronted by the flaws within our current health care framework. Obstacles such as timed patient encounters and time consuming entry into electronic health records have created a substantial gap between what physicians feel is best for the patient and what care they are actually able to provide. We are faced with a health care system predominantly designed by business professionals and administrators rather than a practice created by providers for their patients and health professions colleagues. Clinicians, those who are on the front lines every day, are in the unique position to see systemic issues first hand, and therefore are well suited to find solutions to these problems. Furthermore, students training under the guidance of these clinician educators also represent a tremendously underutilized pool of perspective and talent for innovation. Our peers have ideas but lack the structure and support to bring them to fruition. We are members of a student organization at Robert Wood Johnson Medical School (RWJMS) called the Biomedical Entrepreneurship Network (BEN). This group is dedicated to informing students of the need for market solutions for health care problems and providing guidance on how to move ideas forward. Using the resources of the student-led and faculty supported BEN as a foundation, we created the annual Healthcare Innovation Summit.

Approach
On April 7, 2018, we organized a one-day Health Innovation Summit and pitch competition to bring together students and professionals within the health care entrepreneurial space. The morning took the form of a keynote lecture followed by interprofessional discussions among panelists including surgeon entrepreneurs, industry executives, health incubator leaders, designers and a patient advocate, whose perspective reminded the audience that as recipients of care, patients can offer key insights for change. Following the didactic portion in the morning, a networking lunch was held in which panelists were spread throughout the venue to permit audience interaction and foster sharing of ideas. The afternoon was allotted for a pitch competition where eight interdisciplinary student teams from the greater Rutgers community came together to compete for $10,000 in prize money and industry mentorship furnished by a NJ-based venture capital firm. All teams were in the early stage with limited prior funding, thereby highlighting our focus on providing a platform to allow for the evolution of new student-led ideas. Our unique approach included opportunities for participants to learn from industry leaders, further their own ideas and gain a glimpse into the possibilities through a multi-disciplinary approach to health care.

Outcomes
Our goal was to facilitate the free exchange of ideas among individuals with diverse backgrounds and experiences. BEN's Healthcare Innovation Summit has fostered synergistic collaboration between students, industry leaders and stakeholders to create health care solutions. With nearly 40% of summit attendees stemming from non-medical fields and industry, BEN has been able to establish a network of innovators with diverse backgrounds interested in mentoring young entrepreneurs. BEN aims to provide a platform for student-led startups to develop novel solutions to the issues within our health care system. In pursuit of this aim, we raised nearly $15,000 of funding through partnerships with health care industry leaders Pfizer and J&J/Janssen/JLABS and the Rutgers Office of Research and Economic Development (ORED). We were able to provide initial funding for two start-ups to take steps toward furthering their projects. Our mission of health care innovation has inspired interdisciplinary collaborations across a multitude of fields, and our network has grown in both size and expertise. As a testament to the innovative environment created by BEN, several current students pursuing medicine have been inspired to attend RWJMS because of the existence of our program. Furthermore, we were able to create awareness around a new longitudinal distinction program at the medical school focused on entrepreneurship and innovation. These outcomes attest to the interest in the values for which the Summit along with the BEN organization as a whole were created for.

Impact on the health system

The Summit had several immediate and long-term impacts on our health system. The competition itself encouraged students who never previously considered creating a product to do so and encouraged others with projects in development to accelerate those projects in order to bring them to light. We inspired students with examples of physicians who broke from the mold to add to their clinical practice by using the tools of industry. This entrepreneurial ecosystem helped students identify paths other than the traditional ones of academia. Participants and organizers have been approached for scientific research opportunities consequent to the event, further potentiating the impact. Solving the future problems in health care requires new thinking and tools, some of which have not been invented yet. Providing a platform for this growth early in medical education will have an enduring impact on our students' career trajectories and on all parts of the health system that they will touch. More than just inspiration, the Summit also provided opportunity for the attendees to network with stakeholders outside of their respective fields. The Summit brought together students from throughout New Jersey and some from across the nation. The Summit attracted allied health students and engineering students to learn and compete. Among our attendees, panelists and judges were internists, surgeons, research scientists, health system administrators, venture capitalists, serial entrepreneurs, designers and patient advocates. By coming together for the explicit purpose of education and competition, participants formed connections with one another that they would not have otherwise been able to make. This early interprofessional collaboration lays the foundation for a health care system in which there is mutual respect and understanding of the diversity of skill sets needed for patient-centered care.

Personal Impact

In identifying and recruiting speakers and panelists, we had the opportunity to network with individuals at the front line of health care system revitalization. These health care leaders have registered through a mentor database, allowing them to work with members of our network in the years to come. This speaks to the mission of the Summit and our organization as a whole—to create a self-sustaining process through which health care students and experienced professionals collaborate to identify systems level issues and develop innovative solutions. In this way, new ideas may transcend the "generational borders," ensuring their sustainability in a constantly evolving system. The success of our summit has also established the reputation of BEN and its members as leaders in health care innovation not only at Rutgers, but throughout the greater New Jersey community. For example, shortly after the summit, our executive board was recruited to assist with Princeton University's MediHack event by mentoring participants in identifying problems within the health care system and designing novel solutions. The foundation of the event within our organization permits us to perpetuate the knowledge and experience from the summit in a sustainable way. The Healthcare Innovation Summit was entirely student-organized, making it a rewarding and educational experience for all involved. Each member of the team grew through the refinement of critical skills in logistical planning, fundraising, financial management and communication. These skills will be universally applicable in our careers as physician innovators. And finally, each member of the team has a deeper understanding of how one should not feel limited based on their title (i.e medical student). Change is possible through a committed, researched and innovative approach.

Vanderbilt Community Circles

Medical Student
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Teammates
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Faculty Mentor
Andre Churchwell, MD, Dean

Abstract
On the heels of the 2016 presidential election, a group of medical students at Vanderbilt noted a need for a robust response from the medical community to the rising political and social tensions in our country. Concerns rose regarding the effects of population-level discrimination, gender inequalities and gun violence on health outcomes. In alignment with the health systems sciences domains of leadership, patient safety, quality improvement and population health, the Vanderbilt Community Circles Committee was founded. The committee facilitated events on important issues of race, gender, guns and immigration. Issues that individuals inside and outside of the Vanderbilt network consider part of their identities and holistic well-being. Attendees stated that their perspectives were broadened and that they were able to sympathetically engage differing viewpoints. Outcomes demonstrated that providing venues for collegial discussions about hot-button issues within a health system is not only possible but desired.

Project addressed/Problem discovered
Recent political and societal changes have exemplified the effects that current events can have on the health and well-being of individuals. For health care professionals, perceptions of increased racial hostility, community-level prejudice, animosity toward immigrants and concerns about reductions in social and health services have come about following the 2016 presidential election. The current landscape of health care delivery in large academic medical centers requires successful interdisciplinary communication and care in order to maximize outcome measures most relevant to patients and the system in which they are served. Successful interdisciplinary communication and care may hinge not only on the health and well-being of individual members, but also on individuals being able to connect, reflect and understand each other's and their patients' feelings, motivations and perspectives. Recognizing the gravity of our current political and societal landscape led our team to create a venue where Vanderbilt students, staff, faculty and the entire Vanderbilt University Medical Center can come together to discuss current events within an open and inclusive setting.

Approach
A student committee was formed of nine from the first class and then two to three students from each class thereafter. Committee members are selected based on peer recommendation, leadership, capability, potential, motivation and interpersonal skills. Events are run quarterly and revolve around specific issues or current events such as: "Gender in the Workplace," "Immigration in America," "Gun Violence in America" and "Race in America." Conversations are not intended to change opinions or to even come to an agreement but rather to listen and to come to a deeper understanding of diverging viewpoints. Additionally, guidelines were explicitly voiced to ensure a mutual understanding to making these events inviting, respectful and safe. An example of some of these rules were: "Participate as you feel comfortable," "Treat this discussion as a private conversation," "Focus on ideas not on individuals" and "Talk about yourself and your own experiences." The events are facilitated by a senior faculty member who is a bioethicist with experience in group discussion along with student members from the committee. Questions for each event are carefully prepared in order promote healthy dialogue with diverse perspectives. Finally, surveys are disseminated to participants after each event to investigate the personal effects that the discussions have had on attendees.

Outcomes
Around 40 people attended each event with 245 RSVPs spanning four events. Of these, 126 individuals took validated quantitative and qualitative surveys constituting a 51% response rate. Demographic data of responses depicted a broad spectrum of important identity markers: age, gender, race, ethnicity, religion, political and economic persuasion and sexual identity. The majority of attendees were female (75%), white (53%), Caucasian (48%), Christian (46%), strongly socially liberal (47%), slightly economically liberal (41%) and heterosexual (94%). The vast majority of responses endorsed slight or strong agreement with the following qualitative metrics: "Multiple perspectives and opinions were represented," "My own perspectives were broadened on the issues," "The format and setting were conductive to dialogue and discussion" and "I would attend an event like this again." Initial interpretation of these results suggests that our events follow in line with our initial mission of creating an open venue for individuals at Vanderbilt to discuss important societal and political topics. Qualitative responses yielded both positive and constructive feedback. Positive comments from participants included: "It was incredibly interesting to hear opinions from people of a variety of occupations, backgrounds, cultures, race and life experience," "Great event, always nice to have diverse representation from across the VUMC community" and "broad diversity standpoint including age of participants." Constructive feedback included: "Those who come to these events tend to have sympathetic opinions, I wish there were a broader diversity of viewpoints… Specifically, that means pulling more conservative people into discussions" and "Finding more divisive issues would lead to meatier discussions."

Impact on the health system

Due to differences in schedule and context, professionals in different areas of specialty within a medical system may not regularly interact with each other and when they do, it is usually for brief transactions of information. Our efforts promote the coming together of pockets of professionals from every part of Vanderbilt University Medical Center to discuss issues important to them and their patients. Interprofessional communication is a cornerstone for the proper functioning of any health system. We understood that deeper interpersonal and professional communication transcends mere clinical information but also necessitates mutual sympathy of issues that carry profound personal significance. As such, our organization continues to meet that need by providing a stage for students, staff, faculty and anyone in our health system to come together to converse about these topics. Over time, we envision the Vanderbilt Health System leading the charge in cultivating deeper and more trusting relationships within our community, even as tensions in our country rise. We intend our efforts to fall in line with that vision and predict that through these dialogues we will see the fruits of more compassionate care, humble disposition and greater health outcomes for our patients.

Personal Impact

My parents came to the U.S. from Colombia as legal residents to serve the immigrant population in North Alabama. I lived most of my childhood surrounded by and in commonality with undocumented families. It was in the setting of the South and in service to this community that I saw the impact of social and political forces on the Hispanic population. My parents actively encouraged them to diligently care for their health: mental, spiritual and physical. We would visit them in the hospital, and I would help translate. Fast-forward a few years later, now being on the provider side, I am now seeing the difficulties of a health system to attend to and care for these illegal immigrants. Through the discussion I led on immigration I was able to see where my points of views and experience may contrast or harmonize with those of my colleagues. Immigration in America is not a one-dimensional issue as there are moral, financial and legal factors that rightfully come into play. Through this event, my view on immigration became more humble and more nuanced. Without a doubt, health systems care for the physical ailments of patients who walk through the door, but they also need to account for the social and political forces in play. It was enriching to hear from differing perspectives as much as it was to share my own, and I am confident that it will continue to impact the way I interact with my co-workers, administrators and patients. It would not suffice to describe the impact that each event had on me in the way I consider gun rights, race and gender in the workplace. It stands to show the benefit that we hoped would come from facilitating these discussions. I am hopeful that the impact it had in the microcosm of my life is expanded to influence the way our health system ruminates on these issues.

Building a Toolkit for Medical Students: Addressing Microaggressions and Discrimination on the Wards

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Teammates
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Faculty Mentor
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Abstract

Health inequities based on race, gender identity, sexual orientation, socioeconomic status, nationality and other factors have persisted over decades. Multiple studies suggest that physicians' implicit biases affect the care they provide to their patients, contributing to persistent health disparities that exist between minority and non-minority populations (Pascoe and Richman 2009, *Psychological Bulletin*). These implicit biases often manifest clinically as microaggressions: casual debasements of identity groups through brief or commonplace verbal indignities that communicate hostile, derogatory or negative insults (Montenegro 2016, *JAMA*). The prevalence of these experiences of microaggressions during undergraduate medical education training is currently unknown, and without any proven or standard training, medical students typically express uncertainty about how to address these situations. To address this, I co-led a team of rising second-year medical students and faculty at Harvard Medical School (HMS) to design and implement a curriculum and accompanying study on microaggressions in the clinical environment. The purpose of this work was to determine the prevalence of micro-aggressions among undergraduate medical students and educate participants about how to recognize and respond to them. We developed and facilitated a two-hour workshop combining lecture and small group discussion for 163 students at HMS. We also completed an analysis of 81 pairs of pre- and post-workshop surveys from approximately 50% of first-year HMS students. Our results demonstrate that education and training around microaggressions in the clinical environment workshop broadly and significantly improved competencies for recognizing and combating microaggressions in a clinical setting. This novel curriculum is easily replicable and provides an early intervention to equip medical students with tools to respond to microaggressions, as well as to dismantle existing systems of bias and discrimination in medicine.

Project addressed/Problem discovered

Health disparities exist for most minority populations in the United States, such as non-white, women, LGBTQ+, immigrant or disabled populations. While structural issues—such as housing discrimination, criminal justice and access to care—indisputably contribute to these inequities, wide health disparities persist despite the dismantling of parts of these systems, such as post-hospital segregation. It is thought, therefore, that systemic discrimination persists due instead to bias rooted in individuals, which mounting evidence suggests is widespread in medicine and does negatively affect patient care (Pascoe and Richman 2009, *Psychological Bulletin*). Microaggressions are dangerous to physicians and yet poorly understood. A microaggression is characteristically unbeknownst to the offender, yet lacerating to the offended—for example, when women and minority physicians are mistaken for custodial staff in the hospital, or when medical students feel that they must stay silent and watch discriminatory comments from patients or team-members go unaddressed. Microaggressions, compared to experiences of more obvious discrimination and health outcomes, have been poorly studied: no prevalence data exists for their presence in the clinical environment. However, it has been well demonstrated that repeated exposure to microaggressions contributes significantly to physician burnout (Wells 2009, UGA). Finally, undergraduate medical education reserves little time for training future physicians in microaggression recognition and response. At Harvard Medical School, the discussion of broad topics related to identity and medicine—"Social Medicine"—is one of four threads in two month-long courses entitled, "Essentials of the Profession." These courses include myriad topics ranging from biostatistics to medical ethics to policy, leaving little time for robust discussions of physician and trainee experiences of discrimination in medicine—let alone microaggressions.

Approach

To address the aforementioned problems, we chose to implement two education strategies in this workshop: (1) a lecture that presented two established structural frameworks: "Categories of and Relationships Among Racial Microaggressions" (Sue et. al 2007, *Am Psychol*) and "STOP, TALK, ROLL" (Georgetown University School of Medicine). The first model was used to identify types of microaggressions while the second model provided strategies after encountering microaggressions. (2) a small-group session during which students worked through two cases by applying the presented frameworks in role-playing scenarios. Cases were inspired by student and physician experiences reported to staff and affiliates of the Office of Recruitment and Multicultural Affairs (ORMA). The first case concerned an attending physician dismissing a patient's racist and sexist microaggressions toward the team's black female medical student. The second case featured a Latinx student who was assumed to speak Spanish and asked to take on additional responsibilities for a Spanish-speaking patient. A third case in which a gay medical school student was told to hide his interest in OB/GYN due to it being suggestive of his sexuality was reserved for the aforementioned didactic presentation. A total of 163 students were separated into small groups led by 1-2 facilitators. Facilitators were recruited from the HMS ORMA and e-mail lists for medicine residents, psychiatry residents, and cross-discipline physicians and residents

interested in social justice work at Massachusetts General Hospital (MGH), Brigham and Women's Hospital (BWH), Beth-Israel Deaconess Medical Center (BIDMC) and Cambridge Health Alliance (CHA). Facilitators underwent an in-person faculty training that reviewed learning objectives, three cases to be presented in the workshop and facilitation strategies.

Outcomes

"Building a Toolkit for Medical Students: Addressing Microaggressions and Discrimination on the Wards" took place on Thursday, August 16, 2018, from 10:00 a.m.–12:00 p.m. at Harvard Medical School as a mandatory session in Professional Development Week III. We completed an analysis of 81 pairs of pre- and post-workshop surveys from about 50% of first-year HMS and HSDM students. 47.9% reported female gender, and 36.4% reported being a member of a group traditionally underrepresented in medicine (URM) on the pre-workshop survey, allowing for stratification by reported gender and URM status. We report a prevalence for microaggressions among this cohort of medical students. In our data, the prevalence of medical students personally experiencing or witnessing microaggressions was 56.2% when assessed after the workshop. The odds ratio was not significantly different for reporting microaggressions between URM and non-URM students (OR = 1.51; 95% CI: 0.59, 3.89; p = 0.39 in pre-survey; 0.70; 95% CI: 0.27,1.78; p = 0.45 in post-survey). However, female students were significantly more likely to report microaggressions than male students (OR = 2.88; 95% CI: 1.12, 7.37; p = .024 in pre-survey; OR = 5.031; 95% CI: 1.83, 13.84; p = .002 in post-survey). Students were asked to self-assess how challenging the following factors were in responding to microaggressions: "Fear of retribution," "Difficulty recognizing," "Not sure what to say or do," "Lack of allies" and "Lack of familiarity with institutional support." Scores were compared in a pairwise fashion between pre- and post-surveys. Perceived challenges to addressing microaggressions and episodes of discrimination on the wards ultimately decreased for all of the aforementioned barriers regardless of reported URM status and gender, except "Fear of retribution," which remained a barrier for all respondents post-workshop.

Impact on the health system

This novel curriculum and study have two major impacts: (1) Establishment of an undergraduate medical student curriculum as a novel, easily replicable tool to combat clinical microaggressions. To our knowledge, this curriculum and its accompanying analysis is the first study on microaggressions in the education setting among medical students, including the first reported measure of prevalence. We found that this workshop can improve individuals' confidence in identifying and addressing microaggressions, assessed by improvements between pre-workshop and post-workshop self-assessment surveys. We are hopeful that the workshop's teaching principles can be vastly incorporated in different educational settings familiar to residents and medical students, such as mannequin simulations or objective structured clinical exams (OSCEs). We have recently replicated the workshop with a group of Cambridge Health Alliance residents and are planning to facilitate another for residents at Brigham and Women's Hospital. (2) Direct training of future physicians. This workshop equips future physicians to respond to microaggressions from patients, providers and others who engage with the health care system. For medical students and future physicians carrying marginalized identities, the workshop provides strategies for responding to microaggressions despite team dynamics and a society that affords these individuals less power. These strategies are also important for those who have never experienced microaggressions (NEMA). The social issues from which microaggressions and discrimination stem arise due to hierarchical institutions of power that grant authority to NEMA, such as governing bodies and national leadership organizations. By educating NEMA, the leadership of future generations of physicians can be expected to be more conscious of the impacts of microaggressions in clinical and everyday contexts. Finally, by defining and exemplifying microaggressions throughout the curriculum, the workshop acts as an intervention to prevent medical students from committing microaggressions themselves in the future.

Personal Impact

On my first weekend call in the OR, I was preparing to scrub in for a right partial arthroplasty when a scrub tech made a joke to the team that was undeniably grounded in homophobia. The room was silent, and nobody responded. As an LGBT student myself, I felt deeply uncomfortable but powerfully, I also felt equipped. I relied on the skills that I had built a curriculum around—identifying allies to talk to and the right moment to act—to quickly talk to my medical student colleague while scrubbing about the joke and to consult with my surgery adviser later, which led to an announcement and reporting of the comment to administration. Working on this project gave me the skills to combat microaggressions, but moreover, putting them to the test gave meaning to my work, demonstrating that the skills I worked so hard to instill in others will actually work to combat microaggressions and cultivate resilience in the face of bias. As a first-year medical student, I was active as a stakeholder in my own education: I designed and executed a part of my own curriculum, rather than passively doing my best to drink from the fire hose. Moreover, in an accelerated pre-clinical curriculum, I felt empowered to be supported by faculty team members who saw me as capable and valued on the team. The experience of developing this workshop has bolstered my sense of agency as a medical student and future medical educator. I am enthusiastic today to submit this work for the American Medical Association's consideration in the 2018 Health Systems Science Student Impact Competition. This work is unique and transformative, existing at the beautiful nexus of academic study, medical education and social justice. I hope that national recognition of this innovative project at the 2019 AMA conference will move us all toward the goal of this work: to disseminate microaggressions training across the greater multi-institutional sphere of medical education.

Leadership/underrepresented in medicine (URM) recruitment

HealthCORE: Innovating the Health Professions Pipeline for Underrepresented Students

Medical Student
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Teammates
Natasha Furtado Dalomba and Andrew Del Re

Faculty Mentor
Paul George, MD, MHPE, Director of the Primary Care Population Medicine Program

Abstract
The Health Career Opportunities Reimagined (HealthCORE) offers enriched activities, clinical exposure and longitudinal advising as a novel health professional pipeline model for rising sophomores to seniors in high school who are underrepresented in medicine. An initial two-week summer intensive program inspires students using several health disciplines, including many not covered in traditional pipeline programs such as global health, research, medical design, health care policy, clinical practice and narrative medicine. Students then transform their interests into practice through a yearlong longitudinal experience in the community, from volunteering to shadowing physicians to research internships, that medical students help to establish for these students. Following the first course iteration, underrepresented students graduated with more interest and a greater sense of capability in pursuing a health career serving others. The course continues to use a longitudinal, multi-disciplinary approach as it's refined with its second cohort of students.

Project addressed/Problem discovered
Inspired by Alpert Medical School's Primary Care Population Medicine (PCPM) program in which I am enrolled, I realized the importance of longitudinal clinical mentorship in building the skill sets, confidence and interest to best practice medicine. Having previously worked with underrepresented high school students attempting to learn more about medical school, I began to wonder; if this comprehensive approach set off a spark for medical students, could it be applied to high school students with an interest in medicine as well? A handful of previous studies examined the success of programs in attracting underrepresented college students to medicine, yet few researchers have focused on curricular pedagogy to cultivate interest among these students during their high school years. Previous health professions exposure offered by medical schools for high school students appeared transient, limited to a small number of sessions with minimal longitudinal mentoring relationships. Using the PCPM program and my past experiences as a guide, innovating the opportunities in which underrepresented students could be exposed to the health professions became a primary focus early in my medical school experience.

Approach
All students enrolled in the first cohort of HealthCORE (n=23) were asked via email to complete course surveys via a password-protected online form both immediately prior to and at the conclusion of the summer course in 2017. Both these pre-course and post-course surveys included Likert-scaled questions pertaining to: personal comprehension of the health professions, understanding of the various career paths a health professional can take, interest in pursuing a health profession, capability of pursuing a health profession and the quality of the advising system to which they felt connected. These questions were scaled from 1 (least) to 5 (most). Questions specific to the post-course survey included whether they would recommend the course to a friend ("yes" or "no") and a ranking of the students' most and least favorite health disciplines covered.

Outcomes
Of the 23 students requested to complete both surveys, 22 students completed both surveys for a total of 44 survey completions (22 pre-course surveys and 22 post-course surveys). Mean trends from pre-course to post-course included an increased personal comprehension of the health professions (3.45 to 4.59), an increased understanding of the various career paths a health professional can take (3.18 to 4.45), an increased interest in pursuing a health profession (4.36 to 4.59), an increased capability of pursuing a health profession (4.00 to 4.23) and an increase in the quality of advising system to which they felt connected (3.50 to 4.14). Narrative medicine, public and global health, and individual mentoring sessions were the most popular course days, while health policy and health administration were those days students felt needed the greatest improvement. Among the students who completed the survey, 95.5% would recommend the course to a friend. Subsequent studies led by this team are already underway that incorporate a mixed methods approach of interviews and surveys. Future research will examine the career trajectories that these students undertake relative to those for more traditional pipeline programs.

Impact on the health system
At the end of the first course iteration, underrepresented students graduated with more interest and a greater sense of capability in pursuing a health career serving others. Fourteen students demonstrated their interest within the health system through participation in at least three longitudinal projects each, including volunteering at Rhode Island Hospital for a semester, assisting emergency medical teams in ambulances, leading various medical research projects, among many more. Former students, as HealthCORE alumni, are offered the opportunity to return as teaching assistants to help with the following year's course as well, providing not only further mentorship to current students but also giving former students a valuable experience in medical education. Several high school teachers commented that HealthCORE changed their

students' trajectories and heightened levels of confidence to pursue a medical career. The course continues to use a longitudinal, multi-disciplinary approach as it's refined with its second cohort of students who have completed the summer course.

Personal Impact

As a budding practitioner, HealthCORE has provided me with an opportunity to witness firsthand the importance of integrating health capacity gained with the community for which one works. On a personal level, HealthCORE provided me with fulfillment, as I grew to understand that the program impacted the young individuals, their families and the larger communities. Moving forward in my career, my hope is to take what I have learned from this program and apply its core value of addressing health inequalities across any and all communities in which I work. Additionally, HealthCORE reminded me that self-advocacy is an invaluable tool to pass on and encourage among young teens and adolescents. Students quickly became aware of the nearly impossible task of teasing apart health from socioeconomics, politics, sociology and economics. Allowing these dialogues to take place will hopefully remain invaluable to them. My hope is that they take away from HealthCORE a lens of health equity, to be applied to any field within health they choose. Encouraging that mentality at a young age is a pillar of this program, one which I hope continues in the years to come.

Medical Students Galvanizing the Diversity Mission at UC Davis School of Medicine

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Teammates
Aljanee Whitaker

Faculty Mentor
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Abstract
Minority students often feel the burden of their minority status in medical school. The UC Davis Diversity Advocacy Council is a coalition of student leaders from various identities and backgrounds coming together to hold our university accountable for concerns regarding diversity and inclusion. The Diversity Advocacy Council operates at the medical school, K-16 and health system levels. The Council is a key consulting body with the Office of Medical Education to facilitate bidirectional input on matters such as leadership recruitment, admissions committees and curriculum reform. The Council organizes and promotes campus wide education on local and regional health disparities and pipeline programs with UC Davis, other regional undergraduate and community college minority student pre-health groups, and local Title 1 schools to encourage young children to consider health care careers. The Diversity Advocacy Council is the student voice that works with health and university leadership to advance health and education equity at all levels.

Project addressed/Problem discovered
Achieving health equity is at the forefront for all medical students. For many of us, the promise of equity drives us into a career in medicine. While the road to a solution is long and complex, UC Davis medical students are impacting the health system as partners, advocates and experts on advancing the diversity mission to reduce health disparities. Until the nation reaches a state of true health equity, medical students can provide the voice that links diverse communities with diverse attributes and needs with a non-diverse health and education system leadership. Organizing students into a Diversity Advocacy Council can facilitate communication between students and leadership, be a resource that provides a community perspective and advocate for multi-level system change

Approach
UC Davis medical students have aligned to create the Diversity Advocacy Council. Composed of leadership from all student affinity groups representing diverse cultural, gender, identity and religious backgrounds, the Diversity Advocacy Council seeks a seat at the table for all School of Medicine and Health System committees and key leadership recruitments. Our goal is to become embedded in the institutional structure as an advisory board/committee on issues regarding diversity and inclusion. The Council invites membership from any organized student group seeking membership. At schools like ours, student affinity groups naturally come together based on a shared background, but each affinity group tends to be small. The Council organizes these groups into a united coalition that coordinates education, outreach and advocacy on diversity and inclusion topics. In this way, leadership can call upon one Council to seek multiple perspectives, and multiple student perspectives can be voiced through one Council.

Outcomes
Over the past two years, key Council outcomes include:

- Reaching over 1,000 pre-health students each year through events, mentorship and outreach
- Hosting over 200 pre-health students at the School of Medicine
- Hosting monthly Diversity Advocacy Council lecture series and education events focused on improving the health of marginalized communities
- Securing seats on the Admissions Committee, Dean Recruitment Committee, LCME Planning Committee and Resident Medical Staff Committee
- Working with the chancellor to develop an action plan to recruit and retain more Black, African American and Caribbean students, residents and faculty
- Bringing Medi-Cal (California's Medicaid program) back to UC Davis

Impact on the health system
A more diverse health workforce leads to better health outcomes for patients of color, better access to care for non-White patients and better education and decision making for all in our community. Medical students can play important roles in addressing health disparities. Students, particularly students with diverse backgrounds, often shoulder the burden of representing a minority perspective when indeed they are the minority of students in a school. By coming together to act as allies and collaborators, students can amplify impact and galvanize change through a shared voice.

Personal Impact

Participating in the Diversity Advocacy Council has been one of my most impactful activities in medical school. Diversity Advocacy Council has helped me understand medical school as a system and an institution, one that claims "diversity" but may not actually mean it. This has highlighted the fundamentally exclusionary system that medicine is rooted in. Hundreds of years ago, this system was designed by and created for individuals of a certain class, gender and race and not much has changed since then. I've come to realize the necessity for people of color to become a part of this system, to be in positions of power at medical schools in order to transform the culture of medicine and influence what the future physician workforce will look like. It has incited my desire to work in academic medicine and become involved at the administrative level.

Population and public health

Determining Factors Affecting Age of Clinical Registration of Infants with Sickle Cell Disease at the Sickle Cell Unit, Jamaica

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Abstract

Newborn screening (NBS) for sickle cell disease (SCD) has reduced infant mortality since its initiation across the island of Jamaica. However, due to unknown reasons, many infants do not receive early treatment once screened positive for the disease. The purpose of this study was to determine factors leading to late clinical registration of infants with SCD at the Sickle Cell Unit (SCU) in Kingston, Jamaica. We identified roadblocks preventing treatment through a mixed methods approach. Determinants of delayed care were identified qualitatively through family and provider interviews and quantitatively through statistical analysis of existing newborn records using R and SAS software. Our findings indicate that the primary drivers of delayed care lie within gaps in the health care system's current operations itself rather than due to families lacking understanding of SCD, a belief held by many at the SCU. Using our data as evidence, we have proposed adjustments to existing NBS protocols to consequently lower infant morbidity and mortality rates in Jamaica.

Project addressed/Problem discovered

Newborn screening (NBS) for sickle cell disease (SCD) in Jamaica has been implemented island-wide since 2015. The purpose of NBS is to lower morbidity and mortality of congenital diseases by ensuring all infants receive early diagnosis and thereafter benefit from potentially lifesaving prophylactic interventions. Complications leading to early infant mortality in infants with SCD include pneumococcal sepsis and acute splenic sequestration. Early penicillin decreases pneumococcal sepsis, and family counseling trains parents to identify episodes of splenic sequestration, both dramatically reducing the early childhood mortality rate. When early-age interventions had not been implemented, 14% of children died in the first two-years, compared with less than 1% when preventive strategies have been administered. Jamaica's current NBS design for SCD includes testing cord blood in newborns and confirming all possible cases by six weeks of age. This enables infants to commence pneumococcal prophylaxis and for parents to be counseled and trained in splenic palpation by two months of age. Despite all the evidence supporting early intervention in infants with SCD, infants diagnosed with this disease still experience significant delays in receiving treatment, with an alarming proportion not receiving any intervention at all. In countries with a high prevalence of SCD, late registration can directly lead to increased infant morbidity and mortality, ultimately defeating the purpose of the NBS program.

Approach

This cross-sectional research study was conducted at the Sickle Cell Unit in Kingston, Jamaica through a mixed method approach. The database and clinical records at the SCU were queried to determine what proportion of screened infants were confirmed to have SCD since March 1, 2015, (approximately 180), registered with the clinic and received a dose of Prevnar 13 (pneumococcal vaccine) by two months of age. A research designed questionnaire was utilized to determine the impact of factors which may affect the registration time. These included demographic variables such as distance of residence from the clinic, parent/sibling SCD status, mode of transportation, age of infant when family was notified of screening result, parent occupation and family income. This information has been used to drive future changes in the SCU's NBS procedure as vulnerable populations have been identified. The study population was ordered based on age at first medical visit to the clinic. Parents of infants whose age at first visit lie within the highest quintile were invited to participate in the qualitative aspect of the study. These families participated in semi-structured interviews based on an interview guide. The interview guide is based on the COM-B and Health Belief Models: the likelihood of early treatment for an SCD infant will be evaluated based on parents' perceived barriers to treatment, benefit of early care, self-efficacy and threat of disease to infants. Transcripts were then analyzed by coding the interview responses. Codes (words, phrases or sentences) verbalized by the parents in response to the interview guide were collected. Similar codes were grouped together into themes and continually refined until no new themes appeared. These themes allowed us to identify the root causes of delayed treatment and propose changes to the current NBS system protocol in order to ensure all infants are properly treated for their disease.

Outcomes

The current NBS protocol for infants with SCD in Jamaica is based on past research indicating the effectiveness of specific interventions at various ages within a newborn's life. Shortly after birth, all infants born in Jamaica have their cord blood screened for SCD. Infants with positive or inconclusive results were traced and asked to return to the Sickle Cell Unit (SCU) for confirmatory testing by 6 weeks of age at which time children confirmed to have SCD were enrolled at the Sickle Cell Unit for ongoing care. Penicillin prophylaxis is highly recommended to start at two months of age. In 2010, the conjugate pneumococcal vaccine Prevnar-10 was introduced and provided by the Ministry of Health free of cost to infants with all genotypes of SCD. This was replaced by Synflorix and then Prevnar 13; the initial dose is recommended at 6-8 weeks of age. Our findings illustrate that the current NBS system protocol in Jamaica fails to ensure infants are treated for their disease by the recommended guidelines. The average amount of time it takes for SCD positive infants to return and receive their first dose of Prevnar 13 across all hospitals in Kingston is ~120 days, more than double the recommended age. Of all infants born and confirmed with HbSS (the most severe form of SCD) in the region, 20% do not show up at all for treatment at the SCU and live with unmanaged sickle cell during the most vulnerable period of their lives. Through an analysis of each step in the NBS procedure, it became clear that the time it

takes after confirmation testing of disease is the most significant factor contributing to these long delays. In an ideal setting, infants are confirmed at six weeks of age and are given 14 days to return to clinic for their primary interventions. However, our data shows that it takes over 60 days on average for these newborns to return, driving delays downstream of this step in the process. These figures prove that the current system design for recruiting SCD positive infants back to the clinic is flawed and must be redesigned in order to drive down infant morbidity and mortality associated with SCD.

Impact on the health system

Our interviews with new mothers and providers uncovered a discrepancy between the beliefs held by the health care team and the true factors contributing to delayed care. It became evident that those at SCU attributed later arrival times to new mothers simply not believing the fact that their child has SCD. However, our interviews with these families showed that this was not the case. 45% of participants who arrived at the SCU later than expected claimed that a lack of communication after confirmation testing was the true reason for their delay. Further analysis of the current methodology revealed a sizeable gap within the NBS system in Jamaica. Infants born with a positive indication for SCD are tracked extensively up until they receive a confirmatory test for their disease at the SCU. However, after this test has been performed, communication and tracking become non-existent for these infants, allowing many to slip through the cracks unnoticed.

It is only until these newborns suffer a crisis severe enough to warrant a visit to the hospital that they are referred to the SCU for care, an institution they should have regularly visited after being confirmed positive for disease. After the confirmation test is complete, mothers are simply given a slip of paper with a date in two weeks (the time it takes to process the sample) to return to the clinic for the infant's first visit. Without any follow-up or reminder notifications, these families can misplace this slip of paper or simply forget about the appointment altogether. Upon realizing the missed appointment at a later date, the mothers I spoke with believed that if there were truly an issue with the baby's health, then SCU would have called back for follow-up. When no call arrives, these mothers assume the infant is perfectly fine, leaving the baby untreated in the period of life associated with the highest risk of mortality. Our solution to this issue was to build a more efficient tracking system that integrates the screening lab, clinicians, public health nurses and other various stakeholders of the newborn screening process. By creating a shared platform accessible to all members of the team, the SCU will have the ability to closely monitor SCD positive infants throughout all steps of the NBS procedure. Infants who previously slipped through the cracks will now be collected within a shared database and can be contacted for follow-up when needed. To address the issue of missed appointments after confirmation, we are developing a push notification system to increase communication efforts with our patients.

Instead of giving new mothers a slip of paper with an appointment date in two weeks, families will now have reminders automatically sent to their phones. We believe implementation of these two solutions can drastically reduce delay times for newly screened infants, lowering the burden of SCD across the country.

Personal Impact

My work through the Fulbright program was my first attempt in designing a proposal and leading a research team. Although challenging at times, I thoroughly enjoyed the responsibility associated with this role and the flexibility to change the project's direction as I saw fit. This project was also my first dive into health systems research, a field that has now become my primary interest. In the future, I plan to continue leveraging my business and medical training in order to provide solutions to health care access barriers both locally and abroad. A major component of my time in Jamaica was spent interviewing families with SCD infants.

Through these conversations, I was able to gain a deep appreciation for Jamaican culture, as well as an understanding of the struggles that surround having a child with sickle cell. Outside of work, I volunteered with the Sickle Cell Support Foundation of Jamaica, an advocacy group dedicated to patients and families who suffer from this disease. At this organization, I was able to further support the mothers I spoke with from a non-medical perspective.

What Can We Learn from Hospital Closure? A Case Study of Doctor's Medical Center

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Faculty Mentor
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Abstract
There is an epidemic of safety net hospital closures in the United States. Doctor's Medical Center in the San Francisco Bay Area closed in 2015 and was the sole safety net provider for an urban population of people of color with a high burden of trauma and chronic illness. We conducted 37 semi-structured qualitative interviews to understand the personal and systemic impact of this hospital closure. Results from the interviews are organized into four major themes. Findings from this study have societal, policy and economic implications and emphasize the importance of health care facilities as representations of whether a community is thriving or declining. Repeated denial of public goods, including hospital services, serves as a reminder of systemic inequalities and contributes to chronic stress and ill health. Small safety net hospitals must be optimally targeted by local, state and federal support systems to ensure underserved community health needs are met.

Project addressed/Problem discovered
The people of Richmond, California and surrounding communities have been historically marginalized. Since World War II, Richmond has had one of the most racially and economically diverse populations in the San Francisco Bay Area. While the surrounding Bay Area has thrived in the past decades, Richmond has seen violence, injustice and discrimination. In 2004, Richmond was ranked as the 12th most dangerous city in America. Boarded-up homes in foreclosure lined the streets of every neighborhood. Flares and fires from the Chevron refinery downtown sent parents speeding their children, gasping for air in an asthma exacerbation, to the closest emergency department. Although the city is seeing drastic improvements through social justice groups and community organizations, generations of inequality in every aspect of life have made for a physically and psychologically sick, yet resilient, population. Unfortunately, resiliency cannot mitigate heart disease and asthma. The people of Richmond and nearby communities rely heavily on the medical system for management of rampant chronic illness. Doctor's Medical Center (DMC) was the major provider of emergency and ambulatory health services for 250,000 people and was committed to caring for all patients. The hospital closed in 2015 after decades of financial instability, leaving behind a health care desert. We wanted to understand how and why such a vital hospital closed without a back-up plan for this vulnerable population. We also aimed to understand the personal impact of the closure in the community's own words. Through gathering this information, we hoped to inform governances and communities facing similar gaps in the health care system.

Approach
This was a qualitative study that used in-depth interviews to explore the events leading up to the closure of DMC and the impact of the hospital's closure on the surrounding community. Interview participants fell into one of two groups: key informants (KIs) and community members (CMs). Qualitative methods are useful for exploring understudied phenomena and the experiences of individuals within a specific group. CMs were adults who had lived and/or worked in West County since at least 2013 and included a subset of former DMC employees. KIs were county officials, administrators, physicians and politicians who had been involved in preparing for DMC's closure and/or the closure decision-making process. Purposive sampling strategies were used to recruit the participants. The KIs were included for their in-depth understanding of the hospital's history and closure process. CMs, who were mostly employees or patients, could provide unique insights into the experience of losing a local hospital. The participants who had been employed by DMC would provide the additional perspective of losing one's job with the closure of the hospital. A total of 36 interviews were conducted by the student investigator from September 2016 to June 2017. They lasted 20 to 90 minutes and were audio-recorded and transcribed verbatim. All de-identified transcripts were imported into the qualitative software MAXQDA12 (VERBI GmbH) where they were organized, coded and analyzed. Thematic saturation for the purpose of the research question was reached at 18 interviews as new themes ceased to emerge.

Outcomes
The findings from this project are organized into four major themes: the hospital's importance within the community, the personal and emotional impact of the closure, new barriers to accessing health services and the impact on local and regional health systems. Community members describe DMC as a vital community resource with irreplaceable services and dedication to serving all patients, regardless of ability to pay. Community members identify poverty, crime and racism as primary reasons for the lack of investment in their health care system. Some key informants consider the closure a personal failure of the community, while others consider it to be a natural economic process. Since DMC's closure, community members express disempowerment and fear related to the loss of a reliable source of health services and cite new geographical, transportation, insurance and health education barriers. When this urban underserved community lost its main source

of public health care, fear dominated and new barriers to care emerged. DMC's closure has caused widespread subjective delays in care, which will likely contribute to poor health outcomes. This closure was described as an emotionally traumatic event for the community. It embodies a loss of public resources and ongoing structural violence and represents a devaluation of individual well-being. Small safety-net hospitals must be better targeted by local, state and federal support systems to ensure underserved community health needs are being met.

Impact on the health system

Safety net hospitals are major providers of health care services to vulnerable populations, and these hospitals have recently been closing in favor of larger health systems that can leverage significant capital. We examined the closure of a vital hospital in an underserved urban community of the San Francisco Bay Area and described the local and regional impact of this hospital closure. The local health care system was already fragmented prior to the hospital closure and accessing services has only become more challenging. Anecdotal evidence supports worsened chronic and acute health outcomes related to increased distance to the nearest emergency and outpatient service, unfamiliarity with other systems and longer wait times due to an overwhelmed system. Other hospitals in the area, even those many miles away, have been adversely impacted by a sudden rise in ambulance and walk-in traffic to emergency departments and inpatient overcrowding. This overwhelm has triggered the opening of an urgent care facility within the community and an expansion of the closest emergency department, although these small additions cannot replace a full-service hospital. Although we did not collect ambulance-related data, informants reported a spike in traffic that has been challenging, though manageable, for the county. However, this does not capture the majority of health care need within the community, which is challenged by a lack of both primary care and specialty services. Small safety net hospitals must be better targeted by local, state and federal support systems to ensure underserved community health needs are being met.

Personal Impact

As a physician, I will have a direct and measurable impact on the health and well-being of individuals. This was a driving force behind my decision to pursue a medical degree and continues to be a source of inspiration through the accomplishments and challenges of medical school. I strive to also influence the health of communities and populations through public health research and advocacy, and this project was my induction into the world of health policy and community health studies. I applied what I learned in the classroom to this health systems project, completed a thorough review of the literature and conducted over 30 interviews. Most importantly, I heard and shared the stories of incredible individuals and their resiliency within a system riddled with inequity and imperfections. I met patients and families, mothers and grandfathers, nurses and technicians, and resilient advocates. I heard their tales of intergenerational trauma related to repeated denial of public services, and I began to grasp the physical and psychological effects of systemic inequalities at the level of individual and population. The people in and around Richmond, California are unforgettable. Their personal experiences with an imperfect health care system has absolutely influenced my approach to patient advocacy and systems improvement as a student doctor. I had once separated medicine and public health into fields that focus on individuals or communities, respectively. This project helped me understand how they are intimately entwined. As a physician, I must maintain the perspectives of the individual patient, their community and the system that brings us together.

The Bridgeport Free Clinic and Chicagoland Free Clinics Consortium: Initiatives to Build Health System Capacity Enhancing Health Access for Underserved Minorities

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Teammates
Victoria Wang, Annie Zhang and Stephanie Bi

Faculty Mentor
Karen Kim, MD, Dean for Faculty Affairs; Professor of Medicine; Director, Center for Asian Health Equity

Abstract
Asian Americans are the fastest growing U.S. ethnic group. Physicians treating Asian immigrants often face language and culture barriers, along with disparities in Asian health outcomes. By co-founding a free health clinic serving a predominantly uninsured Asian immigrant community, I aimed to provide University of Chicago medical students and faculty with firsthand experiences to increase cultural competency serving Asian patients. Students and faculty received training from experts in health care disparities affecting Asian Americans, building capacity in the health system to enhance access to quality health care. Additionally, recognizing the need for collaboration among free health clinics, classmates and I established the Chicagoland Free Clinics Consortium, which fosters collaboration among student-run free clinics to promote best practices, share resources and build community. The Consortium brought together over 70 medical students from 16 student-run free clinics across Chicago at an annual conference, initiating a longitudinal collaboration to improve health care provided to underserved patients.

Project addressed/Problem discovered
Since 2010, Asian Americans have been the most rapidly growing ethnic group in the United States, with the total U.S. population of Asian Americans at 19.4 million. Growth has been fueled primarily by immigration: 61% of the growth between 2012-2013 was due to immigration, and 74% of Asian American adults in the U.S. are foreign born. Challenges in providing health care to Asian American patients arise due to language and culture barriers, which may hinder communication about treatments. Additionally, disparities in Asian American health outcomes, such as substantially greater susceptibility to hepatitis B and considerable risk of diabetes even at normal body weights, must be understood for proper patient care. At the University of Chicago, medical education to develop capacity for health care for Asian Americans is limited to one lecture about disparities in hepatitis B health care. Moreover, as of 2014 there were no avenues for medical students to interact specifically with Asian immigrant patients, gain cultural competence, or build skills working through interpreters. In 2015, I co-founded a free health clinic at the University of Chicago to serve Asian immigrants and provide a training avenue for medical students and physicians. Through this effort, my team and I recognized that, although many Chicago-based student-run free clinics coordinate similar initiatives to care for underserved populations, communication among the clinics is sparse. Clinic leaders across schools face similar operational challenges. Moreover, clinic leaders have accumulated a repository of operational documents, including training and survey materials, but have no avenues to exchange these resources among other clinics. Overall, we recognized that the need for information exchange across the clinic leaders was pressing.

Approach
I worked with a classmate in 2015 to establish a University of Chicago-affiliated free health clinic in Chicago's Bridgeport neighborhood. Bridgeport is home to a rapidly growing Chinese immigrant population, and of the 22% uninsured in the neighborhood, the largest proportion (28%) is of Asian descent. Most uninsured individuals are foreign-born (84%) or non-citizens (49%). Compared to Chicago as a whole, Bridgeport has a higher prevalence of liver disease, hepatitis B, lung cancer and suicide, but few primary care services are immediately available. This initiative to establish the Bridgeport Free Clinic was the first at the University of Chicago to address Asian immigrants' health needs, as well as train students and providers to work with this important population. Volunteer physicians and medical students are provided training and education focused on Asian health disparities. Training includes education on the disproportionately high risks of diabetes and hepatitis B, BMI cutoff for diabetes, the need for cancer screening, and prevalence of hypertension. The clinic also provides skill-based training on working with limited English proficient (LEP) populations and working with interpreters. To assess training effectiveness, we surveyed medical student volunteers before and after their first clinic session. We also collected free text responses about the challenges student volunteers experienced working at Bridgeport Free Clinic and the challenges they identified among our patient population. To address the need for collaboration to enhance quality of care at student run free clinics, in 2018 two classmates and I established the Chicagoland Free Clinics Consortium which unites 16 student-run free clinics encompassing every medical school in Chicagoland to share best practices and resources. The Consortium, sponsored by a $9,000 grant from the Alpha Omega Alpha Honor Medical Society, hosts an annual conference and regular workshops to foster collaboration among the free clinics. Moreover, the Consortium has developed a resource repository to facilitate distribution of common resources, as well as an innovation fund to support quality improvement projects among member clinics. Consortium members help incoming medical trainees develop leadership skills and renew funding for the Consortium, supporting its long-term sustainability.

Outcomes

The Bridgeport Free Clinic, which has now been open for three years, has provided screening and urgent care for over 400 economically disadvantaged individuals. Moreover, because many Chinese immigrants lack sufficient information to access health care, the clinic serves as a pipeline to connect patients to safety net health systems. The clinic has connected over 110 patients with affordable longitudinal health care at language-concordant clinics and health centers. 145 student volunteers received education on working with interpreters and treating health risks unique to Asian Americans, with the goal of increasing capacity for culturally competent health care. On a pilot volunteer-reported survey (n = 32) using a 5-point Likert scale, students reported increased comfort caring for patients with limited English proficiency, improving from 3.31 to 3.78 (difference=0.47; p=0.02); and working with interpreters, improving from 3.56 to 4.16 (difference=0.60; p<0.01) after volunteering at the Bridgeport Free Clinic. Notably, this improvement disproportionately affected students who had not had these experiences prior to volunteering at Bridgeport Free Clinic. Students who had not worked with patients with limited English proficiency improved by 1.5 (p<0.01), whereas those who had worked with these patients improved by 0.13. Similarly, students who had not worked with interpreters improved by 1.07 (p=0.02), whereas those who had worked with interpreters improved by 0.18. These findings suggest that BFC fulfills its mission of improving capacity for providing health care to underserved minorities. Over the past two years, these and other aspects of the clinic have been presented at five national conferences as components of a model intervention to increase capacity for Asian health. The Chicagoland Free Clinics Consortium held its first conference on November 3, 2018, hosting over 70 medical student attendees representing all six medical schools in Chicagoland. Attendees met fellow students with similar roles at other free clinics, learned about recent clinic improvements and best practices through seminars, and discussed new ideas and potential collaborations. Out of the students surveyed using a 5-point Likert scale (n = 30), 83% responded that they were likely or very likely to work with other clinic leaders they met at the conference, and 87% stated that they were likely or very likely to work on an idea developed at the conference.

Impact on the health system

The Bridgeport Free Clinic has enhanced understanding of Asian health at our academic medical center; 24 faculty with no prior experience in Asian health have staffed the clinic alongside experts, and their experiences have sparked conversations about disparities in Asian health. Moreover, by creating the first initiative at the University of Chicago to build capacity for Asian health, my team and I have established learning to care for Asian Americans as a priority among medical students. Out of approximately 300 medical students qualified to volunteer at free health clinics, 145 students (approximately 48%) volunteered at least once at the Bridgeport Free Clinic. Pilot survey data showed that medical students identified nine barriers to accessing health care among our patient population that were categorized into two themes— patient factors and health system factors. Students most commonly mentioned language as the main barrier under patient factors. For example, one student stated that "even those with insurance frequently couldn't understand the care they were given due to language barriers." Under health system factors, navigating health systems and access to health services were frequently identified barriers. I am confident that the clinic will continue to create a lasting impact on our health system. The Consortium's conference was a first step to improve the quality of care and quality of education provided by medical student run free health clinics in Chicago. Attendees expressed interest in attending regular Consortium workshops and applying for innovation funding. Moreover, attendees presented ideas to maximize the usefulness of Consortium as a foundation for sharing resources and best practices. My hope is that the Consortium will allow medical students to improve the impact they have on their respective health systems both as students and, in the future, as physicians.

Personal Impact

As a future physician, I am passionate about building sustainable solutions to enhance health access for underserved minority populations. Leading the Bridgeport Free Clinic and Chicagoland Free Clinics Consortium has provided a groundwork for future efforts in my career to build capacity for health. This early experience in reducing health disparities has allowed me to develop several skills I envision using to achieve this goal. First, I have learned to take an evidence-based approach to identifying needs and effective interventions. When establishing the Bridgeport Free Clinic, I learned to use a community based participatory research model to identify high priority health needs in the community, determining that immigrants in Chicago particularly struggle with language barriers and misinformation about health care. After our clinic opened its doors to patients, I continued to gather metrics and survey data from the community to tailor our impact to the needs of the community. I envision using this experience to guide future work in communities I serve. Second, I gained experience leading diverse teams, which included medical students, undergraduates and community members. I developed a simple leadership philosophy: model the behavior I hope to inspire, learn from those around me and be accountable for my actions. Although managing an organization's direction is essential, serving as a resource and colleague is equally critical. I now believe that effective leadership is exemplified when collaboration allows all members to recognize their full potential and make meaningful innovation that benefits society. I hope to continue leading effective teams, using the skills I have developed these last several years to improve process and equip team members toward achieving a shared goal. Most importantly, I had the privilege of partnering with community leaders and learning to listen to the needs of the community. Having worked with eight different community-based organizations and fifteen other free health clinics in Chicago, I am confident that in the future I will be ready to improve health access for minority populations through working closely with the leaders who know their communities best. I look forward to growing as a future physician, placing my dedication to build sustainable solutions to achieve health equity at the center of my career.

Addressing Health Care Disparities in the Mentally Ill: Increasing Cervical Cancer Screening at Wakebrook Primary Care

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Faculty Mentor

Beat Steiner, MD, MPH, Senior Associate Dean for Medical Student Education

Abstract

We investigated the contributing factors that influence cervical cancer screening rates at Wakebrook Primary Care (WPC) and piloted three interventions: distributed weekly pap smear reminders for providers, placed reminder phone calls to patients, and hosted a Women's Wellness Day. We aimed to increase the number of monthly pap smears completed by 50% over an 8-week period from April 2nd to June 1st, 2018. There was a 300% increase in pap smears completed in May when compared to the March baseline period. WPC cervical cancer screening rate improved from 61% (119/194) to 63% (130/206). The screening rate increased to 67% (138/206) after Women's Wellness Day. Eight women had pap smear appointments at our Wellness Day. This is a 300% increase from our baseline monthly number of pap smears completed, suggesting the importance of staff and patient incentives, along with patient transportation. Our Wellness Day serves as a pilot for future events.

Project addressed/Problem discovered

People with serious mental illness die on average 25 years earlier than the general population. One of the primary reasons for this disparity is decreased screening and care for co-occurring medical conditions. Sexually transmitted infections, including HPV, have the potential to cause a variety of serious health problems, from cervical cancer to an increased susceptibility for HIV infection. Individuals with psychiatric disorders are at an increased risk for STIs. The U.S. Preventive Services Task Force recommends cervical cancer screening for all women aged 21-65 years old (grade A recommendation). Wakebrook Primary Care serves patients with serious mental illness and has a cervical cancer screening rate of 61% (119/194) as of March 2018. The Primary Care Improvement Collaborative (PCIC) goal for cervical cancer screening rate is 82% (159/194). A recent Wakebrook study found a 50% rate of Pap smears deferred or declined during scheduled appointments for overdue patients.

Approach

We investigated the contributing factors that influence cervical cancer screening rates and piloted three interventions: distributed weekly pap smear reminders for providers, placed reminder phone calls to patients, and hosted a Women's Wellness Day. We aimed to increase the number of monthly pap smears completed by 50% over an 8-week period from April 2nd to June 1st, 2018. We also planned on including recommendations for system improvements that would increase the number of women with mental illness who complete pap smears. We called all patients due for pap smears and invited them to Women's Wellness Day. We made reminder calls prior to the event and offered Uber Health transportation. At Women's Wellness Day, we incentivized patients with wellness education activities and free giveaways. The entire care team at Wakebrook—physicians, nurses, peer support specialists, social workers and occupational and recreational therapists—prepared exhibits on topics such as:

- How to screen for breast and cervical cancer—pap smears and mammograms
- Healthy living through nutrition and exercise
- How to make a quit plan to extend your life
- Making a plan for your health future
- Healthy living through activity

Wakebrook partnered with Uber Health to help provide transportation for patients, and several local businesses and community members made donations to support the event. Uber Health played a large role in helping patients attend the event who normally have trouble making it to the clinic and appointments due to lack of access to transportation.

Outcomes

There was a 300% increase in pap smears completed in May when compared to the March baseline period. WPC cervical cancer screening rate improved from 61% (119/194) to 63% (130/206). The screening rate increased to 67% (138/206) after Women's Wellness Day. While previous research indicated 50% of pap smears were declined or deferred, our research had a more positive outcome with only a 25% decline rate. Our data found that 36% of patients scheduled for appointments were not seen due to no-shows or cancellations. Further evaluation of barriers contributing to the no-show rate is warranted. Eight women had pap smear appointments at our Women's Wellness Day. This is a 300% increase from our baseline monthly number of pap smears completed, suggesting the importance of staff and patient incentives, along with patient transportation. As indicated by previous research, periodic boosts of major change are important for increasing and sustaining screening rates. This Wellness Day can serve as a pilot to demonstrate the effectiveness and should be considered for ongoing implementation.

Impact on the health system

People with serious mental illness die on average 25 years earlier than the general population. People with serious mental illness receive a lot of their care from emergency departments and hospital admissions. Primary care offices are often not equipped to meet the needs of patients with serious mental illness. Wakebrook Primary Care provides routine follow-up, lengthened appointment times and scheduling flexibility through an enhanced primary care model. This model provides a medical home for patients with serious mental illness and understands the creativity necessary to reach patients with serious mental illness. Organizing a wellness day with Uber Health transportation that provided a one-stop shop for social support and accessible health care screenings highlighted the importance of meeting patients where they are and providing services they need in a way that they can access them.

Personal Impact

As an MD/MBA student interested in systems of care, initiating this quality improvement project on increasing cervical and breast cancer screening rates at an enhanced primary care clinic has given me the reassurance that creativity and flexibility can be part of my career. Organizing an event and working with assertive community treatment teams, social workers, psychiatrists and local businesses to offer Pap smears, mammograms, nutrition and exercise tools, and tobacco cessation to our female patients revealed the importance of integration among a variety of specialties is necessary to effectively reach our patients. WakeBrook has also taught me powerful lessons about people living with serious mental illness. I have a deeper understanding of the issues facing patients with serious mental illness and ways to earn the trust of patients who are often marginalized in our system. I have seen the importance of integrating primary care with psychiatry to improve the care of this group of patients. I am excited to continue my medical school training with a greater appreciation and commitment to delivering patient-centered care to this vulnerable group of patients. I will strive to meet the needs of patients with serious mental illness with the same level of enthusiasm and dedication as my preceptors.

Impact of a Community-Centered, Data-Driven Approach to Health Screening and Patient Education in Miami

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Faculty Mentor
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Abstract
Screening for hypertension, diabetes and obesity can improve awareness of personal health metrics and empower individuals to make healthy lifestyle choices involving nutrition, physical activity and connecting with a primary care doctor (Healthy People 2020). The student-run organization Medical Students Working to Improve Society and Health (MedSWISH) contributes to community-based events that integrate population health, social determinants of health and medical student education. MedSWISH works with the Green Family Foundation Neighborhood Health Education Learning Program (NeighborhoodHELP™) which connects households to interprofessional student teams who visit households in their homes and provides access to primary care and behavioral health for the uninsured and a medico-legal partnership (Greer PJ, et al. *Acad Med*. 2018). We completed a descriptive report to explore the impact of medical student community-centered health screenings on community health. The preliminary data supports the value of community health screening and education by medical students as a way to identify individuals at risk for certain chronic diseases and in need of health insurance and access.

Project addressed/Problem discovered
An estimated 30.3 million U.S. adults have diabetes, and 1 in 4 of them don't know they have it (Fryar CD, et al. 2017. NCHS Data Brief). More than 1 in 3 Americans have prediabetes, which significantly increases their risk of developing diabetes as well as many of the sequelae associated with the disease (Centers for Disease Control and Prevention). About 36 million adults have uncontrolled hypertension. Individuals with either (pre) diabetes or hypertension often are asymptomatic and therefore not aware of their conditions that are dramatically affecting morbidity and mortality (Leon BM, et al. *World J Diabetes*. 2015). Furthermore, the diseases mentioned take an economic toll costing the health care system $190 billion per year and leading to $126 billion in lost productivity on the job. Preventing chronic diseases and managing symptoms when prevention is not possible, can reduce these costs (Benjamin EJ, et al. *Circulation*. 2017). In Miami-Dade county, 76.4% of adults aged 18-64 are insured and 63.8% report a usual source of care, with these relatively low numbers reflecting the vulnerabilities of the community (Miami Matters). The MedSWISH team and community partners in Miami-Dade County aim to raise awareness about health and reduce the consequences of disease. More specifically, medical students have shared their knowledge about healthy eating and the importance of getting regular physical activity, encouraged patients to obtain health insurance if possible, and provided uninsured patients with primary care physicians and programs that care for the uninsured with our biggest partner being our own FIU NeighborhoodHELP program (Rock JA, et al. *South Med J*. 2014; Baker EL, et al. *J Public Health Manag Pract*. 2006).

Approach
Events are planned, organized and conducted by local community organizations in partnership with the Florida International University Herbert Wertheim College of Medicine. The health screenings provide free blood pressure and blood glucose evaluation as well as body measurement information together with individualized counseling. Healthy lifestyle counseling at the event includes assessing the patient's health belief model, providing information about MyPlate, the Dietary Approach to Stop Hypertension (DASH), and regular physical activity. Uninsured individuals are connected with additional resources such as the Green Family Foundation Neighborhood Health Education Learning Program (NeighborhoodHELP). The Neighborhood HELP program at the Herbert Wertheim College of Medicine at Florida International University (FIU) was created in line with the Association of American Medical Colleges and the recommendations of others for changes in medical education. MedSWISH developed the research protocol "Health Demographic Information Collected from Health Screenings by a Medical Student Organization in Targeted Miami Neighborhoods." The protocol was approved by the FIU Institutional Review Board in January 2018. Health screening participants provided verbal consent consistent with IRB-approved informed consent procedures to collect data for analysis on their screening results for blood pressure, glucose and body mass index. Additional information collected included patient race/ethnicity, ZIP code, health insurance status, and access to a primary care provider. Verbal consents were developed in English, Spanish and Haitian Creole. The described protocol is planned to enroll 720 participants. For an interim analysis, frequencies and percentages for categorical variables were used to describe the characteristics of the study cohort.

Outcomes
Between January 2018 and October 2018, the MedSWISH team provided health screening to 500 individuals and enrolled 331 participants in the study (N=331). All individuals were grouped by the health fair they attended. In October 2018, an interim analysis was conducted to describe the participants in the study. The mean age of the study population was 53.0 years (SD +/- 15.7), and 58% were female. All

individuals in the study were over 18 years old and lived in Miami-Dade County. 71.3% of people had health insurance and 72.5% had a primary care provider. Of the group studied, 39.6% were obese, 55.9% were normal/overweight and 0.3% were underweight. Of people with blood pressure measured, 36.9% had elevated blood pressure above 140/90. The average fasting glucose for the population was 122 mg/dL (SD +/- 64). The average non-fasting glucose for the population 124 mg/dL (SD +/- 57). The proportion of individuals who are obese suggests that physical activity is one of the most important things that this population can do to improve their health (Knowler WC, et al. *N Engl J Med*. 2002). A major outcome of the early study data is the finding that medical students successfully identified screening participants who would benefit from improved awareness of individual health metrics and community resources to improve their health.

Impact on the health system

By providing these screenings to our communities in Miami-Dade, we are able to provide awareness, which may prevent complications of disease and increase the benefits for individuals. By providing plans of action about any elevated BMI, glucose level and blood pressure measurements and partnering with community organizations and local clinicians, we hope to improve population health (Record NB, et al. *JAMA*. 2015; Mauksch L, et al. *Fam Pract Manag*. 2013). Additionally, by doing so it may reduce the costs to the health care system. Furthermore, MedSWISH provides the education and helps with accessing care through the NeighborhoodHelp program and local community clinics. By focusing on making lasting lifestyle changes and connecting individuals with early primary care, we are seeking to avoid long-term (and short-term) complications such as morbidity and mortality related to stroke and heart disease as well as many others (Farquhar JW, et al. *Lancet*. 1977). As we continue our screenings, health education and connecting participants to local resources, we hope to better evaluate the impact that MedSWISH is having on our communities.

Personal Impact

The current project has a tremendous impact on our personal and professional growth. Through community involvement and the implementation of a data-driven process to increase accountability and tailor specific health services, we have learned that hard work, diligence and evidence-based prevention services can make a substantial impact. We are passionate about improving individual awareness of their health metrics and connecting those individuals with elevated health indicators to the resources they need. The single point of contact with individuals due to the nature of the health screening means that we do not know with any level of certainty that these individuals followed through. It gives us the humility to remember that each person we speak with has a unique level of health literacy, motivation to prevent or delay the onset of disease, and resources. We believe listening is powerful medicine and our duty as medical volunteers is but to serve. This lesson reminds us to best meet the needs of each individual through caring commitment.

The University of Texas Rio Grande Valley School of Medicine Student-Run Clinic: Community-Based Care in a Colonia

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Faculty Mentor
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Abstract
Colonias are rural, underserved neighborhoods along the U.S.-Mexico border that often lack basic living necessities. In March 2018, the University of Texas Rio Grande Valley School of Medicine (UTRGV-SOM) medical students established a student-run clinic, the first clinic to operate in a colonia. Our student-run clinic aims to create a sustainable health care system by incorporating medical students to provide relevant health care services in an established community center. The development of the student-run clinic in a colonia setting integrates learning and practical elements of population, public health and value-based care in low resource areas to ensure sustainability and cooperation between existing charitable organizations. Furthermore, our model stressed the inclusion of the community in the development of the clinic to ensure we delivered care that matched the needs of the population we served. With these considerations in mind, we created a novel, community-based approach toward establishing the UTRGV-SOM Student-Run Clinic.

Project addressed/Problem discovered
Colonias are disadvantaged communities along the Texas-Mexico border that are federally classified as "economically distressed." Residents living in colonias live in geographic isolation and lack basic neighborhood infrastructure, i.e. do not have stable housing, waste removal services or potable water. Due to these challenges, colonia residents commonly lack health insurance and access to basic medical services, contributing to an overall decline in health. This contributes to an increase in acute illness and chronic conditions. Hidalgo county is classified as a medically underserved area with only fifty primary care physicians per 100,000 individuals. It also has the largest number of colonia residents in the state of Texas. Peñitas, Texas is the home to about 2,000 people in Hidalgo County, where more than a third of people live below the poverty line and twice as many live without health insurance than the national average. A novel stepwise development model was created to focus on community engagement for health care delivery. In line with this approach, we conducted a Health Needs Assessment (HNA), bringing together 23 community leaders and colonia residents. Survey results discovered that over 70% participants were female and Hispanic. A total of 38% did not have a high school diploma, and only 35% had completed some college (N=23). A majority of participants mentioned kidney disease, diabetes and/or chronic pain as the most prevalent health issues. Health education and communication, more health professionals, transportation, lower costs and access to medications were listed among the best suggestions to improve access to care.

Approach
To tackle the many chronic health conditions facing the Peñitas community, we realized that simply providing primary care would not be enough. Chronic conditions like diabetes and uncontrolled hypertension are problems that patients must manage every day, and our health care delivery approach strived to be equally tireless. To this end, we sought not only to provide free and high-quality care to patients in visits to the student-run clinic, but to work with key allies such as community health workers who shared our goals for a healthier Peñitas. We partnered with a local non-profit organization and a community center, Proyecto Desarrollo Humano, in a relationship that brought together numerous preventive health resources under a single roof. While the student-run clinic provided primary care and education to patients with pressing medical needs, Proyecto Desarrollo Humano offered programs that, together with the clinic's treatment, could help patients maintain and improve their health long term. Above and beyond advice to eat more vegetables and get more physical activity, the clinic leveraged these community partnerships to actively refer patients to the local community garden for a source of freshly-grown greens at low cost, a regular exercise program to help them improve their activity and more. Through such partnerships, and planned initiatives such as a telemedicine program, the student-run clinic provided active and ongoing care that not only treated patients, but also helped them take an active role in their health.

Outcomes
Following our opening day, we have held five successful clinic days, each the 3rd Saturday of each month. In total, we have served at least 40 community members during clinic hours. The combined total monetary impact over the last six months of all clinic events has been over $6K, with around $1K saved per month. This is calculated from the average Medicare reimbursement for 40 new patients seen, 45 flu shot administrations and 21 school physicals. Overall, by incorporating community voices into our development, we have ensured that our services are sustainable, well-suited to the colonia's needs and are as impactful as possible. Furthermore, by exposing our medical students to the community early on, we have been able to accelerate their learning. Seeing the effects of social determinants of health has given our students the tools to develop cultural competence. In fact, we are currently in talks with UTRGV faculty to make the student-run clinic an

interdisciplinary rotation site for all health professional students. This early exposure to community health, offers a tangible way for students to learn the integration of community health and provides valuable contributions to their education. Additionally, when we allow students and community members to be active participants in health care delivery and health systems, we allow them to take the reins and become leaders. We have received countless ideas and suggestions due to the collaborative nature of our project. This has led to a better and more efficient health system.

Impact on the health system

Residents from Peñitas and adjoining colonias must travel nearly 20 miles to the nearest clinic to receive health care. Unfortunately, many community members do not have access to transportation. Furthermore, many are uninsured or cannot afford to pay. Prior to our clinic opening, we allowed residents to sign-up to be seen once our doors opened. The demand was much greater than we were able to accommodate. This fact underscores the importance of our clinic. Peñitas and the Rio Grande Valley is extremely underserved. Our clinic helps solve this issue by placing health care structures in an area that is accessible by residents. In fact, by providing free value-based care we can also focus on the sustainability of this project and ensure that we can continue providing services. One of the biggest health crises facing the Valley is the epidemic of diabetes. Without proper access to care, many of our patients suffer from diabetic complications. Some patients we see have never received a diabetic eye exam. Thankfully, we have had the support of community physicians with some even offering their specialty services at no cost. In effect, that is what we are building our clinic toward. We will continue to be a hub for the community, offering preventive and primary care services with the population in mind, all while connecting patients to specialists when needed. We are currently building our referral network. Therefore, as the UTHealth system continues to grow in the Valley, so will our ability to refer our patients to specialists.

Personal Impact

When I joined the board of the Student-Run Clinic, I didn't know what to expect. We had picked a site for the clinic but hadn't opened the doors. We hadn't secured funding and relied heavily upon UTRGV's mobile health van to provide services. However, over the past year, we have become a fully stocked, free standing clinic that sees patients and has cemented its role in the community. Being part of such an amazing project has opened my eyes to the challenges of establishing health care structures and processes in resource poor locations. However, even though it was difficult and there were a lot of moving parts, we were able to come together each month to provide free health services to the community. Furthermore, as this project continues to mature, I am able to see how much change I am able to make in a community. Being part of the leadership of the clinic, I have been able to leverage many relationships with community members to ensure that we deliver care that respects the diversity of our patient population. As I take a step back and attempt to describe this project, I am starting to really see how many skills I have developed. I now view health care disparities with a more systematic lens. Health care takes an entire team of people working together and systems that allow for the efficient delivery of care. I know these lessons will only help me as I continue my journey to becoming a physician.

Interprofessional Student Hotspotting at Grady Memorial Hospital

Medical Student
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Teammates
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Abstract
The Interprofessional Student Hotspotting Collaboration is a national service-learning curriculum that engages students in addressing the care coordination challenges that high-utilizing patients face. The students selected for this program come from diverse fields of study and share an interest in improving health outcomes. High utilizers are medically and socially complex patients that have had four or more inpatient admissions in less than one calendar year, and they accrue about 50% of health care costs despite constituting only 5% of the patient population. This curriculum was brought to Atlanta in 2017 through the partnership of student leaders from three graduate schools: Emory School of Medicine, Emory School of Nursing and Georgia State University School of Social Work. Over the coming years, Atlanta's Interprofessional Student Hotspotting Team will expand the program and begin to measure and evaluate its impact. Ultimately, after demonstrating the benefits of this program to students, patients and hospital systems, we will be able to advocate to our host academic institutions the adoption of this curriculum and associated costs to further expand the program.

Project addressed/Problem discovered
The Centers for Medicare and Medicaid Services estimates that by 2025, health care spending will count for 19.9% of GDP, up from 17.8% in 2015. By 2026, federal, state and local governments are projected to sponsor 47% of total national health expenditures, up from 45% in 2016. Patients with frequent hospital admissions, or high utilizer patients (HUPs), account for a significant proportion of health care spending in the United States. This demographically, clinically and socioeconomically diverse population comprises only 5% of the U.S. population but incurs 50% of health care expenditures. There are a variety of social determinants that have been associated with high utilization, including race, food insecurity and housing status. High rates of utilization also point to challenges in coordination of care and inadequate access to health care services. Hence, strategies aimed at improving the delivery and management of health care to high utilizers have become a focus for health care systems.

Approach
The primary goal of the Atlanta Interprofessional Student Hotspotting Collaboration is to decrease emergency department visits and inpatient hospital admissions for high utilizing patients at Grady Memorial Hospital by improving the management of their health care. HUPs are included in the program if they have had at least four inpatient admissions over the past 12 months. Given the complexity of social determinants contributing to the high utilization rates of these patients, a central tenet of our efforts is to engage multidisciplinary students and faculty advisers (medical, nursing, pharmacy, social work, public health, law and business) from various institutions. Each of the interprofessional teams of 4-6 students complete Camden Coalition's interactive, online curriculum on leadership, patient safety and community health. The teams are then responsible for helping 3-5 high utilizers navigate the personal and systemic barriers they identify as drivers of their overutilization of hospital care. Notably, student hotspotters do not provide medical care or advice. Rather each team's role is to perform the following tasks over a 6-month period:

(1) Systematically identify high utilizers currently admitted in the hospital
(2) Build a trusting relationship with high utilizers during their admission and accompany them at scheduled follow-up visits after discharge
(3) Work with each high utilizer to identify the reasons behind their high utilization and develop a personalized care plan that addresses those reasons
(4) Empower high utilizers through patient-driven goal setting and serve as a reliable resource to help navigate the social services and health care systems
(5) Reflect on their experiences in a final report and relay patient stories to key stakeholders at their academic programs.

To evaluate the impact of this intervention, a dynamic and scalable data collection tool (REDCap) will be used to track and assess three key metrics:

(1) Students' growth as civic and interdisciplinary learners using the Public Affairs Scale and the Nebraska Interprofessional Education Attitudes Scale
(2) HUPs' childhood history of adverse childhood experience (ACE) and their self-reported pre- and post-intervention quality of life using the 36-Item Short Form Survey
(3) Utilization metrics and cost savings for Grady Hospital.

Outcomes

Atlanta's Interprofessional Student Hotspotting Collaboration has had several significant accomplishments within the first year of implementation alone. We have established a partnership model for student groups and large health systems like Grady, as well as established best practices for navigating the legal and administrative barriers to set up such an initiative at a major hospital. The Atlanta team has also recruited one of the most interdisciplinary hotspotting groups in the country, with 30 students and nine advisers representing six disciplines and four institutions. The work of this collaborative also has numerous anticipated benefits for patients, for Grady's health care team and for student hotspotters. Patients have the opportunity to work individually with health professionals, enhancing their experience with the health care system and improving the quality of care they receive. Because patients design their own care plans with our support, they feel empowered to take control of their health and access the preventive services needed to remain out of the hospital. From the health care team's perspective, students offer the essential resource of time, which is critical for building rapport and fully addressing the complex needs of each patient. Hotspotters thus help achieve better continuity of care by building trust between patients and the health care system. Finally, students gain valuable training needed to become compassionate, collaborative and effective professionals. The time spent working directly with patients and navigating complex systems together allows students to better understand patients' perspectives. Simultaneously, working on interdisciplinary teams and building relationships among different fields enables student hotspotters to enter the workforce knowing how to efficiently and effectively utilize the skills of each health profession. As noted earlier, our goal is for surrounding academic institutions represented by each student to adopt the hotspotting curriculum, further fostering a culture of collaborative learning within professional training programs.

Impact on the health system

High rates of emergency department and inpatient utilization are costly to the health care system and are often indicative of poor coordination of care, inadequate access to care and low health literacy. By leveraging interprofessional graduate students to address such complex issues, we are helping to shape the careers of future leaders in health care. In addition, this collaborative is designed as a scalable initiative capable of maximizing the value of care provided to high utilizers; specifically, each interprofessional team is dedicated to improving HUPs' use of and accessibility to high quality health care and to decreasing the costs of providing such care. The recent adoption of similar collaboratives by universities across the nation has already led to promising preliminary results, including improvements in both patient outcomes and cost savings. By increasing utilization of primary care and outpatient chronic disease management services, hospitals such as Grady Memorial can better manage the expense of caring for high utilizers going forward. In addition, active interdisciplinary education on this scale has been shown to improve interprofessional collaboration, care management, patient satisfaction and patient care. With a handful of novel techniques to integrate outpatient preventive services and self-health maintenance into their lives, HUPs will be more equipped to access the broader range of health-related services and support groups they need to improve their quality of life and alleviate the burden on the health care system.

Personal Impact

Through my work with the Interprofessional Student Hotspotting Collaboration at Grady Memorial Hospital, I have developed invaluable skills on how to improve care coordination and access to care for some of our most challenging patients. While participating in the program, I have had the opportunity to learn about complex medical and social needs of high utilizers while discovering intricacies of the health care system that do and do not facilitate health maintenance. While many health professional schools have recognized the importance of interprofessional education, they often have difficulty identifying real world opportunities to be integrated into distinct curricula. This program has offered me the opportunity to actively learn from members of interdisciplinary teams, which will prepare me well for the diverse workforce in which coordination and communication are imperative.

Addressing Pediatric Vision Impairment: an Elementary School and Summer Program-based Vision Screening Program

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Teammates
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Faculty Mentor
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Abstract
Refractive error (such as myopia, hyperopia and astigmatism) is the most prevalent pediatric ocular condition that, when untreated, can be detrimental to a child's academic, social and functional development. Philadelphia public schools struggle to complete state-mandated student vision screenings, thus necessitating complementary approaches. The Wills Eye Vision Screening Program for Children (WEVSPC) has been operating for four years. In the two-year study period, the program has screened 20,601 children in grades K-5, identifying 2,795 (13.6%) with correctable refractive errors, referring 199 (0.97%) to a pediatric ophthalmologist and providing children with two pairs of glasses if indicated. Our study has demonstrated trends in the development of refractive error, namely that myopia increases and astigmatism decreases with age.

Project addressed/Problem discovered
In refractive error, the eye length or shape prevents light from focusing properly on the retina, leading to decreased visual acuity. Refractive error is the most common childhood ocular condition and represents an unmet population health concern in low-income urban populations. Uncorrected refractive error significantly increases a child's risk for visual, academic and cognitive challenges. Children may also suffer from non-refractive conditions that require management by an ophthalmologist, such as strabismus (misaligned eyes) or amblyopia (potentially permanent reduced vision in one eye). Urban school districts often struggle to effectively and systematically screen children for vision problems. Since 2014, the Wills Eye Vision Screening Program for Children—in partnership with the School District of Philadelphia and various local summer programs that cater to low-income children—has conducted vision screenings in Philadelphia for children in grades K-5, providing eyeglasses and referral appointments at no charge in an effort to address disparities in ocular care. These efforts have led to completion of screenings, identification of children who have correctable refractive error or other ocular conditions requiring specialist insight and underscore the need for broader vision screening programs.

Approach
The Wills Eye Vision Screening Program for Children (WEVSPC) includes a pediatric ophthalmologist, project director, manager, coordinator, optometrist, vision screeners, optician, social worker and data manager/biostatistician. During the academic year, the WEVSPC visits approximately 15 elementary schools that require assistance to comply with state-mandated vision screening. In the summers, the WEVSPC visits 12 summer program locations in medically-underserved areas. Coordination with nurses and administrative staff is conducted before each visit, and upwards of 200 children can be screened each day. Screening at each site typically occurs over two days. On the first day, the program screens for near and distance visual acuity, color vision, depth perception, and refractive error at various stations in a quiet area. On the second day, screening continues and children who fail the screen are seen by an optometrist on-site and glasses are prescribed when indicated. An optician then evaluates and fits children who select their glasses from a choice of twenty frames. If needed, children are referred to ophthalmic care with consent and offered the assistance of a social worker to make appointments and to overcome barriers to care such as transportation. Glasses are delivered to consenting families via the schools within a month of screening. Data for each child is recorded on screening sheets and manually entered into a database, checked for accuracy and later analyzed by the biostatistician.

Outcomes
The WEVSPC is ongoing. Over the reported two-year study period, over 20,000 children have been screened. During the academic years, out of 18,974 children in grades K-5 screened between January 2014 and June 2016, 2,492 (13.1%) were found to have uncorrected refractive error: 1,776 (9.4%) had myopia, 459 (2.4%) had hyperopia, 1,484 (7.8%) had astigmatism, and 846 (4.5%) had anisometropia (unequal refractive power between eyes). During the summers of 2014-2016, out of 1,627 children screened, 303 (18.6%) exhibited uncorrected refractive errors: 221 (13.6%) had myopia, 47 (2.9%) had hyperopia, 172 (10.6%) had astigmatism, and 36 (2.2%) had anisometropia. We also found that myopia is the most common form of refractive error and increased with age, whereas astigmatism decreased with age. Each child with significant refractive error was provided with two pairs of eyeglasses. During the academic years and summers, 135 (0.7%) and 64 (3.9%) children were referred for examination by the ophthalmologist, respectively.

Impact on the health system

Due to nursing shortages and funding constraints, completion of Pennsylvania-mandated pediatric vision screenings by public schools has been difficult to achieve. Comprehensive screening and management of refractive errors and other more complex ocular conditions is essential for proper child development. The WEVSPC has successfully assisted local public schools and programs in completing vision screenings for tens of thousands of their children, identifying thousands with uncorrected refractive error, dispensing glasses at no cost, and improving children's vision to at or near 20/20. Furthermore, in a smaller proportion of cases, the WEVSPC has diagnosed children with visual conditions requiring prompt treatment or examination by an ophthalmologist, such as amblyopia and strabismus. The program provided the opportunity for students to experience their best corrected visual acuity and connect with quality pediatric ophthalmic eye care when indicated. It also provided a positive health care system experience for families, especially important in building trust and rapport as members of underserved communities may not seek care regularly. More broadly, the WEVSPC has provided an effective pediatric vision screening model that may be implemented in other communities. The WEVSPC has also successfully experimented with approaches by which similar programs can better address population health, not limited to community program partnership and effective communication with school district staff.

Personal Impact

This project allowed me to gain deep insight into an important health problem present in urban pediatric populations that I hope to continue to strive to solve as a future physician. Vision facilitates our interaction with our environments—how we learn, play, love and convey. Early resolution of medical conditions in pediatric populations can prevent long-term sequelae and improve quality of life. For example, refractive error is a very treatable condition that when unrecognized, can hinder social and academic performance. Firsthand personal testimonies from nurses and teachers brought me joy and purpose; on various occasions elated teachers would similarly comment, "My student was having problems focusing in class, and now that they can see, they are doing so well!" The success of this screening program validated the importance of public health screening and significantly deepened my interest in ophthalmology. It simultaneously exposed me to the importance of coordinated, team-based, and community efforts in both delivery and optimization of medical care. I learned that population health projects could begin with individual ideas and efforts and expand to address community-wide issues. I also gained an appreciation of how health systems research can be used to address population health concerns and improve health outcomes for a significant number of people. In conclusion, via a dynamic screening program, I found great satisfaction in my ability to help children and their families. I also found working with a supportive team deepened my interest in research, population health and ophthalmology.

The Crimson Care Collaborative at the Nashua Street Jail: Improving Access to Interdisciplinary Care for Patients Experiencing Incarceration in Boston

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Teammates
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Faculty Mentor
Marya Cohen, MD, MPH, Assistant Professor in Medicine, Director of the Crimson Care Collaborative

Abstract
Since starting medical school in 2016, I have helped lead a weekly student-faculty collaborative clinic that allows medical students as well as dental, nursing and physician assistant students to provide medical, dental and mental health care, as well as insurance enrollment and patient education services to patients who are incarcerated. It is the only clinic opportunity of its kind in the country. Having trained as a dentist prior to entering medical school, as a medical student I have continued to teach and supervise dental students, train my classmates in the relationship between oral health and overall health, and collaborate with other students to increase the services provided by the clinic for incarcerated patients, including assistance when transitioning back to the community. My continued involvement in the clinic constantly reminds me why I am pursuing medical training and the importance of my future advocacy and clinical work as a physician.

Project addressed/Problem discovered
The United States incarcerates a higher percentage of its population than any other nation on earth. Patients with a history of incarceration face higher rates of chronic illness, serious mental illness and poor oral health. People released from incarceration have death rates more than 100 times higher than their peers in the two weeks following release, and each year of incarceration is associated with a two year decrease in life expectancy. In Boston, individuals undergoing court processes are incarcerated at the Suffolk County Jail (Nashua Street Jail). Individuals may be detained for anywhere from one day to 18 months, and many individuals have substance use disorders and chronic illnesses that may not have been treated prior to incarceration. Many patients have also had negative interactions with the health care system, including feeling that providers have not treated them with respect. A critical component to improving health outcomes for this exceptionally vulnerable and large group is expanding awareness of the health risks associated with incarceration among medical providers. The Crimson Care Collaborative at the Nashua Street Jail (CCC-NSJ) is a student-faculty collaborative clinic that allows health professions students to provide direct clinical care as well as support services for patients at the jail, while also serving as a learning community to discuss the impact of mass incarceration, substance use disorder and criminal justice policy on our patients and the care they receive.

Approach
Our clinic meets one evening weekly and includes dental, medical, nurse practitioner, physician assistant and undergraduate students. Everyone joins a preclinic huddle where teams discuss caring for patients, and there is a teaching session on a clinical topic such as opioid use disorder treatment, antihypertensive regimens or oral health. The dental, medical and mental health teams each provide direct clinical care to patients at highest need in the jail. Patients are always asked if they are comfortable being treated by students and will be seen by a faculty member alone if they decline; multiple patients have requested that all subsequent visits occur when students are present because they value the experience. In addition, a Medicaid enrollment team assists patients nearing release with insurance paperwork and registers them to vote. An education team offers a teaching session on one of the jail's units on topics ranging from interviewing skills to mindfulness. At the conclusion of clinic, all teams reunite to discuss lessons learned before going home. Additional key activities to support the clinic include conducting outcomes research about the impact of clinic participation on students' career goals and comfort caring for vulnerable patients, applying for grant funding to support the clinic and its patients, and collaborating with the Suffolk County Sheriff's Department to increase the services available to people incarcerated at the jail (for example, our most recent initiative is a longitudinal substance use counseling program developed by students based on a need identified by the department).

Outcomes
Since I began medical school, the clinic has held 40 clinic sessions a year and has allowed more than a hundred volunteers to have lasting exposure to the correctional setting. It is the most popular volunteer activity at my medical school and the dental school. Several graduates I supervised in past years now work as dentists in community health centers. We have shared our unique clinic model at national conferences and in peer-reviewed publications such as the *American Journal of Public Health*, the *Health Affairs Blog* and the *Journal of Correctional Health*. Student surveys have shown significant improvements in attitudes toward interprofessional collaboration and comfort caring for incarcerated patients after one semester of clinic volunteering. As the clinic matures, we will continue to follow its impacts on students' careers. Most importantly, we believe the clinic has had a lasting impact for patients. We have cared for hundreds of patients, who receive a full spectrum of services in a single clinic visit. We liaise with the full-time clinic staff to ensure patients' needs are met between clinic sessions. We work to meet needs identified by our patients: for example, education sessions on specific topics were created because patients requested them. Because patients described challenges during the transition from jail to the community, we applied for grant funding to assist

patients with care navigation in the release period, as well as to create a toolkit for primary care practices to improve care for patients with a history of incarceration.

Impact on the health system

With the collaboration of our partners at the jail, we have been able to create lasting infrastructure that has improved care at the jail. Wait times for dental care have reduced because of the increased availability of dental providers, and patients with multiple needs (for example, a patient seen for hypertension who also has a toothache) can be seen by multiple providers in the same evening. By providing us with a list of patients who are scheduled to return home in the next month, we are also able to assist patients with insurance re-enrollment and voter registration, which has reduced administrative burdens for full-time jail staff and increased the number of patients who return to the community with access to medical care. People incarcerated at the jail now have access to weekly education sessions as well as a 6-week substance use counseling course; people who attend the course receive a certificate of completion that can support their court processes or in seeking employment upon release. We are also continuing to collaborate with community partners to improve the transition home for our patients, such as working with Harvard's dental school to help book dental appointments for patients, and training primary care practices on best practices caring for patients with a history of incarceration.

Personal Impact

Before starting medical school, my work as a dentist at the jail constantly reminded me why I wanted to become a physician: the patients I cared for had dental problems, but they also faced a constellation of medical and social challenges that impacted their care and that I would be better able to address as a physician. Since entering medical school, my involvement with CCC-NSJ has continued to inspire me throughout medical training, both by allowing me to occupy my "dual role" as a medical student and dentist and by granting me the continued privilege to care for and learn from my patients. I am continually humbled by each encounter, by the resilience and humanity of my patients and by the hurdles engrained in the health care system that I am driven to clear for them. The clinic also gives me the great good fortune to learn from and alongside my medical school classmates as well as students in dental, nursing and physician assisting schools, which has allowed me to understand all of our roles in providing the best care possible for patients, and how we can work together to truly make a difference. I plan to pursue a residency in internal medicine-primary care and to work with patients affected by incarceration throughout my career. My commitment to CCC-NSJ centers me and has helped me pave the path to the physician I want to be: one who tirelessly advocates for, collaborates with and cares for her patients.

ParkRx: Increasing Provider Prescription of Outdoor Physical Activity to Promote Long-Term Health and Well-Being

Medical Student

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Teammates

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Faculty Mentor

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Abstract

Park Rx is a program that allows medical providers to prescribe specific physical activities for specific durations at parks in a patient's neighborhood. The program uses a website-based database of parks organized by geographic location and park amenities. Despite significant implementation efforts and provider training at a federally qualified health center in Washington, D.C., provider utilization of the program is low. In this study, we attempted to understand this gap in utilization by using a one-time provider survey to determine the knowledge, attitudes and beliefs of providers in regard to the Park Rx program and identify perceived barriers and motivations for using the program.

Project addressed/Problem discovered

More than 40% of Americans currently suffer from one or more chronic diseases. Obesity, which affects approximately 36% of adults and 17% of youth in America, increases the risk of developing chronic conditions such as coronary heart disease, stroke, hypertension, cancer and type 2 diabetes mellitus. Most Americans do not meet the daily recommended guidelines for physical activity, further compounding the obesity problem in this country. Numerous efforts have been made to increase the rates of physical activity in the public, one of which being the Park Rx program. Park Rx is a nationally available database of parks organized by location and amenities such as tennis courts, basketball courts, trails and other resources for physical activity. The database also includes park information such as hours, directions and even staffing and safety information. At the time of this study, primary care providers used Park Rx through an EHR integration that allowed providers to search for a park, write a prescription for specific physical activities for specified amounts of time at a park of the patient's choosing, and include the prescription in the patient's EHR and visit summary. Despite development of the Park Rx database and integration into the provider's EHR, utilization of the program remained low. To continue growth in the program, more data was needed to understand the motivations for why providers chose to use or not use the Park Rx program. Our study was designed to fill this knowledge gap through a one-time provider survey on use of the Park Rx program.

Approach

Online surveys on Google Forms were distributed to health care providers at Unity Health Care via email. Surveys assessed for perception of the Park Rx program, motivations for use, barriers to use and usage frequency. Survey responses were divided into low-use and high-use groups and were compared for statistical significance. We sent out 136 surveys and received 43 completed surveys; thus, our response rate was 32%.

Outcomes

Many of the largest influences of provider utilization of Park Rx were related to personal beliefs of the provider. For example, the most common motivations for use of the program were that providers spend time outdoors personally, find it beneficial to them, want to share this with their patients and believe it is important to encourage patients to spend time outside. Similarly, program users were more likely than nonusers to believe that their patient would benefit through program use. Alternatively, nonusers were more likely to believe that patients would not go to a park if prescribed and that patients had more important priorities to address than spending time outdoors. Our survey also found that external influences were significant in determining motivations and barriers for provider use. For example, the three highest ranked barriers to use among non-users were not having enough time in the visit, focusing on the patient's chief complaint and not knowing how to prescribe with the program. These represent time constraints and technical barriers of using the program website and EHR. It was also found that when asked what actions could be taken to increase provider utilization, nonusers most frequently cited external influences such as visual reminders in both the patient exam rooms and in the EHR.

Impact on the health system

Since the completion this study, changes have been made to the Park Rx program to make it more usable for providers. These changes were based on feedback received from providers nationwide separate from this study which were further confirmed by the results of this study. While originally designed to be integrated into an EHR, the Park Rx program now exists entirely on its website. Providers can register on the website to gain access to the prescribe function. Once registered, providers can search for parks or other recreational facilities on the website by facility name or ZIP code. When a facility amenable to the patient is located, the provider can follow a link to prescribe and fill out the prescription in terms of activity (e.g. walk the dog), frequency (e.g. twice a day), and duration (e.g. every day). This final prescription can

then be texted to the patient, with an option to get a reminder text to complete the task. Prescriptions are available in email and printable versions as well. Finally, the prescription can be copied and pasted into the EHR as a part of the treatment plan for the patient. One of the biggest barriers to use that our study identified was the technical difficulties involved in creating a prescription from within the EHR. By streamlining the process of prescribing parks and simplifying the way of documenting within the EHR, Park Rx is more user-friendly and addresses one of the main barriers to use found in our study.

Personal Impact

This study has helped my team and I see the effect that a well-thought out and implemented study can have not only on a local basis, but on a national front as well. Park Rx is national program, with new parks being added on a regular basis. By making the process of prescribing parks more efficient, we can encourage providers all over the country to utilize this resource. Chronic illnesses create a massive financial burden on our society, negatively affect quality of life and cause premature mortality for millions of people. Park Rx is a low-cost intervention that utilizes physical activity to prevent and, in some cases, reverse the effects of chronic illnesses. Utilizing this resource can make providers more aware of the park resources that exist in their communities and instigate meaningful conversations about physical activity with their patients. Though this study aimed at increasing this program's usability for physicians, we have seen how students can still have a significant impact on our health systems and the problems they face.

Quality improvement

Hurricane Florence Relief Effort in Wilmington, NC

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Faculty Mentor
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Abstract

Hurricane Florence impacted Wilmington, North Carolina with outstanding rainfall, flooding and storm damage. The hurricane damaged infrastructure including local hospitals, skilled nursing facilities (SNFs) and patients' homes throughout eastern North Carolina. In order to care for the at-risk medically-dependent patient population during the disaster, New Hanover Regional Medical Center (NHRMC) set up a temporary SNF in a local elementary school. NHRMC staff and six UNC medical students cared for 58 patients, which were admitted to the temporary SNF due to needs for nursing care, oxygen dependence, dialysis dependence and close physician surveillance. Six patients (10%) were taken to the emergency department for increased medical acuity, and the remaining patients were discharged to more permanent homes once roads and infrastructure were repaired. Overall, the experience was an invaluable educational opportunity to expose medical students to medical care during disaster relief.

Project addressed/Problem discovered

On September 13, 2018, the outer bands of Hurricane Florence reached Wilmington, North Carolina. Upon landfall, the storm slowed to three miles per hour, releasing record rainfall and leading to catastrophic flood damage. Floodwaters across major roads and highways in the area effectively cut the city of Wilmington off from the rest of the mainland. The coastal Carolinas and Virginia prepared for the storm with mandatory evacuation orders. Near Wilmington, five skilled nursing facilities (totaling about 400 beds) were evacuated as well as one community hospital. Home health services ceased during the storm and providers had difficulty returning due to flooded highways. New Hanover Regional Medical Center (NHRMC) in Wilmington, NC remained open through the storm. Additional road closures due to rain in the western and central parts of the state delayed home health services, and patients requiring assistance with living, bathing, meals and medications continued to rely on hospital nursing staff. Safe discharge was an issue due to damaged homes and infrastructure. Most did not have electricity to power medical devices such as oxygen and CPAP. With limited discharge options, patients remained hospitalized holding beds, new admissions stalled, and the hallways of the emergency department filled. As the days of rain continued, space dwindled. To address this problem, NHRMC opened a makeshift skilled nursing facility in a local elementary school staffed by New Hanover nurses and physicians. When additional help was needed, a group of medical students arrived to provide further assistance.

Approach

This temporary skilled nursing facility was established on September 18, 2018, by NHRMC and their staff along with six UNC medical students. The shelter was prepared to house nearly a hundred patients and provide 24-hour nursing and medical care. In addition to medical services, the shelter was equipped to provide other basic services, including case management and social work support. Community restaurants and other organizations generously donated food for breakfast, lunch and dinner for both shelter residents and providers. The day following shelter establishment, mobile bathing facilities and laundry services were brought to the elementary school for the residents. The shelter provided services for 58 patients and one service dog. Medical providers worked twelve-hour shifts for three days before state and federal reinforcements arrived to relieve NHRMC staff and UNC medical students. The majority of patients cared for at the shelter would have otherwise been in skilled nursing facilities or at home with home health. Other patients were there because they required O2 support or peritoneal dialysis necessitating reliable, working electricity. If patients required a higher level of care or experienced an acute event they were immediately transferred to NHRMC for further medical care. Three days after opening, the state disaster relief team arrived with federal aid and took over the shelter, relieving both the NHRMC staff and the UNC medical students.

Outcomes

Medical care was provided for 58 patients, with additional resources to support three caregivers and one service dog. The average patient age was 60 years, ranging from 23 to 90 years. There were 34 (59%) female patients. Need for nursing care was the most common reason for admission (33 patients, 57%), followed by oxygen dependence (13 patients, 22%), dialysis dependence (11 patients, 19%), and need for close physician surveillance due to pneumonia in high-risk patients (3 patients, 5%). Two patients required both oxygen and dialysis. Reasons for nursing care included post-operative care, IV antibiotics, dementia and delirium. Six patients (10%) were taken to the emergency department due to increased acuity during their stay. Two of these patients subsequently returned to the shelter and the remaining patients were admitted or sent to another location. During discharge from the temporary SNF, five patients were transferred to a skilled nursing facility or assisted living facility, five patients were sent home with home health, one patient was sent to another shelter closer to her home and one patient went

to a hotel under Federal Emergency Management Agency Housing. There were no deaths among the patients cared for at the temporary SNF. The remaining patients returned home once access to their homes was restored.

Impact on the health system

Natural disasters greatly impact the efficiency of the health care system and the ability to provide care for medically dependent populations. The shelter created a solution to aid and care for these high-risk patients. The 58 patients served by the Codington Elementary shelter were medically dependent on electricity and required physician/nursing care. There was no safe place for patients to be discharged to, but they did not require acute hospital care. Without the shelter, these patients may have remained in the hospital or been discharged unsafely. Hospital transfer (skilled nursing facility to hospital) and emergency department utilization increase surrounding hurricanes and natural disaster. (Stryckman et al, *West J Emerg Med*. 2017) The hospital was reaching capacity, and caring for these patients in another location opened up the hospital and emergency department. To assess the shelter's quality and health care utilization, it is helpful to examine rehospitalization rates. Though 10% of patients were taken back to the emergency department due to increased medical acuity, the shelter enabled safe care with escalation of services. A study of North Carolina Medicare patients in 2006 showed 21.2% of patients were hospitalized within 30 days of SNF admission. (More et al, 2011) The Codington Elementary shelter was open for nine days (compared to the typical 30-day rehospitalization metric), which impacts our rehospitalization rate. However, this low rehospitalization rate is likely on-par with typical SNF settings. Overall, the experience demonstrates the importance of innovation, flexibility and collaboration in health care, especially during disaster relief. The health care system was able to adapt to new patient needs in order to maintain population health with limited resources.

Personal Impact

It took five hours to get to Wilmington by car because of the flooding; the latest photo of I-40 appeared more like drone footage of an Amazonian river than a major interstate highway. As medical students, we didn't know what to expect. Nothing we had learned in a classroom could have prepared us for the days to come: the chaos, uncertainty and immense loss that was pervasive in Wilmington. We were accustomed to working with patients in a hospital, typing out notes and being praised for our medical acumen. Instead, our "hospital" in Wilmington was an elementary school with army cots that lined the hallways; our daily progress notes were handwritten on printer paper. It was like nothing we had experienced before, but it brought us back to the reason why we chose medicine in the first place. It was an experience that reminded us of the great privilege it is to practice medicine, to gain insight into the lives of others and understand their backgrounds, values, fears and desires. It is humbling to learn that the patient smiling up at you each morning lost everything they owned in a few short days; even more so to realize that this person could be a friend, partner or even parent. We have been grateful for this opportunity to serve those in need and in doing so have gained an invaluable education on courage and the human spirit that we will carry with us throughout our medical careers.

Using Team-Based Communication to Decrease Decision-to-Incision Times in a County Teaching Hospital

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Abstract

Existing research on decision-to-incision (DTI) times in unplanned cesarean deliveries has focused on maternal and neonatal outcomes, while literature on decreasing DTI times remains sparse. Here we describe a quality improvement project to reduce DTI times at a county teaching hospital by implementing (1) a grading system for cesarean urgency and (2) a communication tool to guide interdisciplinary huddles before each cesarean. Recording of DTI times doubled to 47.7% after switching from a checklist system to our communication tool, and mean DTI time decreased by 11 minutes. We observed a significant effect of urgency grade on DTI time, and 52.2% of unplanned cesareans occurred within five minutes of the suggested time for each grade. The grading system adequately stratified the urgency of cesareans, while the communication tool allowed for quantification and anticipation of common delays. Guided interdisciplinary communication, not just checklists, promotes team-based interactions critical to decreasing DTI times.

Project addressed/Problem discovered

Before February 2017, the Family Birth Center at Zuckerberg San Francisco General Hospital (ZSFG) had not implemented a standardized protocol to determine the urgency of unplanned cesareans or to promote consistent communication about cesarean urgency. Furthermore, the unit did not centrally record DTI times and causes of delays. Through chart review, we calculated a mean DTI time of 97 minutes (June-August 2017), three times longer than the 30-minute guideline put forth by the American College of Obstetrics and Gynecology. This high DTI time may increase the risk of adverse maternal or neonatal events. Literature on DTI processes is sparse and existing research highlights the complexity of determining an ideal DTI time. A 2013 systematic review in *Best Practice & Research Clinical Obstetrics & Gynaecology* suggests that DTI times less than 30 minutes are beneficial for emergent cesareans due to irreversible causes only (e.g. cord prolapse, placental abruption and uterine rupture), while a 2014 review in *Obstetrics & Gynecology* found no correlation between DTI time and adverse events. Both acknowledge that a 30-minute goal may not be necessary for all unplanned cesareans. Several grading systems have been proposed to stratify urgency based on indication for cesarean, but none have been adopted widely. Moreover, we were unable to find any implementation science with validated strategies to introduce a DTI system to a new institution. In speaking to team members, we observed a need for clear and accessible worksheets that standardized language around urgency and facilitated uniform conversations before each unplanned cesarean.

Approach

In February 2017, the ZSFG Family Birth Center implemented a grading system to standardize the urgency of unplanned cesareans and directed teams to hold an interdisciplinary huddle before each unplanned cesarean. A color-coded graphic describing the grading system was distributed to each room in the unit and included typical indications and a suggested DTI time for each grade: Grade-0 (1-8 hours), Grade-1 (60 minutes), Grade-2 (30 minutes), and Grade-3 (15 minutes). A team huddle involving the OB chief resident, bedside RN, charge RN and anesthesia resident was called after determining that a patient would require cesarean delivery (decision time). Team members were instructed to set a target incision time and discuss any potential delays. The initial intervention also included a DTI checklist with required tasks for each team member. After noting poor checklist usage, we performed interviews and focus groups with staff. Based on feedback, we replaced the checklists with a printed communication tool: a worksheet designed to facilitate discussion around urgency, with spaces to list potential delays and target incision time. We trained all OB staff on the tool and posted flyers throughout the unit. Using worksheet and medical record data, we analyzed use of the DTI workflow and DTI times pre-intervention (n=35, June-August 2016), post-checklist implementation (n=69, February-August 2017) and post-communication tool implementation (n=55, March-August 2018). We performed an unpaired t-test to compare mean DTI times and one-sided ANOVA to calculate the effect of grade on DTI time. All statistics were performed using Graphpad Prism software.

Outcomes

Use of the DTI workflow in unplanned cesareans more than doubled from 20.2% to 47.7% after switching from our initial checklists in 2017 (n=74) to the communication tool in 2018 (n=86), as measured from completed worksheets. True adoption of the DTI workflow may have been higher at either time point if teams used worksheets but did not submit them. Mean DTI time as measured from completed worksheets decreased from 93 to 82 minutes after switching from checklists to the communication tool. This difference did not approach significance due to the high variability in DTI times across grades. Because the initial checklist did not require an urgency grade for each cesarean, we are unable to compare post-checklist and post-communication tool data stratified by grade. Both values are lower than the pre-intervention DTI

time of 97 minutes calculated by chart review in 2016 (n=35) and suggest a downward trend in DTI time with each intervention. Following implementation of the communication tool, 52.5% of cesareans occurred within five minutes of the suggested DTI times for each grade. We observed a significant effect of urgency grade on DTI time [$F_{(2,47)}=11.3$, $P<.001$], suggesting our grading system adequately stratified cesareans by urgency. The most common delays were due to IV access and spinal placement, with seven reports of each among 55 completed communication tools. The frequency of these reports suggests that teams may be accounting insufficient time for anesthesia needs, and that patients should be brought into the OR earlier to achieve target DTI times.

Impact on the health system

Implementation of the communication tool has facilitated data collection on the DTI process that is instrumental to future improvement at ZSFG and potentially other hospitals. The Family Birth Center now has a repository of data on target and actual DTI times alongside anticipated and actual causes of delayed incision time. These data, along with standardized language around cesarean urgency, have allowed team members to set more realistic desired incision times. In interviewing staff, we consistently heard that more accurate DTI estimates improve situational awareness on the unit, support good relationships between interdisciplinary team members and increase patient trust and satisfaction. Designing the DTI communication tool around anticipated workflow and grounded in staff feedback increased buy-in and ownership of the DTI worksheet. Nearly all nursing, midwifery and physician staff are now aware of the DTI process, whereas very few were aware at the start of our project. The communication tool has empowered nursing staff to share their knowledge with the full team and provided a platform for all team members to discuss potential delays. Furthermore, team leaders have noted that the huddles focus the team on a common goal and increase camaraderie in the Family Birth Center. The printed worksheets and training materials could be adopted at other birth centers with minimal changes, allowing easier implementation of this DTI process. Disseminating this information would fill a current gap in implementation science around DTI.

Personal Impact

Over the course of the last year and a half, we have built strong working relationships with nurses and physicians in several departments and are incredibly grateful for the openness with which the DTI effort was received at ZSFG. Throughout this process, we have learned to continually foster a culture of curiosity, leverage individual convictions toward a common goal and communicate about clinical processes effectively to large groups. Driving a quality improvement effort as first- and second-year medical students has required continual humility and curiosity. With no prior experience at the Family Birth Center, we had to quickly develop trust from staff and providers to elicit their honest opinions about the DTI process. To fully understand what interventions might be helpful to different team members, we spent considerable time learning about each role in the Birth Center, appreciating the complexity and importance of each. We will carry these perspectives with us in our future careers as physicians. As is expected with any process that depends upon effectively mobilizing large and diverse teams, the DTI quality improvement effort uncovered competing interests. Our roles as medical students allowed us to be impartial and by working through the challenges of developing a process that is helpful for a majority, we learned to harness the energy of individual convictions toward the overall goal. In this role, we gained confidence as active members of a large interdisciplinary team and were afforded invaluable opportunities to hone our ability to communicate clinical process changes.

Pre-Operative Enhanced Recovery Pathways in Minimally Invasive Gynecology-Oncology Surgery

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Abstract
Enhanced Recovery Pathways (ERPs) are protocols that optimize post-operative recovery by reducing time to ambulation and hospital length of stay. Since September 2017, we have been working to improve compliance with the pre-operative components of the Enhanced Recovery After Surgery (ERAS) pathway in the Gynecology-Oncology Department at University of California, San Francisco (UCSF), Mission Bay. From October 2016 to September 2017, only 35% of patients undergoing minimally invasive surgery were documented as having carbohydrate loading prior to surgery. In order to further assess compliance with this component of the ERAS pathway, we conducted patient and provider surveys and installed a new modality in the electronic health record that allowed for consistent documentation of carbohydrate loading. By August 2018, only 14% of patients had no documentation, and 79% of patients had documented carbohydrate loading. Our project highlighted the value of structured and standardized communication among health care team members, allowing for more clear and efficient communication.

Project addressed/Problem discovered
Longer hospital length of stay has been shown to be associated with a lower functional well-being and an increased risk of hospital-acquired infections (Sharma et al., 2007; Tess et al., 1993). Prolonged time to ambulation has been shown to be correlated with delirium, pneumonia, increased hospital length of stay and increased risk of pulmonary embolism (Kim et al., 2013; Bernstein et al., 2012). In order to lower hospital costs, improve quality and safety, and enhance the patient experience, we aimed to decrease the hospital length of stay and time to postoperative ambulation. ERAS pathways are strategies that have been shown to optimize the management of surgical patients by lowering the days patients spend in hospitals and accelerating patient recovery. From October 2016 to September 2017, in the Gynecology-Oncology service at UCSF Mission Bay, the average hospital length of stay and the average time to mobility for patients undergoing minimally invasive surgery was 50.16 hours and 10.26 hours, respectively. In order to reduce hospital length of stay and time to ambulation for this patient population, we focused on two pre-operative components of the ERAS pathway: multimodal analgesics and carbohydrate loading. From October 2016 to September 2017, only 35% of patients undergoing minimally invasive surgery in the Gynecology-Oncology service at UCSF Mission Bay were documented as having carbohydrate loading prior to surgery. Furthermore, only 37.34% received multimodal analgesics (acetaminophen, gabapentin and diclofenac).

Approach
In order to assess the situation, we performed a gap analysis that identified two potential contributors to increased hospital length of stay and time to ambulation: low perceived compliance with ERAS and delayed insurance approval of Lovenox. For low perceived compliance with ERAS, we investigated compliance with carbohydrate loading (Boost Breeze (BB)) and multimodal analgesics. To assess BB compliance, we installed a modality in the electronic health record that allowed medical staff to document if patients consumed BB or a substitute. Once the modality was installed, feedback regarding rates of BB documentation were provided to medical staff to encourage higher documentation rates. To assess patient understanding of the importance of BB, we also conducted patient phone interviews the day prior to surgery. To identify causes of perceived low compliance with multimodal analgesics, we administered quality control surveys to providers at the Gynecology-Oncology service at UCSF Mission Bay. The surveys revealed that patient comorbidities were the limiting factor in multimodal analgesics compliance, suggesting that this component was nearly optimized and required no additional intervention. The last major component of our gap analysis was identifying ways in which we could improve the discharge process. The principle reason identified was the inability to prescribe Lovenox preoperatively due to insurance regulations. To expedite this process, we catalyzed the initiative to create a prefilled Lovenox prescription form that would allow providers to prescribe Lovenox preoperatively. Once these interventions were established, we performed monthly data analyses to monitor progress and to relay feedback to medical staff.

Outcomes
To monitor compliance with the ERAS pathway, we performed monthly calculations of the percentage of patients who had pre-operative carbohydrate loading. In September 2017, we found that the percent of patients with documented consumption was 35% (32% BB, 2% Gatorade and 1% Other). To better understand the carbohydrate-loading status of the 65% of patients without documentation, we conducted patient surveys on the day prior to surgery. From these surveys, we discovered that all patients had received BB at a pre-operative appointment and confirmed their intention of consuming the beverage. In addition, providing feedback to the pre-operative nursing staff revealed that information regarding carbohydrate loading was sometimes indicated in a separate note within Apex. The new modality installed in February provided a standardized way of indicating when a high-carbohydrate beverage was not taken. By August 2018, the

percentage of patients with no documentation dropped to 14%, and the percentage of patients who took BB or another substitute increased to 79%. Because our goal was to reduce hospital length of stay and time to ambulation, we calculated monthly the average length of stay and time to ambulation. We discovered that the high compliance with preoperative carbohydrate loading did not affect length of stay and time to first ambulation despite our interventions. This result could be attributed to the possibility that the majority of patients were already compliant with carbohydrate loading; however, this could not be seen due to the lack of adequate documentation techniques.

Impact on the health system

Our quality improvement project in the Gynecology-Oncology department at UCSF Mission Bay had a positive impact on the microsystem in which we worked and has broader implications for the importance of communication in the health system. In particular, our project has highlighted the value of structured and standardized communication among health care team members. Prior to the implementation of the new modality in the Apex system in February 2018, information regarding the patient's compliance with the preoperative components of the ERAS pathway was occasionally added to a separate note within Apex. Because of the inconsistency in documentation, it was not always clear which patients were compliant with these components of the ERAS pathway. The addition of the new Apex modality in February 2018 provided the microsystem with a means of standardized communication which allows all members of the health care team to be fully informed about the patient's status preoperatively. As a result, communication among team members can be more clear and efficient.

Personal Impact

This project enhanced our understanding of how quality improvements projects are initiated, implemented and reinforced within a microsystem. We learned that it is imperative to establish a clear central goal. The project should attempt to address a gap in the system by first identifying specific areas for improvement. Once this has been established, each area can then be further explored to identify potential contributors that can be manipulated to improve the gap in the system. In addition, we learned that once potential contributors have been identified, it is necessary to outline the project such that it addresses each phase of the project. This includes planning, conducting research, identifying areas of improvement, implementing an intervention and performing a final review to assess project efficacy. We also learned that it is important for us to learn how to effectively work in an interprofessional setting. Our experience working in the microsystem prepared us for future interactions with other health care providers. In addition, we refined our ability to communicate effectively with both patients and providers. Through our monthly meetings, we learned how to present data in a clear and concise manner that was both understandable and comprehensive. We developed an appreciation for the action-oriented learning process that occurred as a result of our quality improvement efforts within this microsystem.

Toward Health Equity: An Inpatient Psychiatric Smoking Cessation Counseling Program

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Abstract
While individuals with serious mental illness use tobacco products at significantly higher rates than the general population and die more commonly of smoking-related illnesses, insufficient resources are devoted to smoking cessation interventions for this population. Using the methods of quality improvement, our project aimed to increase the availability of smoking cessation counseling for patients on the inpatient psychiatry unit at Zuckerberg San Francisco General Hospital (ZSFG). Guided by a health equity lens, we applied a two-pronged intervention involving: (1) creation of a nursing position to deliver evidenced-based smoking cessation counseling; and (2) efforts to increase psychiatric unit team buy-in for smoking cessation counseling. Over the course of our project, the percentage of patients offered smoking cessation counseling during their stay on inpatient psychiatry increased from 0-10% to 80%. This work highlights a significant inequity in health services for psychiatric patients and provides evidence of the potential for successful interventions.

Project addressed/Problem discovered
Individuals with serious mental illness (SMI) make up an estimated 44.3% of the U.S. smoking population and are about twice as likely to smoke tobacco as compared to individuals without SMI. Additionally, high smoking rates are likely a driving factor in why individuals with SMI die at younger ages, most often due to smoking-related diseases. While studies suggest that smoking cessation interventions may be particularly effective when initiated during hospitalization, many public hospitals in the U.S. do not offer formal smoking cessation counseling services to psychiatric patients. Moreover, a randomized controlled trial conducted at UCSF's Langley Porter Psychiatric Institute found that an inpatient smoking cessation intervention was effective and associated with lower rates of smoking several months later, decreased psychiatric rehospitalization after discharge, and no increases in psychiatric symptoms. Yet, no formal process for providing smoking cessation counseling existed on the inpatient psychiatry unit of Zuckerberg San Francisco General Hospital (ZSFG) at the start of this project. Notably, the state of smoking cessation counseling on the inpatient psychiatry unit stood in contrast to ZSFG's medical and surgery units, where a dedicated team of licensed vocational nurses (LVNs) provides a brief intervention and referral for treatment to nearly all patients identified as smokers. In April 2017, 90% of smokers on these units received a visit from the dedicated smoking cessation team and were offered practical counseling, in contrast to only 0-10% of inpatient psychiatry patients who received such counseling.

Approach
We aimed to increase the percentage of ZSFG inpatient psychiatry patients who are offered smoking cessation counseling during their hospital stay from 0-10% to at least 50%. To assess the baseline attitudes and practices around smoking cessation on the inpatient psychiatry units, we conducted a survey of 44 psychiatric providers. Almost all providers reported that smoking cessation counseling was not a particularly worthwhile part of their practice, and they reported low confidence in providing cessation counseling. In order to create a program for inpatient psychiatry similar to the smoking cessation counseling offered to ZSFG's medical and surgery units, we organized a training with the existing Med/Surg smoking cessation team for one psychiatric unit nurse to be trained in how to provide evidence-based smoking cessation counseling. Following that training, the psychiatric nurse spent one day per week on the psychiatric unit offering smoking cessation counseling to all patients identified as smokers. This approach utilized existing resources and avoided diffusion of responsibility by identifying a dedicated individual to take ownership of the intervention. Our project also aimed to increased buy in among all members of the psychiatry unit team for the importance of smoking cessation counseling. In service of this goal, we gave several short project presentations during the daily unit review, as well as sent informational emails with updates to staff. We hypothesized that team support would help the newly trained nurse to be most successful in providing smoking cessation counseling to patients on the unit.

Outcomes
Over the course of our project, the percentage of patients offered smoking cessation counseling on the inpatient psychiatry unit increased from 0-10% to 80%, thus we achieved and exceeded our target goal. We also saw increased provider buy-in as evidenced by the results of our post-intervention survey on provider attitudes. Notably, providers' attitudes toward the importance of smoking cessation for this patient population increased from a previous average of 3.6/5 to 4.3/5 (Likert scale). Additionally, providers found the newly implemented smoking cessation counseling service to be "very worthwhile" (avg. ranking of 4/5). Moving forward, a dedicated psychiatric smoking cessation counseling nurse will continue to offer smoking cessation counseling and resources to all patients identified as smokers once per week. While this model is both sustainable and reaches the most patients, we would suggest that the Medicine-Surgery Smoking Cessation Team instead extend its services to include psychiatric patients in the future, as this would be the most efficient and equitable use of hospital resources.

Impact on the health system

As a direct result of this project, at least 80% of patients identified as smokers on ZSFG's inpatient psychiatry unit were offered smoking cessation counseling. For the health system, this is an important step forward in providing equitable care for all patients, as well as potentially preventing mortality and reducing readmissions, all of which are part ZSFG's "True North" goals. However, this project also has important implications for Centers for Medicare & Medicaid Services (CMS) payments. Since January 2015, CMS required that hospitals report the percentage of patients receiving practical tobacco cessation counseling and FDA approved cessation medications during their hospital stay, as mandated by the Inpatient Facility Quality Reporting Program. In the future, ZSFG's performance on these metrics will likely have implications on CMS payment, as well as be available for stakeholders to assess as a quality measure of the hospital. This project has also prompted important discussions around health care inequities that exist within ZSFG's hospital system and other ways to create sustainable models of health systems change that will positively impact patients.

Personal Impact

Over the course of this project, we were most impacted by witnessing the health care inequities that exist for psychiatric patients and the remarkable amount of work that it takes to overcome traditional misbeliefs that contribute to these types of inequities in the health care system. We encountered a number of challenges throughout this project, such as changing long-standing attitudes and stigma about psychiatric patients among providers; convincing very busy and overworked providers to add a new, yet necessary, service to their workflow; and successfully motivating providers to change their documentation of smoking cessation counseling. However, by building buy-in among inpatient psychiatry providers/leadership and highlighting inequities in the services available to psychiatric patients, we were able to create a new service for a vulnerable patient population and change provider attitudes. We also learned that by looking to related initiatives in other departments of the hospital, we can refrain from reinventing the wheel and share resources/collaborate in our quality improvement efforts.

A Novel Quality Improvement Curriculum for Preclinical Medical Students: First Year of a Student-Led Initiative

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Abstract

Undergraduate medical education must adequately prepare trainees to participate in quality improvement (QI), but there is limited literature showing effective experiential learning of QI, particularly in the preclinical years. At Oregon Health & Science University, a medical student designed and led an innovative curriculum for preclinical medical students to experientially learn QI in a longitudinal, interprofessional and team-based setting. This was piloted with seven students in a novel preceptorship program. All students had improved scores on a locally designed pre/post knowledge test and all reported increased confidence in implementing a QI project. The curriculum's impact on the health system is two-fold in that it generated a student-led QI project that improved systems of care and created a learning environment that effectively trains future physicians to lead improvement. With the success of the pilot year, the curriculum will be expanded to ten students with a second clinical site added.

Project addressed/Problem discovered

To respond to the current needs of the health care system, undergraduate medical education must adequately prepare trainees to participate in improvement of the health systems in which they work. However, there is limited literature showing effective experiential learning of quality improvement (QI), particularly in the preclinical years of medical school. The major barriers to implementing experiential learning often include a lack of buy-in from clinical sites, inadequate protected time to complete a project, and limited faculty capacity for mentorship and QI teaching. Overcoming these barriers requires creative interventions that can guide learners to see improvement work as fun, feasible and essential to their role as future health care professionals. Ultimately, the act of doing improvement work allows students to gain a more authentic experience of systems thinking, a stronger appreciation for interprofessional teamwork, and an enhanced ability to engage in health systems improvement upon entering residency. While longitudinal clerkships have been recommended as the optimal setting for experiential learning, there is also opportunity during the pre-clerkship phase in institutions such as Oregon Health and Science University (OHSU) with a longitudinal preceptorship experience. Thus, I began an endeavor to design a novel curriculum combining didactics and project-based work for preclinical medical students to engage in meaningful improvement training during their preceptorship experience. I aimed to demonstrate a feasible and effective model of teaching QI to preclinical students, creatively address common barriers to implementation and sustainability for experiential QI learning, and contribute meaningful work that promotes medical education reform in health systems science.

Approach

I designed, implemented and evaluated a novel quality improvement curriculum for preclinical medical students to identify problems in clinical workflows and systematically address these issues through a team-based improvement project. The curriculum was piloted with seven students in a preceptorship program at OHSU known as the Student Navigator Project, where students act as patient navigators and medical assistants in a primary care clinic for 18 months. Students participated in eight hours of didactics to learn the fundamentals of improvement through three Institute for Healthcare Improvement Open School (IHIOS) modules. They then identified an area of improvement based on their own experience working in the clinic and partnered with clinic staff, a faculty adviser and a student coach to complete the IHIOS Quality Improvement Practicum (QIP) course over the next four months. The IHIOS QIP guides learners through the critical stages of an improvement project, which includes creating a project charter, developing a fishbone diagram, generating change ideas, conducting multiple Plan-Do-Study-Act (PDSA) cycles, creating a run chart to display data and generating a summary report to share project learnings. Students culminated their experience by submitting posters to conferences and delivering an oral presentation to clinic staff. Finally, learner competency and confidence in QI were assessed using a 17-question knowledge pre- and post-test and a post-participation learner survey on self-perceived change in knowledge, skills and attitude. These materials were locally designed to be tailored to the level of preclinical medical students and based on the key objectives of the IHIOS courses.

Outcomes

Baseline assessments revealed limited QI knowledge and skills among learners. All students had improved scores on the knowledge test with an average improvement of 5 out of 17 points. All reported increased confidence in understanding and executing an improvement project. Six students agreed or strongly agreed that they felt comfortable engaging with staff on improvement work, with all students stating they will likely be involved in future improvement work. Of the 12 medical assistants and six providers surveyed, 15 agreed or strongly agreed that student-led projects would help improve patient care in the clinic, and 16 were open to helping students conduct a project in the future. In summary, a curriculum for preclinical students to apply their newfound knowledge to an improvement project is both feasible and effective in building learner competence and confidence in QI. A critical element for success is a longitudinal clinical experience that authentically integrates students into clinical workflows and promotes strong learner camaraderie. The curriculum also encouraged many clinic staff leaders to embrace the role of a project advocate, which will help optimize stakeholder buy-in in future student-led projects. A continued

barrier to implementation and sustainability is the availability of faculty with requisite QI knowledge and capacity to mentor. As OHSU continues to enhance faculty development, a creative and effective way of navigating this barrier in the meantime, as demonstrated through this curriculum, is to empower medical students who are passionate and knowledgeable in QI to fill the gap in teaching and coaching learners.

Impact on the health system

The curriculum's impact is two-fold in that it directly improved systems of care and created an innovative learning environment that effectively trains future physicians to lead improvement. This program demonstrated preclinical medical students can implement a project that could potentially generate meaningful change in patient care. Drawing on their roles as medical assistants and patient navigators, students identified an opportunity to improve the medication reconciliation process in clinic. In their PDSA cycles, they created and tested a new medication reconciliation form that was more user-friendly for both patients and medical assistants. As a result, the intervention generated more accurate and efficient documentation of medication adherence. In addition to clinic staff experiencing increased satisfaction, patients also reported enthusiasm with the new form allowing them to be more engaged in their care. Ultimately, this curriculum allowed for students to improve patient-centered care and workforce satisfaction on a challenging systems-level issue that pervades many clinical settings. Moving forward, the project will be passed on to the next cohort of learners to continually build on PDSA findings and sustain improvement. The curriculum also generated key learnings on how to provide impactful QI education for preclinical students. Not only should improvement learning be experiential and team-based, but the project topic should also be learner-initiated and focused on processes that students have direct, longitudinal exposure to. Encouraging students to examine system-level problems that are linked to institutional improvement priorities can ensure an appropriate balance between maintaining learner enthusiasm, securing stakeholder support and optimizing project sustainability.

Personal Impact

This experience has been instrumental in defining my professional identity as a physician-in-training committed to education, teaching and health systems improvement. During the first six months of this journey, my ideas were met with considerable skepticism from faculty and students, as many felt wary of QI education being a significant priority for preclinical medical students. Nonetheless I persisted in believing that early introduction to the principles of improvement is critical in training medical students to be effective systems thinkers, and I ultimately connected with faculty mentors who advocated for my work. In leading this curriculum, I learned how to navigate the unique dynamic of being a teacher and project adviser for medical students with the awareness that I was a medical student myself. While I did embody a sense of humility and amicability in building peer-to-peer rapport, I also found it equally important to firmly maintain authority and self-confidence to hold learners accountable for their work. Furthermore, I learned how to provide a psychologically safe space for learners to candidly express concerns and how to constructively utilize their feedback to improve the curriculum experience. Most importantly, I experienced immense joy in collaborating with several students and faculty on this endeavor and constantly felt energized by our shared passions for lifelong learning and health systems science. I am honored to have had the opportunity to build an educational experience that strives to improve systems of care and promote future change agents from OHSU.

Simple Changes in Discharge Paperwork Increase Mental Health Follow Up After Psychiatric Hospitalization

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Abstract
Following discharge from an inpatient psychiatry unit, patients who do not attend their first outpatient mental health appointment (OMHA) are more likely to be readmitted within 30 days. Additionally, they are at higher risk for suicidal ideation and completion, decreased medication adherence, and decreased future use of outpatient mental health services. This project sought to improve rates of OMHA attendance following discharge from inpatient psychiatry at Zuckerberg San Francisco General Hospital (ZSFG), a public hospital serving underinsured, marginally housed and severely mentally ill patients. The intervention included a more visible appointment reminder card and personalized conversation with a social worker that increased patient involvement. The percentage of patients discharged from ZSFG attending their first OMHA increased from 55% to 64% following implementation of the intervention. An easily recognizable appointment card and patient engagement in the discharge process can increase rates of attendance at first OMHA following discharge.

Project addressed/Problem discovered
Continuity of care is extremely important in caring for psychiatric patients, as it is associated with reduced rates of suicidal behavior and suicide, increased medication adherence, and increased future use of outpatient mental health services. Thus, a failure to attend the first Outpatient Mental Health Appointment (OMHA) following discharge from a psychiatric hospitalization indicates a break in continuity of care for vulnerable patients, as patients who do not show up for their first OMHA are more likely to return to the hospital for care within 30 days. With an average cost of $50,000 per inpatient psychiatric hospitalization at Zuckerberg San Francisco General (ZSFG), low OMHA attendance, and consequently high recidivism, represents health care dollars that could be better spent. Putting cost aside, recidivism indicates a regression in disease state which may be painful or even dangerous, for both patients and their communities. Based on an internal review of discharge data from the ZSFG Inpatient Psychiatry unit during April 2017, 45% of patients discharged into the San Francisco community did not show up for their first OMHA. Comparable institutions show similar OMHA no-show rates indicating that low attendance to first OMHA is a widespread concern. Given the significant room for improvement and studies demonstrating positive outcomes with attendance at first post-discharge OMHA, our project aimed to increase the percentage of patients attending their first OMHA.

Approach
We used the Observe-Plan-Do-Study-Act (OPDSA) quality improvement framework for our project.

Observe: To begin, we interviewed and surveyed both patients and their providers to better understand the barriers to first OMHA attendance and surveyed patients asking which interventions they would find helpful in facilitating first OMHA attendance.

Plan: Patients and providers identified forgetfulness as a primary reason for not attending first OMHA, and identified OMHA appointment reminder cards as an intervention that might increase OMHA attendance. This intervention was also low-resource and, potentially, high-impact.

Do: We designed bright pink, half-page appointment cards with date, time and address of OMHA; name of provider; and patient plan for transportation to OMHA. The sheet was completed during a personalized conversation between the patient and discharge social worker, with the goal of investing patients more deeply in their own care and using this increased motivation to increase OMHA attendance.

Study: We tracked patient's OMHA attendance post discharge in order to test our hypothesis that providing patients with recognizable appointment cards with details of their OMHA, along with engaging patients in filling out the card themselves, would improve rates of OMHA follow up. We also asked for feedback from social workers to improve the format of the card to meet their and their patients' needs.

Outcomes
After four months of implementing our intervention, the rate of patients who attended their first OMHA following discharge from the ZSFG Inpatient Psychiatry Department increased from 55% to 64% (n = 100). The intervention has been permanently folded into the discharge process on the inpatient psychiatric unit. The unit has also expressed interest in hosting future student QI projects.

Impact on the health system
Our findings of improved OMHA follow up suggest the potential for a reduction in future readmissions to the psychiatric unit, improved management of patient disease status through continuity of care and decreased risk of patient suicide. The reduction in readmissions is

associated with savings of $50,000 per admission avoided, the average cost of a single psychiatric hospitalization at ZSFG. Further, these benefits are realized through an intervention that fits smoothly into existing workflow and requires minimal resources. It is therefore sustainable and can be readily disseminated to other settings. Our intervention was pivotal in creating a culture of openness regarding quality improvement in a department which had previously never been involved in quality improvement practices. This represents a substantial shift in mindset as members of the inpatient psychiatry microsystem had previously expressed cynical feelings toward quality improvement efforts and the hospital system's attention to psychiatric outcomes. That our minimally invasive project sought input from all members of the department was important in establishing a healthy and positive quality improvement culture.

Personal Impact

Engaging in this project allowed us to better understand the patient experience across the continuum of care. As part of this project, we interviewed inpatients and visited an outpatient mental health clinic, to which many patients from ZSFG are discharged, to better understand the barriers and facilitators of a smooth discharge process and attendance at the first OMHA following discharge. This was extremely valuable in cultivating understanding and empathy as we were working with low resource patients with a high acuity of illness. This project was also valuable in allowing us to seek insight from a number of medical professionals working with disenfranchised patients. The patience, generosity and high-quality patient care we observed will be carried with us throughout our careers. Furthermore, the implementation of this project would not have been possible without the collaboration of the discharge social workers, who we worked with to put the new discharge protocol into practice. In collaborating, we developed our ability to work as members of an interprofessional team, a skill that we will continue to use throughout our medical careers. Finally, having completed a QI project using the Plan-Do-Study-Act framework as first-year medical students, we now have the ability to recognize areas for quality improvement and the skills and confidence to carry out such improvement projects in future clinical settings.

Improving COPD Care at the University of North Carolina Internal Medicine Outpatient Clinic

Medical Student

Camilla Powierza, University of North Carolina School of Medicine

Teammates

Nelson Vick and Brenna K. McManus

Faculty Mentor

Amy Shaheen, MD, MSc, Professor of Medicine

Abstract

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) has encouraged symptom assessment for all COPD patients and pulmonary rehabilitation for COPD patients with high symptom burden and risk of exacerbations. Pulmonary rehabilitation has been shown to improve these symptoms, quality of life, exercise tolerance and reduction in readmissions and mortality in patients with a recent exacerbation ($\leq$ 4 weeks from prior hospitalization). However, many patients never have the opportunity to take advantage of this cost-effective strategy because systematic ways of assessing symptoms, identifying symptomatic patients and referring those who would benefit from pulmonary rehabilitation are lacking.

Project addressed/Problem discovered

In our general medicine clinic, symptom assessments and pulmonary rehabilitation referrals were not done prior to this effort. We aimed to systematically screen for dyspnea symptoms during all chronic obstructive lung disease patient encounters, with secondary goals of improving rates of screening for hypoxia, referrals to pulmonary rehabilitation in symptomatic patients and documentation in the electronic health record.

Approach

To address these goals, a quality improvement team was formed including a medical student, patient educator, front desk staff and a physician. Our process began with a staff member flagging charts for patients due for symptom assessment. The front desk responded to the flag and handed out a paper copy of the Modified Medical Research Council (mMRC) dyspnea scale to the patients at check-in.

Patients self-scored their degree of dyspnea (grades 0-4). After filling out the form, patient scores 2 or higher prompted algorithmic responses by members of the health care team. Nurses checked oxygen saturations for symptomatic patients. Provider algorithms included escalating inhaler therapy and placing pulmonary rehabilitation referrals. The process was further streamlined with daily messages to providers with COPD patients scheduled and provider education sessions on pulmonary rehabilitation and the cost-effective benefits for patients.

Outcomes

Over the span of 42 weeks, there were 571 COPD patient encounters, of which 87% were screened for symptoms of dyspnea with an mMRC questionnaire. Of these patients, 233 were found to be highly symptomatic (mMRC $\geq$ 2) and qualified for pulmonary rehabilitation, with a total of 30 referrals to pulmonary rehabilitation made (30/233=13%). Oxygen saturation was checked in 78% of these symptomatic patients. MMRC scoring was documented with a note template available to all providers, and during the 42 weeks, scores were documented 126 times (126/571=22%), from a baseline of 0%.

Impact on the health system

Overall, we have improved COPD symptom assessment using an mMRC questionnaire and introduced an algorithm of care followed with good fidelity by providers and nurses. The rate of pulmonary rehabilitation referrals increased significantly over 42 weeks and there was an overwhelming increase in awareness of pulmonary rehabilitation as a treatment option in symptomatic COPD patients.

Ease of documentation has continued to improve with automatic reminders in the electronic health record. Future directions involve improving rates of referral to pulmonary rehabilitation, with the largest limitations including insurance coverage and transportation needs.

Personal Impact

This quality improvement project began during my third year of medical school, when I first experienced the clinical world as a health care professional. During our training process, of which I am now currently an intern, it is very easy to feel trapped in a system that feels impossible to move. This leads to frustration and eventually can culminate in burnout.

As a medical student, I remember feeling helpless in situations where patients seemingly slipped through our imperfect health care system. Through empathy and motivation, I was able to aid in caring for my patients, but there was nothing as empowering as discovering that I had the ability to change systems in practice to better care for our patients.

Through this project, I learned how to use my voice for encouraging improvements in our practice, to identify shortfalls in our health care system and to motivate others to work as a team to change and grow. I carry these skills with me now in residency and continue to look for ways to bring about positive change.

Improving Communication between Psychological Counselors and Pediatricians at Carolina Pediatrics of Wilmington, NC

Medical Student
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Faculty Mentor
Heather Henderson, MD, Pediatrician

Abstract
At Carolina Pediatrics of Wilmington, NC, many patients require treatment for psychological disorders, yet there are few available psychiatrists. As a result, pediatricians often prescribe these patient's psychiatric medications but refer them to counselors for therapy. The objective of this project was to increase communication between counseling services and pediatricians by sending a one-page summary report for counselors to report visit summaries, diagnoses and recommended treatments. We faxed a summary report to counselors for each patient referral made during two study periods; a second request was sent if no response was received after one month. Referrals were considered "complete" if pediatricians received some form of communication from counselors about their patients. Overall the project team observed a 212% increase in complete referrals after sending the summary reports to counseling services during study period 1 and a 600% increase in complete referrals in study period 2.

Project addressed/Problem discovered
At Carolina Pediatrics of Wilmington, North Carolina, many patients are referred to counseling services for psychological disorders, most commonly attention deficit hyperactivity disorder (ADHD), anxiety disorders and depression. Due to the shortage of psychiatrists in Wilmington, these counselors are frequently social workers or psychologists who provide therapy to patients but are unable to initiate or make changes to medication regimens. As a result, pediatricians often remain responsible for prescribing and managing psychiatric medications. Unfortunately, pediatricians frequently receive either no information back from counseling referrals or receive lengthy therapy notes that contain details on counseling provided but no recommendations for medications. In fact, between September and December 2017, Carolina Pediatrics made 114 referrals to counseling services, but only 25 (22%) of these referrals were marked as "complete", meaning that pediatricians had received some type of communication back from counselors about their patients. Lack of communication between pediatricians and counselors may result in suboptimal management of psychological disorders. Previous research has found that adverse consequences of these untreated disorders may include poor academic performance, decreased self-esteem, higher rates of substance use and suicidal ideation. The objective of this project was to increase communication by 125% between counseling services and providers at Carolina Pediatrics by implementing a brief form for counselors to report visit summaries, diagnoses and recommended treatments.

Approach
A quality improvement (QI) team consisting of a medical student, a pediatrician and an office administrator developed a one-page summary report for counselors. These reports asked counselors to indicate 1) whether or not the referred patient kept the appointment, 2) diagnoses associated with the patient, 3) the date of the next scheduled appointment and 4) concerns and recommendations for treatment. The team then used the electronic health record (EHR) to determine the number of counseling referrals made during two study periods: 1) September 1, 2017-December 31, 2017, and 2) January 1, 2018-March 16, 2018. Counseling referrals included those listed as behavioral health, counseling, cognitive behavioral therapy (CBT), mental health, psychology and psychology/counseling. Psychiatry referrals were excluded because these providers manage patient medications themselves. Referrals were marked "complete" if Carolina Pediatrics had received counseling notes or other forms of communication about the referred patient. Referrals were marked "pending" if no information was received from counselors. We faxed the one-page summary reports to counselors for each referral made during the two study periods, with a cover sheet requesting counselors complete and return the forms to Carolina Pediatrics. A second request was sent if referrals were still marked "pending" after one month. We determined the number and percent of complete and pending referrals for each study period before and after sending the summary reports. We also calculated the percent increase in complete referrals after implementation of the summary reports. All data analyses were conducted using Microsoft Excel.

Outcomes
During study period 1, Carolina Pediatrics made a total of 114 counseling referrals. Before implementing the summary reports, 25 (22%) referrals were complete, compared to 78 (66%) referrals after sending the summary reports. During study period 2, Carolina Pediatrics made 55 counseling referrals, of which 5 (9%) were complete before the summary report and 25 (64%) were complete after the summary report. Overall, the QI team observed a 212% increase in complete referrals after sending the summary reports to counseling services during study period 1 and a 600% increase in complete referrals in study period 2. One limitation of this work is the long waiting period for counseling appointments in Wilmington, NC. Some patients referred for counseling did not have scheduled appointments before the time of data analysis, especially among patients in study period 2.

Impact on the health system
The project's goal was to improve communication between pediatricians and counselors at Carolina Pediatrics in Wilmington, NC in order to optimize psychiatric care for pediatric patients at this practice. After implementing the use of summary reports, the number of complete

referrals increased by 212% in study period 1 and by 600% in study period 2. This outcome aligns well with the long-term goals of Carolina Pediatrics to provide excellent medical care to their patients, which includes management of psychiatric conditions. I believe one of the strengths of this project is its simplicity. The summary reports require only a few minutes of a counselor's time to complete, but they provide extremely valuable information to the pediatricians. Although the report does not provide the same level of detail as complete counseling notes, its brevity facilitated a rapid incorporation into the practice's existing protocol for counseling referrals. Anecdotally, several of the pediatricians at this practice shared that they are seeing an increasing number of psychiatric problems requiring counseling services. In order to support the ability of pediatricians to care for these patients, next steps for this project could include incorporating these forms into the practice's EHR and sharing this project with other pediatric practices in southeast NC.

Personal Impact

According to a 2004 report by the Cecil G. Sheps Center for Health Services Research, the ratio of psychiatrists in the state of North Carolina is only 1.05 per 10,000 people. In fact, among the 100 counties in North Carolina, 17 have no practicing psychiatrists at all. Although I was aware that my home state is facing an increasingly high demand for psychiatric services, this project impressed upon me the gravity of the situation. For instance, I saw a young boy who was struggling with overwhelming grief at the loss of his grandmother. Since her passing, he had been unable to concentrate in school and told me tearfully that he "just keeps having bad days." This patient needed timely counseling to cope with the loss, but no appointments were available for several months. We ultimately decided to refer him to hospice to ensure he could receive help within the month, but I cannot forget how helpless we initially felt when we saw the waiting lists at numerous counseling practices. These wait times are not a problem that can be readily addressed by a single quality improvement project, but rather by more health care professionals choosing to enter the field of psychiatry. Before my involvement in this project, I had not considered training in psychiatry, as I had previously assumed I would become an internal medicine physician. However, I am now strongly considering pursuing psychiatry residency so that I can provide psychiatric care in the underserved areas of North Carolina.

Targeted Interventions Decrease Loss to Follow-Up Among Veterans Seeking Mental Health Care

Medical Student
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Teammates
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Faculty Mentor
Caitlin Hasser, MD, Associate Professor of Psychiatry and Clinical Microsystems Clerkship Coach

Abstract
The Same Day Clinic (SDC) at the San Francisco Veterans Affairs Medical Center (SFVAMC) is an urgent care/drop-in clinic for patients seeking urgent mental health care. Patients who need further follow-up are made appointments in the Access Center (AC), from where they can be referred to other longitudinal care options if appropriate. It is common, however, for patients who have AC appointments made to no-show and fall through the cracks even though they may need continued care. Our project aimed to decrease the non-attendance of patients at their AC appointments. We implemented a post-visit summary and informational form for patients after their SDC visit to elucidate and make transparent the care process. The form also acted as an appointment reminder sheet. The no-show rate decreased from 37% in June and July of 2017 to 16% in June and July of 2018. Our project successfully decreased the no-show rate over this period of time.

Project addressed/Problem discovered
A 2018 report published by the National Academies of Sciences, Engineering, and Medicine finds that among veterans who served in Iraq and Afghanistan with a need for mental health care services, half do not utilize these services. Additionally, patient non-adherence to appointment attendance is a problem in outpatient psychiatry, with national rates around 20%-55% (Matas, 1992). The Same Day Clinic (SDC) at the San Francisco Veteran Affairs Medical Center (SFVAMC) was established in March 2016 with the intent to help address this unmet need. SDC serves as both an urgent care/drop-in clinic for patients already in mental health care, as well as a clinic for new patients to enroll in long-term specialty mental health care. Patients seen at SDC in need of further care are referred to the Access Center (AC) for further management. From the AC, patients can then be referred to longitudinal care if appropriate. Initial analysis of the 79 patients seen at SDC between June 2017 and August 2017 shows that 37% of patients given an AC appointment did not attend their appointment to establish long-term care. Given that the patients seen at the SDC have made an initial attempt to connect to mental health care, we believe there is an opportunity to decrease appointment non-adherence. Decreasing non-adherence to initial appointment attendance at the VA AC can help to achieve the SDC's mission of increasing access to longitudinal psychiatric care for veterans in need.

Approach
To reduce barriers in access to long-term mental health care for veterans at the SFVAMC, our goal was to decrease the percentage of patients who do not attend their AC appointment after their initial assessment at SDC (no-show rate) from 37% to 34% by July 30, 2018. We conducted several focused interviews with key members of the SDC and AC teams, as well as patient participants in a group art class, that revealed common barriers to patient non-adherence to AC appointment attendance. Lack of patient comfort with the waiting and interview rooms, instability in housing which resulted in lack of mailing address or phone number, and severe mental illness interfering with the functioning required to attend the appointment were listed as possible causes of non-adherence to the appointment. We hypothesized that improving patient's understanding of their treatment plan and need for ongoing care could ultimately improve adherence to appointment attendance and increase the number of veterans connected with long-term care. We chose to implement new post-visit materials that outline the patient's trajectory from SDC to long-term care because of this intervention's high feasibility and modest impact. The post-visit material includes the following:

- Explanation of the role of Access Center
- Expectations for next appointment
- Graphic map of the pathway to long-term care
- List of long-term care options
- Appointment date, time and location
- Space for additional notes from provider
- Crisis contact information

Outcomes
We aimed to decrease the percentage of patients who do not attend their AC appointment after their initial assessment at SDC from 37% to 34% by July 30, 2018. After implementing our intervention, we repeated chart review for 72 patients who were seen at SDC and made an AC appointment. The rate of patients who did not attend their AC appointment was 16% from June 1, 2018, through July 31, 2018. This no-show rate is significantly lower than our goal target rate of 34% and suggests that our intervention contributed to decreasing the percentage of patients who did not attend their AC appointment

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Impact on the health system

Because many of the patients who are seen in SDC are in urgent need of mental health services, it is crucial that they are able to get connected to any further care that they may need. However, we understand that it is easy to be confused by the process of referrals and appointments or for patients to forget when their appointment is, even though they still need continued care. Our intervention demonstrated that a simple, single sheet of paper that centralizes all of the relevant information for a patient can help decrease the no-show rate. A significant number of patients who are in need of continued mental health care are able to successfully receive that care and fewer patients fall through the cracks. Although it is difficult to determine how much of our impact is due to the intervention and how much is due to the team's presence and involvement in the health system or other confounding factors, there was a significant effect that was likely not simply due to normal variation, especially as we completed our chart review for the same two months between 2017 and 2018. Throughout the process, we gained significant buy-in from the directors of both the SDC and AC, and received input from multiple members of teams at both clinics in the creation of our post-visit materials. This collaborative process and investment in our intervention makes it much more likely that our intervention will continue to be implemented even after our student team is no longer directly involved in the health system.

Personal Impact

I learned a great deal about the process of quality improvement through participation in this project. Our project took several different iterations throughout the year that we worked on it, and there were times when I felt frustrated thinking that we were backtracking on some of the work we had already done. Now, however, I can see that that process was necessary for us to gather all of the information we needed to ensure that we were working on a solution that was applicable to our problem. I understand better how flexible we should be in quality improvement projects. I also learned a great deal about the difficulties of getting input from all stakeholders and synthesizing them to create a solution that works for everyone. While I was initially skeptical about the importance of conducting interviews with all team members, I soon realized that every person had valuable input, much of which we either seriously considered or actually included in our final interventions. The nature of the project itself also meant a great deal to me. I could see the measurable impact we had on ensuring that veterans in need of mental health were able to receive continued care. As someone who has lost people close to me to mental health struggles, I truly believe in the difference we made and the possibility that, even if it was just one person, we helped prevent a suicide or other death due to poor mental health.

Social determinants of health

Mentors In Medicine Program: Improving Health Education in Woodlake Unified School District and Surrounding Community

Medical Student

Kimia Etemadi, A.T. Still University—School of Osteopathic Medicine in Arizona (SOMA)

Teammates

Assani, Khadij; Bhatia, Anmol; Dhaliwal, Jaberpreet; Etemadi, Kimia; Liou, Christina; Royter, Evgenia; Sotoudeh, Chaudy; Virk, Harman; Yellin, Rachelle; Zachariash, David; Cryns, David DO; Quezada, Carolina MD; Whelihan, Kate MPH, CPH and Joy H. Lewis, DO, PhD.

Faculty Mentor

Carolina Quezada, MD, Clinical Assistant Professor, Family HealthCare Network

Abstract

Although California maintains one of the lowest obesity rates in the United States, the Central Valley remains an area with increasing rates and lacks adequate health education regarding the topic within the public school system. This project assessed and increased the awareness of 24 fifth-grade students in California's central valley to obesity in addition to providing them with goal setting tools to make healthier decisions. One-hour modules pertaining to nutrition, physical activity and mental health were performed weekly for six weeks and students' understanding was assessed using pre/post surveys. Results of the 20/24 pre-tests and 15/24 post-tests indicated that students' knowledge of health topics improved significantly (P value=0.0100). These results indicated that adequate health education taught to grade school children can improve the perception of self-efficacy with regard to their physical health.

Project addressed/Problem discovered

A.T. Still University School of Osteopathic Medicine Arizona is dedicated to preparing physicians who are innovative leaders serving underserved populations by focusing on research and community-oriented primary care. As a part of our curriculum we are divided into groups of 10 students and travel to community health centers around the nation where we begin clinical rotations in our second year. In addition to our course work, we also complete a community health project addressing health disparities faced by our respective community. Initially, our group decided to conduct a needs assessment of Tulare County, CA to better personalize our project's goals. Using the Health Resources and Services Administration, we investigated the data provided by Family Healthcare Network, our partner community health center in California. The database contained various patient characteristics such as income/poverty status, age, top reasons for clinic visit, quality care measures and chronic disease management. Our assessment concluded that the top two reasons that patients in Tulare County visited their primary care physician was due to hypertension and diabetes. Given that these two comorbidities are associated with obesity, we decided to take an upstream approach and increase awareness in the younger population to decrease obesity rates along with its associated comorbidities. We also hoped that by mentoring students who are transitioning from elementary school to middle school in an underserved area, we would be able to instill a message that they can teach to their peers and further promote healthy lifestyle choices throughout their lives.

Approach

Our initial assessment of the community, identified obesity to be a major public health concern in the Central Valley, increasing communities' risks for heart disease, diabetes, cancer and stroke. Among those counties composing the Central Valley, Tulare county boasts the highest rate of obesity in both adults (38%) and adolescents (47%). Additionally, through multiple interviews with community members we found that nutrition, physical activity and mental health to be topics lacking most in the health education curriculum taught in Woodlake Unified School District. We approached these findings with the intention of fulfilling two main tenets of quality population medicine—education and empowerment. We targeted fifth graders assuming that a younger population will still have the ability to change unhealthy habits. The students can then promote healthy decisions as they transition from elementary school to middle school thus contributing to sustainability of this program. The study involved completing six one-hour sessions addressing topics mentioned above to a classroom of fifth grade students at Castle Rock Elementary School during the after school program. Prior to each session, a pre-test was given to assess the baseline knowledge of our students. The final session concluded with a post-test to assess students' knowledge about the material presented. Data analysis involved using a paired t-test to compare the results of the pre and post-tests to assess retention of information pertaining to living a healthier lifestyle.

Outcomes

Results: This project had both quantitative and qualitative outcomes. The quantitative data was measured using the pre- and post-tests that were given to 24/400 fifth-grade students. The students returned 20/24 pre-tests (n=20) and 15/24 post-tests (n=15). Paired t-test analysis of the results showed that students' knowledge of the topics covered had improved significantly (P value=0.0100). Qualitative outcomes included students who perceived themselves as leaders in the community with the ability to empower others using their newfound knowledge. Additionally, students were given goal setting tools and exposed to paths in higher education to motivate them to pursue their full potential. The following are student responses shared with mentors after a few of our sessions: "One day, I want to be a medical student, so I

can help fix people like you guys!" "I joined the soccer team today because now I know that playing helps my heart be strong!" "I talked to my grandpa about his diabetes last night. He only had 2 cookies instead of 5!

Limitations: Although this project had instrumental impact in the community, the small sample size of students served as the biggest limitation in this study.

Future Research: Future research may be indicated to investigate these effects in a larger number of students with incorporation of age appropriate topics for that respective population. Moreover, an interesting approach would be measuring the effects of the student's teachings to the community by asking students to teach their guardians lessons they have learned and analyzing results of a survey returned by the guardians.

Impact on the health system

Chronic conditions such as obesity, diabetes and hypertension are leading causes of death across the nation. Preventive services that utilize campaigns, community fairs and educational modules can help promote disease prevention or delay onset of associated co-morbidities. Unfortunately, many communities do not have access to adequate care due to financial barriers and lack transportation and are not aware of available resources. Our project was designed to identify such barriers and implement methods to help overcome these obstacles. Our modules were designed to not only teach students about the pathophysiology of disease but also emphasized the importance of utilizing community resources to prevent initiation or progression of chronic disease. For example, during our nutrition sessions we taught students about adequate diets but also mentioned local farmers markets and community gardens where they can purchase or grow fresh produce. Additionally, we persistently made an effort to bring educational pamphlets from our school's partner Family Healthcare network to help establish patient/provider relationships and demystify any assumptions about visiting the doctor's office. We hoped that our mentorship would increase prevention and awareness but also encourage students to pursue higher education, thus increase diversity among future working professionals. Truthfully, our project was only the start of a promising primary prevention campaign in Tulare county. However, we believe that this program has potential for sustainability and can continue to impact the health system on a bigger scale. By sharing our results and methods, we hope to inspire other future health care providers to implement similar concepts in their communities.

Personal Impact

"Growing up in California's Central Valley entails its own unique set of challenges. This project provided me valuable insight into ways that I can better tailor my practice to help my community" fellow author Jaberpreet D states. Our project was intended to have a lasting effect on the students of Castle Rock Elementary School and the community at large. By working toward this goal the past few months, we have been fortunate enough to gain important perspectives that will be instrumental in our future careers as physicians. Chaudy S mentions "teaching students about their health and having them teach back to others has demonstrated the power of education in the health care system." Rachelle Y and Evgenia R add, "in our future practice we are going to make an effort to promote healthy lifestyles and disease prevention among the younger generation, considering how receptive they are to change." Harman V and Anmol B's perspective reflects the importance of primary prevention in health care: "we now have a better understanding of how to implement preventive measures on a larger scale and can personalize care to better meet the needs of future patients." In conclusion, our outcomes would not have been met had it not been for the fluidity of our team. Khadij A and David Z comment on our teamwork: "we learned to consulted each other, respect everyone's opinions, and use each individual's strength to create our final product." Furthermore, Kimia E and Christina L would like to mention that "this project was done while having fun, sharing laughs, and creating some our best memories in medical school!"

Veggie Rx

Medical Student
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Teammates
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Faculty Mentor
Karen Lin, MD, MS, Family Medicine and Community Health

Abstract
Food insecurity is both detrimental and widespread throughout the state of New Jersey. In response, VeggieRx was created as a collaboration between Promise Clinic, a student run free clinic under Rutgers Robert Wood Johnson Medical School's Homeless and Indigent Population Health Outreach Project (HIPHOP), and the New Brunswick Community Farmers Market (NBCFM). The VeggieRx program "prescribes" $30 worth of vouchers to patients who can redeem them at NBCFM for fresh produce. The goal of this initiative is to ameliorate the financial strain of produce, to provide patient education through nutritional teaching sessions and to perpetuate the idea of food as medicine. The impact of this initiative was evaluated by tracking patient use and collecting qualitative data about the experience to assess the effect on patients' dietary habits, nutritional knowledge and unaddressed needs. The project is undergoing final data analysis that aims to elucidate the full scale of Veggie Rx's impact.

Project addressed/Problem discovered
The U.S. Department of Agriculture lists two regions near New Brunswick, New Jersey that are labeled as food deserts, defined as regions where a significant number of residents are more than one mile from the nearest supermarket. A 2016 community survey executed by the Rutgers Eagleton Institute of Politics showed that 39% of New Brunswick residents say "there have been times in the past 12 months when they did not have enough money to buy food that their family needed." Additionally, 50% of all residents report that their household can "sometimes" afford enough to eat "but not always the kind of food they should." Lack of access to healthy foods geographically and/or financially becomes detrimental to one's well-being and health—increasing the risks of metabolic dysfunction, chronic disease, obesity and mental illness. Ecological models of population health highlight that to effectively prevent chronic disease, the community must offer healthy food options. In response, the VeggieRx initiative was born to address the need for both the affordability and availability of fresh fruits and vegetables. Current government programs (e.g. Supplemental Nutrition Assistance Programs (SNAP) and Special Supplemental Assistance Program for Women, Infants and Children (WIC)) are offered only to those who meet specific eligibility criteria, and VeggieRx helps cover those who do not qualify. With almost half of residents stating they had times when they did not have money to buy food their family needed, VeggieRx hopes to begin to address this great need in combating food insecurity.

Approach
The Promise Clinic is a student-run free clinic that serves patients who are uninsured members of the New Brunswick community, recruited from the Elijah's Promise soup kitchen. Thus, all of our patients are currently experiencing food insecurity or have experienced it in the past, and therefore could benefit from the VeggieRx program. VeggieRx is introduced at regularly scheduled clinic appointments or by phone, and patients interested in participating provide consent and complete a brief pre-intervention survey that captures baseline dietary habits and access to affordable fresh produce. Participants are provided a written "prescription" for $30 worth of "Market Bucks" that can be redeemed at any of the three locations of the NBC Farmers Market. The Market Bucks serve as vouchers that can be used to exclusively purchase fresh fruits and vegetables. Patients can earn an additional Market Buck by participating in an educational program developed by the Rutgers Department of Nutritional Sciences at the NBCFM. After using the prescription, patients follow up with their Promise Clinic care team and complete a post-intervention survey. To evaluate the impact of the VeggieRx initiative, the team tracked the use of VeggieRx prescriptions and the number of Market Bucks spent. Responses from the post-intervention survey were used to assess patients' experiences at the market and compare this with baseline data. Outcome measures include impact on patients' dietary changes, nutritional knowledge and eating habits.

Outcomes
Quantitative primary outcomes include number of VeggieRx "prescriptions" filled, number of Market Bucks spent at the Farmer's Market, nutritional sessions attended, frequency per week of produce consumption and changes in diet composition. Qualitative primary outcome measures include information regarding barriers to food access, patients' experiences with the program, subjective assessment of healthiness of diet, attitudes toward farmers markets, household division of produce consumption and expressed needs. Long term outcomes to study will include biometrics such as BMI, blood pressure and blood sugar, as well as other health outcomes which serve as proxy for cost reduction such as emergency department visits, number of medications, and cost of medications. Based on pilot outcome measures, the team will initiate future goal-directed improvements. These outcomes will guide future goals for VeggieRx, which include expanding the prescription program to allow for multiple "prescription refills" for patients and their families. Additionally, future goals include launching a long-term program in collaboration with the local grocers (eg. ShopRite, SuperFresh) to transport food to areas lacking access, creating multiple

VeggieRx access points in alternate locations throughout the year. Based on patient survey responses, the program will be tailored to the most pressing needs expressed by each patient and/or their family.

Impact on the health system

According to Centers for Disease Control and Prevention data, more than 90% of the $3.3 trillion in annual health care expenditures can be attributed to chronic health conditions. Of the many known risk factors for common chronic diseases such as hypertension and diabetes, lifestyle is the most pliable. Other similar prescription produce programs have shown actual cost reduction as well as improved biometric outcomes which can be correlated with better long-term health outcomes. The traditional model leaves pockets of local communities outside of the health system. This needs to be redrawn to one that redefines and includes non-traditional means for achieving health. An essential aspect of the VeggieRx program is the collaboration with existing community resources. VeggieRx expands the classic model of the health care system (clinic, hospital, medical school, etc.) to existing resources promoting a more robust dedication to health and wellness in New Brunswick. VeggieRx should be but a single step away from a reactive health care system and toward a proactive system that promotes wellness in the local population. Our patients are connected to local affordable food vendors that they and their neighbors can continue to shop at even without VeggieRx vouchers. RWJMS's resources and educational initiatives are paramount to VeggieRx's success. Furthermore, partnering with Wellness on Wheels (WOW), a mobile health education service, will maintain and promote the educational component. The expansion of VeggieRx will continue to combat the local burden of chronic disease and obesity that plagues communities and health care systems through the promotion of a wholesome approach to sustainable health.

Personal Impact

VeggieRx was born from the intimate connection between the Promise Clinic and our community partner, Elijah's Promise Soup Kitchen. Twice a week, medical students visit Elijah's Promise for blood pressure screenings, health workshops and to recruit uninsured community members to receive free medical care. Our student founder, Josh Gilens, who helps at these biweekly visits to the soup kitchen, was struck by the two versions of New Brunswick that RWJMS students are exposed to—a blatantly clear division between those who can and those who cannot access health care, shelter and food. During clinic visits with our patients, we assess vital signs and labs, prescribe medications, and recommend lifestyle modifications, but it's painfully obvious inside and outside the clinic how many social barriers exist for our patient population. Our school does an exceptional job at embedding its students in the community. It's clear that the responsibility of health providers for making healthy communities extends beyond the clinic. The students of RWJMS never have to reach far for healthy food options. For us, it is simply logical to try to extend this access to our patients—mothers, fathers and New Brunswick community members. We yearn to share not only the nutritional benefits, but the pleasures of eating fresh and wholesome foods. The VeggieRx program is our most large scale attempt at tackling social determinants of health—but it is just a start. Along with expanding the program we hope to take on other social factors in the future, such as transportation, housing and child care.

Exploring Barriers to Care and Improving Blood Pressure Control Through Integration of Health Technology and Self Care Management at Watts Health Center

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Abstract

Hypertension is a disease which can lead to stroke or heart disease, both being leading causes of death in the United States. The Watts neighborhood has the third highest percentage of adults diagnosed with hypertension in Los Angeles County. The purpose of the study was to help patients with uncontrolled hypertension take an active role in their health care using self-care management by enrolling them in a blood pressure self-management and education program (BPSMEP). The program addressed barriers patients with uncontrolled hypertension experienced in managing their blood pressure along with the barriers Watts Healthcare Corporation faces managing these patients to aid in the delivery of care. As a result, 71% of the patients showed a decrease in their blood pressure values. The BPSMEP was an intervention created based on patients' barriers to care and motivational interviewing which aided patients in changing their lifestyle behaviors and reducing their blood pressure.

Project addressed/Problem discovered

Hypertension is a disease which can lead to stroke or heart disease, both being leading causes of death in the United States. The Centers for Disease Control and Prevention report that 1 out of 3 adults in the U.S. have high blood pressure but only 1 out of 3 adults have it under control. The disproportionate number of people with uncontrolled hypertension can be the result of many factors from access to health care to awareness of the disease. The social determinants of health are the conditions in which people are born, grow, live, work and age that shape health. Factually, socioeconomic status has been recognized as the most powerful social determinant of health and socioeconomically disadvantaged groups have the highest risk for cardiovascular disease from greater exposure to smoking, higher incidences of atherosclerotic diseases such as obesity and diabetes, stress, poor working and living conditions, and low levels of formal education. The Watts neighborhood is located in the Los Angeles Department of Public Health (LADPH) Service Planning Area 6. Watts has a population with the majority of residents identifying themselves as being Latino (69.85%) and Black (28.61%). Among the health indicators reported by the LADPH, Watts has the third highest percentage of adults diagnosed with hypertension in Los Angeles County. Watts Heathcare Center (WHC) is a patient-centered medical home with a full range of services including preventive, behavioral and specialty care services. Although Watts residents have access to care through WHC, there are still a large number of patients with uncontrolled hypertension. The purpose of the project was to address social determinants of health when identifying patient barriers' to care to aid in the creation of individualized blood pressure self-management plans to help patients control their blood pressure. In addition, the project addressed challenges faced by the WHC community health center to aid in managing patients with chronic conditions.

Approach

Watts Health Center's electronic health record system, eClinicalWorks, was queried for patients diagnosed with hypertension (HTN) with diabetes mellitus and hypertension only with blood pressure (BP) ≥ 140/90. They were contacted to join the Blood Pressure Self-Management and Education Program (BPSMEP) via email, text and phone calls. Patients were also offered an incentive for participating in the program. The BPSMEP had three major components, patient education, self-management and progress tracking. Patients were given a one-on-one hypertension education session in their native language. WHC and patient barriers were explored by asking a set of questions to gain information on patients access to care, blood pressure medication, transportation, healthy foods, rate of physical activity and life stressors. Lifestyle goals were chosen by the patient using motivational interviewing. For self-management, patients were instructed on how to measure and record their blood pressure at home with a digital blood pressure monitor. Patients were grouped into a 2-week or 3-week BPSMEP based on their start date and patient progress was tracked by using weekly follow-up calls. Patients were encouraged to complete the program and to maintain their lifestyle changes. During the return visit, patients returned their completed blood pressure log and digital blood pressure monitor. A final blood pressure was taken in clinic and patients were encouraged to continue the program and lifestyle modifications. WHC barriers were documented and presented to the quality improvement office as well the board of directors to address the identified challenges to managing patients with chronic conditions.

Outcomes

There were 17 patients who agreed to participate in the program however, 9 patients completed all BPSMEP components. Patients' ages ranged from 40 to 83 years old. Of the participants that completed the program, 5 identified as Black, non-Hispanic/Latino origin with an English language preference and 4 identified as White, Hispanic/Latino origin with a Spanish language preference. Group A consisted of 5 participants, 3 females and 2 males, with hypertension only. Group B consisted of 4 participants, 2 females and 2 males, with hypertension and diabetes mellitus. The most prevalent barriers to care identified for WHC were limited resources, clinic hours, no continuity of care and

patient distrust in the health care system. The most prevalent barriers patients reported for controlling blood pressure were stress from home environment, diet, lack of exercise, addiction to smoking and not taking medications as prescribed. The major lifestyle modifications patients elected to implement during the intervention were exercise, diet, stress management, avoiding or limiting smoking and taking hypertension medication as prescribed. Overall, 71% of patients showed a reduction in both systolic and diastolic blood pressure values from baseline. Patients in Group A had the greatest reduction in both systolic and diastolic BP values from baseline. Patients in Group B experienced more difficulty with controlling their BP due to an increase in vascular events from both of their chronic conditions, hypertension and diabetes. The use of self-management and motivational interviewing aided patients in changing their lifestyle behaviors and reducing their blood pressure.

Impact on the health system

The Blood Pressure and Self-Management Education Program's (BPSMEP) objectives, methodological approach and findings significantly impact Community Health Centers (CHC) and how they provide care for patients. Similarly, medical providers can benefit from these clinical research findings to see the benefit of incorporating new techniques in motivational interviewing and self-care management in caring for patients with chronic conditions as well as the benefit of acknowledging the impact social determinants of health have on their patient populations. Self-care management and motivational interviewing are methods to empower patients with chronic conditions to set their own goals and take an active role in their health. Understanding and acknowledging the barriers patients experience with controlling their blood pressure will allow Community Health Centers and medical providers to identify what social determinants of health may be impacting the patients access to care and/or fulfillment of care. Once these factors have been identified, a plan of treatment can be adapted to care specifically for the patients' individual needs, including the use of enabling and preventive services the CHC has to offer to aid in helping the patient manage their blood pressure. Understanding the barriers CHC's experience with controlling patients' blood pressure gives health care administrators the opportunity to assess patient barriers to receiving care and create a plan to alleviate these concerns. Barriers such as clinic hours, limited resources and continuity of care can be addressed to aid in the accessibility and delivery of care along with establishing a trusting relationship with patients.

Personal Impact

It was truly an honor to work with Watts Healthcare Corporation (WHC). I learned about the history of Watts as a teen, I was told about gang violence, the Rodney King incident and the Watts riots that followed. I was excited and eager to have my own experiences and learn about the Watts community from a different perspective as a WHC clinical research intern. WHC's stone-walled building was rich with history. I was shown a cluster of clear stones encased in marble. The stones were pieces of molten glass from the rebellion known as the "Watts Riots". These were historical artifacts from a time in history which helped shape one of the first community health centers (CHC) in the nation. WHC became one of the first CHC's to fulfill the need of health care for many when access to care was denied simply because of one's race. The most gratifying part of my experience was working with patients in the Blood Pressure Self-Management and Education Program. The conversation in most quality improvement offices discuss the lack of patient compliance. It was fulfilling to address the social determinants of health that impact patient care to investigate how CHCs and providers can help patients fulfill their plans of treatment and "comply." The feeling of knowing that I helped change someone's life by empowering them with knowledge and motivation to take charge of their health was rewarding and makes me eager to continue these methods of patient care as a physician.

Impact of Distance on the Presentation, Treatment and Outcomes of Lung Cancer Patients in the Northern Plains

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Abstract

To examine the impact of distance to a cancer treatment center on the presentation, treatment and outcome of non-small cell lung cancer (NSCLC) patients. We reviewed medical charts of patients newly diagnosed with NSCLC at a community hospital in Grand Forks, ND. Travel distance was defined as distance from the patient's primary residence to the treating cancer center using complete street addresses and the fastest road-travel route mapped on Google Maps. A total of 163 patients with NSCLC were analyzed. The average distance traveled to the treating cancer center was 48.5 miles. Bivariate analysis revealed no association between travel distance and patient's demographics, risk factors for NSCLC or tumor stage at diagnosis. Chemotherapy (p-value = 0.004) and radiation therapy (pvalue = 0.038) were significantly associated with travel distance. There was no association between travel distance and survival status. Providing transportation to patients may help complete the recommended treatment regimens.

Project addressed/Problem discovered

Cancer deaths decrease annually across the nation, but not equally. Rural communities suffer from lack of access to health services compared to urban areas and bear a disproportionate burden of preventable cancer deaths. North Dakota is the 47th least populous state in the U.S. with 38 of the 54 counties having a U.S. Department of Agriculture population designation code of completely rural. Therefore, as a truly rural state, North Dakota faces unique challenges regarding cancer detection and management. Residents in rural counties have a higher lung cancer mortality than those in urban areas. Results from the SEER program showed that lung cancer incidence was 29.8% higher and mortality was 20.3% higher in rural compared to metropolitan counties. Despite these disparities in lung cancer morbidity and mortality, few national level priority-setting initiatives have encouraged research on lung cancer in rural populations. Therefore, we sought to determine whether travel distance impacted stage at diagnosis, the treatment received or survival status in a rural state. The United States Preventive Services Task Force (USPSTF) assigned grade B recommendation for lung cancer screening. Surprisingly, we found that only 5% of the patients who were eligible for USPSTF recommended low-dose computed tomography scan lung cancer screening actually received it. This finding is an opportunity to remind clinicians of the importance of lung cancer screening for primary prevention.

Approach

We performed a retrospective medical records review of patients newly diagnosed with NSCLC between January 1, 2007 and December 31, 2016 at a community hospital in Grand Forks, ND. A total of 321 patients were identified. Patients with small cell lung cancer (mostly due to smoking and highly fatal), non-white race (racial makeup of the county was 93% White), recurrent cancers or multiple cancer diagnosis were excluded. A total of 163 patients with NSCLC were analyzed. Data included: age at diagnosis, gender, race, insurance status, stage at presentation, treatment modalities, number of days from diagnosis to treatment, length of time until last follow-up, survival status, low-dose CT lung cancer screening, low-dose CT lung cancer screening eligibility, smoking history, family history of lung cancer and travel distance from primary residence to treating hospital. Travel distance was defined as distance from the patient's primary residence to the treating cancer center using complete street addresses and the fastest road-travel route mapped on Google Maps. We created four travel distance (miles) categories: 0-10; 11-50; 51-100; and > 100. SPSS 24.0 for Windows was used to analyze demographic and clinical characteristics of patients. Frequencies and relative percentages were computed for each categorical variable. Chi-square tests or fisher's exact tests were performed to determine which categories were significantly different from one another. All p-values were two-sided, and p-value < 0.05 was considered significant. Institutional Review Board approvals were obtained from the hospital and the University of North Dakota.

Outcomes

163 patients newly diagnosed with NSCLC and no previous history of cancer were included. The average patient traveled 48.5 miles to the treating cancer center; with 41.1% traveling over 50 miles and 15.3% traveling over 100 miles. In bivariate analysis, there was no association between travel distance and demographics, patient risk factors or presentation. Surgical treatment was not associated with travel distance (p-value = 0.772). Rural residents have limited access to specialist interventions such as thoracic surgery which may explain why distance is not associated with surgery. Farther distance from the treatment center was negatively associated with radiation therapy receipt (p-value = 0.038). Only 20% of patients living more than 100 miles from the treating cancer received radiation therapy compared with 54% of those living 10 miles or less away. Patients (37.1%) living within 11-50 miles from the treating cancer center were less likely to receive chemotherapy compared to patients living less than 11 miles or more than 50 miles away (p-value = 0.004). There was no association between travel distance and survival status (p-value = 0.107) during the 8 years of follow-up.

Impact on the health system

Identifying a problem is the first step to solving it. This project was originally designed to identify health system disparities but is now being reimagined to combat them. Our research showed that rural patients received less or different therapy for their cancers than their urban counterparts. In the very rural state of North Dakota, patients regularly travel many miles to receive needed care, and they travel in harsh weather conditions (snow is not uncommon 6 months out of the year). This may impact the receipt and completion of the required therapies. The least received therapies, such as radiation therapy, carry the additional constraint of requiring daily consecutive delivery over many weeks compared to typically single-event surgeries. While we cannot change the geography, climate or modality specific best-practices, we hope to engage and educate clinicians in our community on the treatment-impacting barriers their most rural patients face. The fact that our research showed that only 5% of patients who were eligible for the USPSTF recommended low-dose CT scan lung cancer screening received it is an important action point in our health system. We are currently planning further work to address this by means of clinician engagement, assessment of attitudes toward screening recommendations and resource delivery.

Personal Impact

One of my earliest experiences with medicine and cancer was as a young adult. I was 15 and at the time I lived in a rural farming community about two hours from the nearest cancer center. My neighbor had recently been diagnosed with a recurrent form of breast cancer and had begun chemotherapy. I offered to sleep on her couch the nights her husband (a long-haul trucker) was away so she was not alone. I will never forget how useless I felt that first night; completely incapable of alleviating her suffering as she spent the night on the toilet clutching a trash can, moaning in pain. I was struck by how far away any real help seemed in our very rural setting. At the time, my presence was all I had to offer. But the desire to know more, to do more and help more never left me. Since that day rural cancer care has always been on my radar. When the recent Centers for Disease Control and Prevention report was published showing rural communities suffered a disproportionate burden of preventable cancers, I knew I wanted to gain a better understanding of the problem in our community and contribute to its solution.

A Helping Hand: Coordination and Implementation of a Hand Surgery Outreach for Underserved Populations

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Abstract
We increased access to specialized surgical care by providing free hand surgeries to uninsured or underinsured patients from Nashville's free and low-cost clinics. We organize our outreach project in conjunction with the American Society for Surgery of the Hand's Touching Hands Project. Our hand outreach day was planned by an attending surgeon, a nursing clinical staff leader and a medical student. Patients were referred from free or low-cost clinics and were screened through Vanderbilt's student-run free clinic. Nineteen patients received free surgeries during two hand outreach surgery days. We identified key logistical challenges and developed strategies to minimize these barriers. Importantly, we formed strong collaborative partnerships with Vanderbilt providers and community providers, allowing us to better care for this underserved patient population. This project provides a unique opportunity for medical students, academic physicians and community physicians to work together to provide specialized surgical care to an underserved population.

Project addressed/Problem discovered
There are many barriers for physician volunteerism, including high levels of burnout, unique challenges of underserved populations, liability concerns and inadequate supplies or staffing. These barriers may be exacerbated in a surgical setting, and thus many free clinic patient populations lack adequate access to specialized and definitive surgical care. Vanderbilt's student-run free clinic, Shade Tree Clinic, has a monthly orthopaedics/physical therapy clinic which sees patients with various musculoskeletal conditions. While conditions like carpal tunnel syndrome are very common, they are typically treated conservatively with physical therapy or bracing, due to a lack of surgical care opportunities. These conditions are highly debilitating to our patient population, as they can cause significant pain and can prevent patients from working or from completing their daily activities. Uninsured or underinsured patients already face significant socioeconomic challenges and cannot afford specialized surgical care. We address this need by organizing an annual hand surgery outreach day to provide free hand and upper extremity surgeries to Nashville's underserved patient population. By involving a student-run free clinic as well as a teaching institution, this outreach is a phenomenal opportunity for medical students and academic physicians to directly impact patients in the local community.

Approach
The American Society for Surgery of the Hand's Touching Hands Project has historically led medical mission trips to third world countries. More recently, the Touching Hands Project has begun to host domestic missions. In 2017, Vanderbilt University Medical Center became the second domestic site. In addition to the general logistical challenge of highly specialized surgical care, we quickly realized that our outreach would also have the challenge of coordinating surgeries for a patient population with unique barriers to care. We initially screened patients through Vanderbilt's student-run free clinic, Shade Tree Clinic, since all patients are eligible for charity care. The Shade Tree clinic director also contacted several area free clinics to identify additional patients with hand or upper extremity conditions. Patients were seen on specific clinic dates by a hand surgery team comprised of medical students, residents, a fellow and an attending physician. The hand surgery team determined the patient's surgical candidacy as well as whether he or she will need further imaging or diagnostic studies. Patients who needed additional imaging or diagnostic studies had these tests scheduled and completed at Vanderbilt since Shade Tree Clinic does not have these studies available on-site. Several patients were also screened in a hand surgery clinic at Vanderbilt, which provided imaging at the time of the clinic visit. Eligible patients were scheduled for surgery on an annual date. On the surgery date, 30-40 Vanderbilt volunteers, including attending physicians, residents, medical students, nurses, scrub techs and housekeeping staff, gathered on a weekend day at an outpatient surgery center to perform the surgeries. Operating room space, supplies and liability coverage were provided by Vanderbilt. Patients were seen for post-operative follow up by a Vanderbilt attending surgeon in his clinic.

Outcomes
Our team has organized annual hand surgery days for the past two years (2017 and 2018). Patients are referred from four different free or low-cost clinics located in the Nashville area. Nineteen patients have received free hand surgeries. Cases include carpal tunnel release, trigger finger release, ulnar nerve decompression, proximal row carpectomy and distal radial osteotomy. Notable patients include a housekeeper with a trigger finger that previously made it difficult for her to grip her vacuum or to complete her cleaning duties. We also performed an AC joint reconstruction on a patient who was assaulted and sustained an AC joint dislocation, causing him to lose his job and subsequently become homeless. As these cases demonstrate, hand and upper extremity conditions can have a significant impact on patients' quality of life and broader socioeconomic status. By addressing these conditions, we hope to not only improve our patients' pain and debilitation, but also to improve their broader quality of life by allowing them to more fully engage in society. On a large-scale level, we have built strong

connections with providers at multiple Nashville free clinics which has allowed us to broaden the scope of our outreach. We are particularly excited about encouraging other physicians and medical students to participate in similar outreaches, so we also share our experience via blog posts on the Touching Hands Project website and a journal article in *Journal of Hand Surgery*.

Impact on the health system

The hand surgery outreach day has truly transformed treatment options for Shade Tree Clinic and other Nashville area free clinic patients with hand and upper extremity conditions. These patients are now able to see specialized orthopaedic providers and receive definitive surgical treatment for their debilitating conditions. Since many free clinic populations lack access to surgical care, we believe that our outreach fulfills a very unique need for this population. This outreach also demonstrates that charity care is an important and attainable endeavor for any specialty, even for sub-specialized disciplines like hand orthopaedics. We hope our outreach exemplifies that physicians of all specialties are distinctively poised to provide much needed care to underserved populations. Conducted at an academic medical center, this project can also serve as a model for involving medical students and residents in the planning, logistics and implementation of a specialized surgical outreach. Our outreach is a structured way for academic medical personnel to engage in charity care to meet local needs and connect with their local community. We hope that our experience will encourage other academic medical centers to organize similar outreaches, as we have found that a student-run free clinic is an excellent way to identify and screen patients. Moreover, our outreach is conducted at an academic outpatient surgery center with the logistical, staffing and supply support provided by the academic institution, demonstrating the strong potential for academic involvement in caring for the community's needy patients.

Personal Impact

This hand surgery outreach opened my eyes to the dearth of surgical care options for uninsured or underinsured patients. I am now much more cognizant of the necessity for physicians of all specialties to utilize their specialized skills to serve needy populations. Regardless of my future specialty, I hope to be involved in similar outreaches to provide specialized care to underserved patient populations. On a more personal level, my faculty mentor, Dr. Lee, gave me a great deal of autonomy and responsibility in the planning of the hand outreach day. I am deeply grateful for this opportunity as I feel it has been a formative and transformational part of my development as a physician and a professional. I tremendously value the opportunity to creatively brainstorm and problem-solve as we plan and execute this project with its accompanying barriers and successes. I am also very thankful to be able to work with such an incredible team of professionals at Vanderbilt and at Shade Tree Clinic, but also with community providers across Nashville. I have learned so much from them about the logistics, challenges and rewards of caring for a disadvantaged population and it is truly an honor to collaborate with them. This outreach project has confirmed my commitment to identifying and meeting specific, specialized medical needs in my future practice and has emphasized the impact that a small team of dedicated professionals can have on their city's health system and beyond.

Student Run Free Clinics Impacting Communities through Mobile Primary Care: A Descriptive Report

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Abstract
Since its founding in 2011, Morehouse School of Medicine's Health Equity for All Lives (MSM H.E.A.L) Clinic has played an integral role in developing student commitment to serving the underserved and exposing medical students to the clinical setting. Through the dedication and leadership of a diverse team of students and professionals, the H.E.A.L Clinic has expanded from one location at its inception to operating three locations in the city of Atlanta and a newly implemented H.E.A.L on Wheels Rural Mobile Clinic. There are many health disparities and barriers to accessing quality health care in the state of Georgia. H.E.A.L. on Wheels was founded to address those barriers and provide a model for addressing similar barriers in other communities throughout the nation. As a medical student and director for H.E.A.L. on Wheels, I have had the opportunity to engage with diverse professionals and organizations to promote more equitable health outcomes in my community. The purpose of this descriptive report is to demonstrate how the MSM H.E.A.L Clinic identified the need for expansion of health services to communities with limited access to health care within the state of Georgia and addressed that need by harnessing innovative financial and community resources.

Project addressed/Problem discovered
In Georgia, lack of Medicaid expansion has placed an undue burden on hospital emergency departments throughout the state. The need for primary care in populations that cannot afford adequate insurance is the basis for the expansion of the H.E.A.L. Clinic. This has been efficacious in increasing its capability for seeing a larger number of patients. Though a major determinant of health outcomes, lack of insurance is not the only consideration when looking at medically under-served populations. Physical access to health care is an impactful social determinant of health in the U.S. According to the Georgia Department of Community Health, there are currently 146 medically under-served areas/populations within the state of Georgia. These areas are characterized by limited access to health care services and shortage of physicians. An example of this is Meriwether County, a rural community located 50 miles from Grady Memorial Hospital (the only level 1 trauma center in a 100-mile radius) and the focus of our mobile clinic outreach efforts. Meriwether county ranks at 88th out of 156 counties for health outcomes and has sparse community health clinics located in 20-mile intervals (Warmspringsmc.org, 2012).

Approach
The Georgia Baptist Healthcare Ministry Foundation awarded us a grant to obtain sufficient funds for purchasing the necessary equipment and renting the mobile unit to conduct a mobile clinic. This foundation has played an instrumental role in the development of health care in communities by funding and developing hospitals throughout the state. With the financial aspect solved we proceeded to locate key community and institutional partners to develop a plan for the H.E.A.L. on Wheels mobile clinic implementation. We contacted local health officials and organizations to identify optimal locations to conduct H.E.A.L. on Wheels. Once located and identified contracts were drafted to partner with community leaders and institutions, outlining the responsibilities and liabilities of both parties. A workflow diagram was created to establish the most efficient environment and optimize the patient experience. The H.E.A.L. on Wheels team continues to conduct outreach and improve our efforts in reaching the rural community as well as all those who cannot access health care due to lack of transportation or geographical distance. We aim to expand rural mobile clinics in other counties and cities across Georgia as well as continue our work in Meriwether County throughout the course of the academic year.

Outcomes
On July 14, 2018 the first H.E.A.L. on Wheels mobile clinic was conducted within the Atlanta perimeter at the Pentecostal Temple Revival Center in partnership with the local community. This clinic served a two-fold purpose of establishing access with a local underserved community and reveal the challenges we might face once in the rural setting. Throughout the day, many challenges in logistics and resources were made clear. However, with the support of the church and nearby community health resources we were able to serve 11 patients during the inaugural session. Following the first mobile clinic, the H.E.A.L. on Wheels leadership team conducted several trainings for the medical students and volunteers to improve patient numbers and patient care delivery in Meriwether County. After connecting with the regional Department of Public Health, conducting a county visit, and establishing a relationship with the local community, we were able to identify a location for rural H.E.A.L. on Wheels mobile clinic. The Department of Public Health partnered with us to provide HIV/HCV screenings, and we provided patients with blood pressure monitoring and education, diabetes screenings and primary care services. A representative from Family Connect and the mayor of Meriwether County attended to support and promote H.E.A.L. on Wheels. We were able to serve 11 patients during the first rural clinic on September 29th. Since its launch in July 2018, the H.E.A.L. on Wheels mobile clinic has served more than 40 patients within the Atlanta perimeter and in Meriwether County. Of patients we served at the initial rural H.E.A.L. on Wheels mobile

clinic in Meriwether County, 100% reported receiving excellent care, and 88% reported preventive care or chronic medical conditions as the reason for their visit. These results support our assertion of the necessity of mobile health care in populations that have no or limited access to health care. We aim to serve 250 patients through H.E.A.L on Wheels in the 2018-2019 academic year and collect more data on their general need for health care resources as well as feedback on the quality of health care received from H.E.A.L. on Wheels. Additionally, H.E.A.L. on Wheels has engaged 20 medical student volunteers and four public health student volunteers both in the planning and execution of each mobile health clinic. Five of these medical student volunteers have undergone official training for point-of-care glucose testing and blood pressure monitoring. These medical students are then tasked with training their colleagues in these same skills and continue involvement with H.E.A.L. on Wheels. Teaching other students serves the additional purpose of promoting service as an integral part of medical education and providing valuable onsite clinical experience and skills to pre-clinical medical students.

Impact on the health system

Primary health care is instrumental in providing the preventive services this country needs in order to lessen the burden on our health care system. By enabling easier access to primary health care, we are intercepting potentially devastating health issues in their early stages and aiding in the evolution of a healthier community as well as reducing the national debt. Though the number of patients we serve is relatively small, with continued growth and replication of these efforts' nationwide, the impact that we could have on future health outcomes is immeasurable. For example, one of our patients visited the emergency department multiple times in a few months for recurring exacerbation of heart failure. After discussion, the patient was noted to have improper use of his medications and lack of education about the disease process. These frequent admissions could have been prevented by regular visits to a primary care physician to monitor medication doses, ensuring adherence and educating patient on necessary lifestyle modifications such as decreasing fluid intake. By making health care available to patients who have limited access, we are able to decrease the expense of emergent health crises, both on the system and on the individual, and promote a better quality of life for the patient. In addition to promoting healthy communities in the state of Georgia, we are providing future student run free clinics and other health care institutions with a model for impactful primary health care. H.E.A.L. on Wheels can serve as an example of how to effectively reduce barriers to health care access and providing quality health care at a lower cost. In this way, we have a potential impact on communities throughout the U.S.

Personal Impact

As an undergraduate at the University of California, Davis, I was heavily involved in leadership within the student-run free clinic system. I was the coordinator for the annual Mobile Mammography Clinic for the Willow Clinic, serving the homeless population in Sacramento and founded the Smoking Cessation Program at the Willow Clinic. These experiences allowed me to develop my organizational skills and fostered a passion for serving the under-served. However, I was not challenged to play an integral role in the establishment of a health care system until I accepted the role of student director of the H.E.A.L. on Wheels mobile clinic. Through my role I have discovered the importance of the community and collaboration with diverse community groups in health care. The impact that H.E.A.L. on Wheels has made thus far could not have been accomplished without the support of community institutions like the Pentecostal Temple Revival Center, the Ingles grocery store in Woodbury and the Meriwether County Department of Health. I have learned that the journey to health equity involves many individuals and groups outside of the health care profession. Additionally, I have learned how to engage with those personnel to achieve maximal impact. Finally, I have realized the importance of education and empowerment in all communities. For example, the individual with heart failure who simply needed teaching on how to properly take his medications in order to prevent his critical complications, through communication and explanation, we were able to provide him improved health outcomes without contributing to polypharmacy and preventing repeated hospitalizations. This experience was powerful; being able to impact the lives of patients through empowering them with the knowledge they need to promote their own health. Ultimately, my goal for H.E.A.L. on Wheels is to not only establish a recurring and reliable health care service but to also motivate local officials to address the need for expansion of local health care services in rural and under-served areas. References Stubbs, Chivon V. "Meeting the Needs of Our Patient Population: Morehouse School of Medicine HealthEquity for All Lives (MSM-H.E.A.L) SRF Clinic Expansion." Morehouse School of Medicine, Atlanta, GA, Department of Family Medicine. (2016). Warmspringsmc.org. (2012). Community Profile, Market Share Analysis and Needs Assessment. [online] Available at: http://www.warmspringsmc.org/CHNA/chna.pdf [Accessed 30 Oct. 2018]

Systems thinking

Innovation Activism in Medicine: Bringing an Engineering Mindset to Clinical Rotations

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Abstract

Vanderbilt's Medical Innovation Development Program (MIDP) trains medical students with a PhD in engineering or applied sciences to become physician innovators through novel coursework. Innovation Activism (IA) is a course designed by the charter class of two MIDP students that trains the next generation of thought leaders while disrupting current medical education practices. Specifically, during the clerkship year, MIDP students utilize their engineering backgrounds to intentionally observe and identify where medical practices fall short of efficiency or delivering quality care. As a result of the course, students identified over 20 diverse needs on six unique rotations. In a final IA symposium to the medical community, MIDP students formally presented their experiences and shared a template for the needs-finding process. Through this call-to-action, MIDP students inspired their community to innovate and empowered them with tools for continuous quality improvement in the health care system and beyond.

Project addressed/Problem discovered

Health care, often for fear of unintended consequences, is slow to adopt change. For example, health systems classically resist implementing new technologies that could improve clinical outcomes or system efficiencies. This conservative approach to change pervades medical education as well. This may generally be appropriate; a conservative approach tends to favor proven methods that are known to be safe and effective. However, a reticence to adopt innovation may also slow improvement. Additionally, due to the complex and regulatory-ridden nature of the health care industry, it is often difficult for external engineers or business administrators to advance the adoption of technological innovation in the health care system without provider buy-in. Innovation Activism (IA) is an approach to inspire system change that intentionally disrupts deeply-ingrained practices. The course was designed by the charter class of medical students in the Medical Innovators Development Program (MIDP) at Vanderbilt University. IA formalizes engineering coursework on clerkships by establishing a method to quantify daily observations of unmet needs. The goal of this course is to propel the health care industry appropriately into the technological age starting at the root of its foundation: medical student education. IA disrupts the rigid culture of health care from perpetuating "this is the standard of care" to asking, "can the standard of care be better?"

Approach

MIDP Students enrolled in their clerkship year identified and documented needs during each of six required rotations in Medicine, Surgery, Neurology, Psychiatry, Pediatrics and OB/GYN. To document these needs systematically, Clinical Quality Functional Deployments (CQFDs) were introduced to students' clerkship workflow. The CQFD is a process that utilizes all human senses (e.g., sight, smell, taste, touch and sound) to observe one's surroundings and subsequently consider other perspectives. These perspectives are combined in a quantitative matrix that correlates considerations from various stakeholders with measurable engineering parameters to adequately address concerns. Throughout the year, MIDP students and faculty reviewed the completed CQFDs together. All CQFDs were purposefully constructed around observed needs, without considering solutions. The goal of this approach was to prevent restrictions in design-thinking and to direct potential solution development in subsequent MIDP coursework. At the end of the year, an Innovation Activism symposium was held for the Vanderbilt community. The symposium detailed this design-thinking process and highlighted that intentionally including all senses in the observational process allows for viewing the clinical setting with a set of specialized "goggles." This approach equips students and diverse health care professionals with the ability to question and document inefficiencies in their everyday activities. The symposium also presented the tangible steps used to compile CQFDs as well as examples that were documented throughout the year. Finally, a template was created with instructions and made available for those within the Vanderbilt community to download and utilize, facilitating innovation and design-thinking across disciplines.

Outcomes

Throughout the course of the clerkship year, MIDP students identified and documented over 20 clinical needs from six required rotations. IA inspired conversations that increased awareness of the innovation mindset of both the student and the stakeholder (e.g., clinician, administrator, etc.). This facilitated development of the ACGME Core Competency of "Practice-Based Learning and Improvement." The flexibility of IA provides an opportunity to find and explore topics of interest in each of the clinical rotations. Students remain engaged while learning to discern between situation-specific complaints or ubiquitous frustrations in the health care system. This highlights the course's ability to not only develop "Systems-Based Practice" Core Competencies, but also systematically introduce ways to question the current approach to solving problems. Examples of needs identified include difficulties obtaining weight measurements in newborn pediatric patients

and being unable to perform a comfortable OB/GYN exam in emergent situations with standard hospital beds. The needs are further analyzed in subsequent coursework to be vetted for future research and development. These later courses include going back to key stakeholders identified in the early stages of CQFD development and continuing the discussion. At the IA symposium, MIDP students shared their design-thinking process with an audience of approximately 40 community members. These individuals collectively participated in vetting through an everyday example of a messy ice cream cone. Finally, the students made a CQFD template available to the Vanderbilt community. This was uploaded to a webpage that has been viewed 94 times in 5 months.

Impact on the health system

As previous graduate students in engineering and applied sciences, MIDP students are uniquely positioned to bridge the gap between health care and designthinking. IA creates a nidus of innovation communication to ripple across campus. As MIDP students are immersed in clinical workflows and identifying needs, conversations are started regarding why certain procedures and policies are in place. These conversations can be a quick exchange or rather complex and detailed. In every situation, beginning the discussion of why health care is done in certain ways helps to illuminate inefficiencies that may not be founded on scientific merit or best practices. Opening these dialogues moves the health system toward a structure that breeds innovation; one in which those embedded in clinical workflows are able to question their everyday roles. As MIDP students are often broaching difficult or sensitive topics regarding health care processes with busy medical professionals, it requires personal improvement in the ACGME Core Competency of "Interpersonal and Communication Skills" and "Professionalism." While navigating the best time to approach others or how to phrase questions considerately, students are inherently increasing their ability to open a line of communication with others in a respectful, professional and effective way. The charter class of MIDP students executed this novel mechanism to approach clerkships in medical education by overlaying engineering tools allowing the quantification of needs. This innovative mindset is of utmost importance as health care focuses on reducing costs through reducing inefficiencies and waste.

Personal Impact

As the charter class of MIDP, changing medical education through IA has been a transformative experience. It is an honor to be involved with a movement to bridge the gap between disruptive technologies and health care. IA trains students to intentionally observe the surroundings in which we work. We sought out different viewpoints and experiences, thus developing a new set of "goggles" through which to view our clerkship year. As students, we became valuable members of the clinical team while introducing productive discussions. This position allows us to better understand clinical needs and subsequent barriers to implementation. The "goggles" that we mature through the course empower us to develop the ACGME Core Competency of "Patient Care." By better understanding the needs of the patients and other key stakeholders, we are increasing our capacity for empathy and reverence in all clinical encounters. In preparing for our final symposium, we had the opportunity to reflect and summarize our experiences with IA throughout the clerkship year. This led to the realization that our perspective of everyday life had shifted to where we were seamlessly applying the CQFD process in our daily activities. During the final symposium, we highlighted this insight by guiding the audience through redesigning the common experience of the messy ice cream cone. This demonstrated that the CQFD process of analyzing needs can be applied to any situation, including the clinical workspace. IA is truly a course that inspires innovation activism with a goal of diffusing innovation-thinking throughout the health care system!

Value-based care

The Value Conundrum: a Student-Led Project on Incorporating HVC into UME

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Abstract

The Institute of Medicine estimates that waste consumes 30% of U.S. health care dollars. As the debate over health care costs continues, tests and procedures that can be eliminated without harming care quality deserves resolute attention from physician training programs. With evidence to suggest that high-value care (HVC) education is underrepresented in medical education, the student authors developed educational competencies for HVC specific to undergraduate medical education (UME). These competencies were used to guide the incorporation of HVC principles into learning activities at Eastern Virginia Medical School (EVMS). These competencies have been mapped to the Association of American Medical Colleges Core Entrustable Professional Activities for Entering Residents (AAMC CEPAER). A program evaluation tool has been developed for longitudinal monitoring of the impact of this pilot curriculum. The goal of this student-led initiative is to provide graduates with a strong foundation in high-value care allowing them to be change-agents.

Project addressed/Problem discovered

Excess and wasteful health care spending are well-documented in the literature, as are the far-reaching implications of unnecessary tests and procedures on patient outcomes. Despite this, the physician's responsibility in reducing health care costs has not fully been defined and is not effectively taught during medical school training or any stage of physician formation. Lack of a framework and consensus on curricular content to teach and assess may be reasons for this poor training. Our review of literature did not reveal agreed-upon undergraduate medical education (UME) competencies and/or curricular models on HVC. If left unaddressed, there is a real threat of future care providers not being adequately trained on ways to reduce cost and wasteful health care spending. The authors aim to propose competencies specific to a HVC curriculum targeted at UME and use these competencies to develop curricular content and assessment models.

Approach

This project was initiated with a review of existing curricula (of both undergraduate and postgraduate medical programs) and competency-based training involving Choosing Wisely and/or HVC. The authors then proposed a competency-based model for Choosing Wisely. The authors used Kern's six-step approach as a strategic framework for the needs assessment, design, implementation and evaluation of HVC curriculum at EVMS. Using the previously published Choosing Wisely Competencies for Clinicians as a basis, the student authors worked with their faculty mentor and an instructional designer to adapt the competencies to UME level learners. The next step was to map each of the competencies to AAMC CEPAER in an effort to demonstrate relevance to the EPA framework and to justify the need for entering residents to be trained in providing HVC. In addition, the student authors convinced the school to assign one of the elected class representatives to serve as a Choosing Wisely representative, who will be tasked to meet with the faculty and advocate for inclusion of Choosing Wisely recommendations in relevant case-based sessions. The Choosing Wisely UME competency framework will serve as an easy-to-follow guide on the depth and breadth in which the HVC topics will be covered.

Outcomes

The competency model consists of knowing "why," "when" and "how" to Choose Wisely and further defines these competencies with specific outcome oriented learning objectives. The proposed curricular model separates learning activities into these three competencies based on how well they align with the objectives of each competency. Each of the competencies can be addressed throughout the UME continuum. Using the competency framework, HVC threads can be incorporated into existing learning activities including didactic lectures, team-centered learning and case-based learning. The student authors were successful in jointly working with the clinical skills team to incorporate value-based discussions and Choosing Wisely recommendations into the standardized patient (SP) scenarios. The SP encounters are focused on having conversations about value and learners will be evaluated using checklists and feedback from encounters. The competency framework also inspired new learning activities that will augment student growth, including self-reflection. Throughout their UME training, including during their Longitudinal Generalist Mentorship (a clinical mentorship and observership program in years 1 and 2), students will be asked to reflect on high-value care practices (or lack thereof) that they have observed during their clinical experiences. An inaugural annual Choosing Wisely Day is organized for November. This student-led event includes a keynote by a well-known HVC physician expert from Johns Hopkins, opportunities to share Choosing Wisely recommendations with residents and collegial challenges to engage students at all levels in conversations on high-value care. Pre- and post- evaluations will be distributed for this campaign day.

Impact on the health system

By empowering our undergraduate medical trainees to identify value in health care, we hope to encourage them to ask more questions about value: to their patients, to their peers and to their faculty. This student empowerment hopes to facilitate bottom-up change promoting HVC at

EVMS and our community hospitals. One of the events during Choosing Wisely Day asks our UME interest groups to make a poster of the top five Choosing Wisely recommendations. The groups will take these posters to the resident/attending lounges to be displayed and to engage the attendings and residents in a conversation on value. By increasing awareness among our students of Choosing Wisely recommendations, we hope to establish a value-added role that allows students to use recommendations supported by medical specialty societies to advocate for patients. Ultimately, we hope graduates of this curriculum will practice cost-conscious care and will feel comfortable having conversations about value. These empowered students will challenge health care teams to maximize value and minimize cost. This project has also allowed students to work with faculty to redesign a specific thread in our curriculum. By allowing students to be involved in curriculum evaluation, design and implementation, we hope to help cultivate future leaders in academic medicine, particularly in health systems science. We hope the impact of our experience can extend to other institutions. Accelerating innovation in medical curriculum involves collaboration and sharing; we hope these competencies and/or our curriculum are of use to other institutions hoping to establish HVC curriculums.

Personal Impact

This project has impressed upon me the importance of empowering future practitioners with an understanding of value in health care and equipping them with tools they can use to combat low-value care. This project has required me to advocate that valuable educational time be allocated to address value in medicine. It has required me to ask my peers to look beyond material specific to USMLE Step 1 and challenge themselves to investigate critical issues in health care. Of the health care issues that we will inherit, reducing health care spending will be a prominent issue for the next generation of physicians. My mentors have allowed this project to be autonomously executed by the student leaders, but have been supportive throughout the process. Working with medical education has impressed upon me the importance of not simply what information is taught, but how it is taught. I have a newfound appreciation for the immense amount of effort that goes into planning and executing our curriculum. I was fortunate enough to begin designing and implementing this project during my first year of medical school and thus can follow the project longitudinally. The ownership and dedication I have for this project and for identifying how health care can be improved will stay with me throughout my career. In fact, this experience has made me certain that I wish to be involved in academic medicine at some level throughout my future career.

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