AMA
AMERICAN MEDICAL ASSOCIATION

Medical students, residents and fellows making an impact

Special COVID-19 Edition

Submissions to the 2020 AMA Accelerating Change in Medical Education Health Systems Science Student, Resident and Fellow Impact Challenge

Foreword

In 2013, with the aim of creating the medical schools of the future, the American Medical Association launched the "Accelerating Change in Medical Education" initiative. Having closely monitored the progress of the initiative over the past seven years, it is clear it has made a significant impact on medical students who are now well on their way to becoming well-trained physicians.

Today, a total of 37 schools (20% of all eligible U.S. allopathic and osteopathic medical schools) are now in the AMA Accelerating Change in Medical Education Consortium. These schools are educating nearly 24,000 students who will one day care for more than 41 million patients annually. Our efforts have also spread to residents. In 2019, we launched the AMA "Reimagining Residency" initiative, which includes 11 teams of educators working in graduate medical education.

With the launch of the **2020 AMA Health Systems Science Student, Resident and Fellow Impact Challenge,** our intent was to see if health systems science—which is one of the most important innovations to emerge from the consortium's work—was aiding efforts to combat the COVID-19 pandemic, especially since:

- Medical students were removed from most clinical settings
- Medical education was disrupted for almost all learners
- Health systems faced unprecedented systemic challenges

The entries that the challenge generated were astounding. They demonstrate that training in health systems science—the third pillar of medical education, along with the basic and clinical sciences—empowered medical students, residents and fellows to find meaningful ways to contribute to the pandemic response.

Covering a variety of topics, this book highlights a selection of submissions that show medical students, residents, and fellows moving rapidly in the face of a global crisis and devising innovative ways to trace the contacts of COVID-19 patients, provide childcare to the offspring of physicians and other health care professionals, serve as the conduit for information between patients' families and physicians, and manage the constantly changing information about COVID-19, to name just a few.

We are very proud that, not only did the AMA "Accelerating Change in Medical Education" and the "Reimagining Residency" initiatives make a difference in medical education, they made a difference in the lives of patients, communities, physicians and other health care professionals—as together we faced our greatest challenge.

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

Preface

During the COVID-19 pandemic health systems and medical education have faced unprecedented systemic challenges. However, it was our belief that training in health systems science, the third pillar of medical education, would prove invaluable in empowering medical students, residents and fellows to find ways to contribute to the response.

Under the most dire circumstances, how would medical students, residents and fellows across the country apply health systems science to impact patients, physicians and health systems? We launched the 2020 AMA Health Systems Science Student, Resident and Fellow Impact Challenge to find out.

Eligible submissions from individuals or teams were required to show meaningful learner-led activities or projects in response to the COVID-19 pandemic and describe the components of health systems science that informed those activities. The competition was open to all U.S.-based medical students, residents and fellows.

The submissions were outstanding. We are amazed at the impact medical students, residents and fellows have had on the lives of patients, fellow learners, physicians, other health professionals and the health system. We are in good hands!

In this book you will find the abstracts for some of the most impactful submissions. We hope you will be as impressed as we are.

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

Contents

Change agency, management and advocacy

Electronic Workflow Improvement for COVID-19 Case Investigation and Monitoring at Health Department in Saint Louis, MO

Project lead
Christina Herbosa, Washington University School of Medicine

Teammates
Gaurang Guapte, Sharon Abada and Bruin Pollard

Faculty mentor
Dr. Steven Lawrence, Assistant Dean for Curriculum and Clinical Sciences, Washington University School of Medicine

Abstract

Case investigation and contact tracing — the process of notifying cases of COVID-19 positive status and identifying exposed contacts — is a critical tool for outbreak control. From May to June 2020, a team of over 60 medical students from Washington University in St. Louis (WashU) volunteered with the St. Louis County Department of Public Health (DPH) to trace over 720 contacts and investigate over 2,400 cases of COVID-19 (accounting for 45% of total). Beyond this immediate impact, we also applied our training as medical students to improve workflow efficiency by upgrading from paper folders to an electronic data management system, REDCap. Our project highlighted the importance of community collaboration as well as the cross-system implementation of health technology.

Project addressed/problem discovered

The COVID-19 pandemic has placed an unprecedented burden upon regional health departments to serve and support their local communities. Official Centers for Disease Control and Prevention guidelines have encouraged health departments to "prioritize case investigation and contact tracing activities," as well as "build up their workforce, recruit from new applicant pools and train individuals from varied backgrounds" (Interim Guidance on Developing a COVID-19 Case Investigation & Contact Tracing Plan, 26 May 2020). For many health departments, the sudden surge of infectious cases has been overwhelming.

Leading up to the pandemic, contact tracing for communicable diseases at the St. Louis DPH was documented only on paper. The use of paper-based, rather than online, records was driven primarily by two system-level factors: (1) the lack of a readily-available HIPAA-compliant database for storing and sharing information and (2) a workforce lacking experience with an online database. Although the department's paper files were sufficient for routine communicable disease documentation, they were quickly saturated by the spike of COVID-19 cases. Thousands of paper folders piled up, often leading to duplication or misplacement of files. To make matters worse, multiple people could not access a given file at the same time. As the number of cases continued to increase, it became more and more apparent that this paper-based system was insufficient to keep up with the pandemic.

Approach

On March 23, 2020, our team of medical student volunteers began volunteering as auxiliary contact tracers and case investigators at the DPH. In this role, we remotely interviewed laboratory-confirmed COVID-19 cases to gather information about exposures, travel and contacts. Next we called the close contacts to ask about symptoms, as well as provide recommendations for quarantine and/or testing.

Once we became more familiar with the workflow, we recognized the inefficiencies of paper documentation and approached the department leadership about the

possibility of transitioning to an online database. This idea was initially met with resistance, given apprehension about such a monumental shift in the middle of an already overwhelming situation. However, despite this inertia it eventually became clear how unsustainable the current system was. We held multiple meetings to determine the project's stakeholders and plan next steps for designing, implementing and troubleshooting a new system. Ultimately we agreed to implement Research Electronic Data Capture (REDCap), a platform primarily developed for research, to create a more organized and streamlined management of the rising number of cases in the surrounding community.

By applying the holistic framework of systems thinking, we identified the public health department's data management process as an opportunity for quality improvement, leveraging our previous experience with REDCap to eliminate wasted time and effort (i.e. the "lean" methodology). This allowed us to make valuable connections between complex health systems by integrating the technology we encountered in academic research into the patient-centered and community-centered process of outbreak control.

Outcomes

During the first three months of the pandemic, we recorded 3,600 total volunteer hours, including upwards of 8,700 phone calls to monitor confirmed cases and close contacts. Our volunteer effort was directly responsible for over 720 contacts traced and 2,400 cases investigated, accounting for approximately 45% of the total health department productivity throughout this period. Patients in the community benefited from faster and more consistent follow-up, which we hope helped to increase trust in community health institutions. In addition, the health department system benefited from both the short-term boost in productivity and relief of overworked staff, as well as the long-term increase in efficiency due to the lasting improvement of infrastructure.

Personal impact

Our collaboration with the DPH was a unique opportunity to respond firsthand to a public health crisis. During our time volunteering, we learned firsthand about leadership and teamwork. For example, having a strong team of medical students with different skills and opinions underscored the value of diverse individual skills as part of the whole team effort. With the IT and DPH teams having very different expertise, we often served as a bridge between teams to facilitate communication. This taught us about the importance of understanding other perspectives to be an effective communicator. As the project unfolded, we appreciated the importance of partnering with established stakeholders (e.g. DPH staff and administrators) and integrating their early feedback into development. We found that the implementation of a new system is often far more challenging than development. We expect to carry forward these lessons into our careers as we continue to work in diverse teams and respond to new and evolving crises.

Optimizing a Dementia-Focused Virtual Reality Based Training Curriculum for Certified Nursing Assistants on the Front Lines of the COVID-19 Pandemic

Project lead
Johanna Balas, Rush University Medical Center, project implemented at Chicago Methodist Senior Services

Faculty mentor
Neelum T. Aggarwal, MD, Rush University Medical Center

Abstract

Long-term care (LTC) facilities represent a major source of COVID-19 cases, accounting for nearly 43% of U.S. COVID-19 deaths. The need to assess LTC staff training becomes clear in the context of LTC census statistics. More than 50% of residents in LTC facilities have some form of dementia or cognitive impairment. In LTC facilities, certified nursing assistants (CNAs) serve as primary caregivers and provide the most meaningful daily human contact to residents. Despite providing the majority of direct care, CNAs are among the most under-resourced and undertrained front-line workers. Given their essential value, finding ways to support and enable CNAs to provide quality care during the COVID-19 pandemic for persons with dementia (PWD) is critical. This student-led project applied virtual reality (VR) based online curriculum to train CNAs about the realities of living with dementia. This curriculum was designed to increase empathy and confidence in providing care for PWD.

Project addressed/problem discovered

COVID-19 has placed both an extraordinary and disproportionate level of responsibility and risk on CNAs relative to their training, resources and compensation levels. There is a steadily increasing number of patients receiving care from CNAs who are not equipped or supported with sufficient training in providing empathic caregiving to PWD. VR provides a unique opportunity for health care professionals to experience an educational environment from a first-person perspective that is otherwise unattainable. Due to the constraints of the physical world, caregivers can rely only on assumption and research-based best-approximation for what it is like to be a patient with dementia. Embodied Labs utilizes VR to bypass these limitations by providing caregivers the opportunity to see the world through dementia patient's eyes, creating a highly unique and immersive training experience. Embodied Labs VR has been shown to have demonstrable benefits in improving levels of empathy and confidence for students at Rush University Medical College (RUMC), but little has been done in the way of meaningfully integrating or expanding the tool into educational programs.

Virtual reality provides a uniquely distinct opportunity never before available to medical professionals to experience the conditions of their patients from a visceral, first-person perspective. However, to date, there have been no significant studies on combined virtual reality and educational programs beyond that of a one-off VR experience at RUMC. This project combined a traditional didactic dementia curriculum with the power of virtual reality to cultivate a reliable and effective educational program for Chicago's front-line essential health care workers.

Approach

CNAs were recruited from Chicago Methodist Senior Services (CMSS) to assess empathy, age-related bias and confidence in caring for PWD. Pre and post-surveys were administered and included three existing measures of empathy, implicit bias and dementia knowledge. Participants (N=8) engaged in a seven-week training program, spending 1.5 hours in online class per week. Each class included a 50-minute didactic lecture on dementia delivered by a cognitive neurologist and

neuropsychologist addressing stages, signs, symptoms, type variety, functional and cognitive mood assessments, creating a culture of compassionate care, and coping with behavioral changes. Each didactic lecture was followed by an interactive, 40-minute VR module developed by Embodied Labs (EL).

Embodied Labs, www.embodiedlabs.com, creates VR storytelling programs as immersive windows into the patient experience. These modules portray a Latina woman, Beatriz, on her 10-year journey with progressive neurodegenerative Alzheimer's disease through scenarios of what it's like to be at the grocery store, struggling with other activities of daily living (ADLs), and sundowning — the phenomenon of increased dementia-related confusion and agitation later in the day. EL VR modules were adapted to use a 'distributive group mode' in order to conduct the VR experience through an online video conference platform. As the study coordinator, I wore the VR headset and went through modules as the participants watched and experienced through the distributive screen sharing mode. Following each lecture and VR module, participants engaged in a recorded focus group debrief aimed at exploring how the VR module and didactic lecture's themes could be applied to their current working conditions. The focus group consisted of the CNA participants, medical student coordinator, cognitive neurologist, neuropsychologist and the director of volunteer services at CMSS. This project specifically addressed health system improvement by investing in the education and well-being of CNAs in order to increase their knowledge of dementia and in turn improve the way they deliver care to PWD.

Outcomes

Combining traditional didactic lectures and VR based curriculum provides the opportunity for socially-distanced multi-dimensional learning that is critical for front-line workers providing care for PWD during the COVID-19 pandemic. Didactic lectures supplied foundational knowledge aimed at improving CNAs approach to caregiving for PWD. Formal qualitative content analysis and quantitative statistics on implicit bias, change in dementia knowledge scores, and ageist attitudes are pending at this time.

Emerging motifs from the focus group indicated that participants felt states of exhaustion, frustration, isolation and confusion during the dementia simulations. Participants noted insight from both the patient's inner dialogue and family response to their decline. Participants were able to empathize with the patient navigating a new diagnosis of Alzheimer's Disease (AD) while also understanding the patient's family members' lack of experience with the disease. The role of gender in both disease and caregiving, and its increased significance during COVID-19, surfaced as emergent themes throughout the program. Specifically, AD as a disease found predominantly in women, the disproportionate percentage of women caregivers, and COVID-19's impact on the way caregivers treat PWD.

Participants reported greater levels of insight and empathy while working with their residents, citing the immersive VR curriculum. Participants expressed an appreciation for the opportunity to have access to both a cognitive neurologist and neuropsychologist to ask questions about specific patients within CMSS and receive advice on techniques for dealing with disruptive dementia-related behavior. Individuals also conveyed the significant need for more programming that allows CNAs from different facilities within CMSS to come together and discuss their problems and stresses associated with being a caregiver. This project shows promise in leveraging VR to teach CNAs dementia curriculum from a patient-perspective orientation, in addition to improving their foundational dementia knowledge. We further aim to broaden didactic lectures and VR cases in CNA education across a spectrum, including end-of-life conversations, LGBTQIA aging, Lewy Body dementia, and Parkinson's disease.

Personal impact

After researching medical students' virtual reality projects, I noticed a gap in training when it came to the education of CNAs. Because of my lived experience seeing family members suffer from dementia, I was particularly drawn to the opportunity to help create an improved dementia curriculum for CNAs. When my grandmother's dementia needs exceeded our family's capability to care for her, we had to place her in an LTC facility. It was nerve-wracking not knowing if staff were properly trained to deal with her symptoms. Virtual reality poses an incredible opportunity to not only improve the care for PWDs but alleviate some discomfort from the family entrusting their loved one to others.

My goal is to help shape this program into a reliable resource for caregivers who struggle with the challenges of caring for PWD. Participating in this project provided me the opportunity to appreciate the role CNAs play within the health care team and the importance of interprofessional collaboration. Being the facilitator of a classroom filled with CNAs and physicians provided me with a glimpse of what contributes to a successful health care team and the importance of education within this team of individuals.

As a future physician, I will inevitably deal with PWD. I believe it to be paramount that we continue to advance our ability to care for this population of patients. I see this study as foundational in further enhancing the quality of care myself and future caregivers are able to provide an ever-increasing number of PWD.

Resuming In-person Care at UC Davis Student Run Clinics During COVID-19

Project lead
Mustafa Shakir, University of California, Davis, School of Medicine

Teammates
Joshua Campista, Omar Escobedo and Neha Mannikar

Faculty mentor
Tonya Fancher, MD, Associate Dean, Workforce Innovation and Community Engagement. Interim Associate Dean, Student and Resident Diversity, Director, Center for a Diverse Healthcare Workforce

Abstract

Following the COVID-19 outbreak, concerns for student safety, shortages in personal protective equipment (PPE) and not-yet-defined safety protocols resulted in the closure of all twelve University of California, Davis, (UCD) Student-Run Clinics (SRCs). The SRCs are the sole providers of health care for thousands of multilingual, medically underserved, uninsured or marginalized members of the Sacramento community. Through the SRCs, health care students engage in interprofessional collaboration to advocate for equitable patient care and learn to combat the barriers imposed by social determinants of health. Therefore, the aim of our project was to safely reestablish in-person operations at the SRCs for patients, who already have tenuous access to care, to receive essential services. We created a protocol to address multiple hurdles, such as exposure to COVID-19, distancing guidelines, access to interpreters, and the global PPE shortage. To minimize exposure, we reopened a single central clinic to receive patients from all SRCs. To ensure adequate distancing we set up an appointment-based system cognizant of the clinic's operating space and average visit time per patient, as well as having patients wait in their cars until their appointment. We also implemented three checkpoints for COVID-19 screening prior to the appointment. Lastly, by working alongside multiple organizations like UCD School of Medicine and California Medical Association, we established a steady supply of PPE for the central clinic.

Project addressed/problem discovered

The learning objectives of our health systems science courses and the mission of the SRCs both converge on the goal of providing marginalized communities with equitable access to care. Prior to the COVID-19 pandemic, our SRCs achieved this mission by functioning to combat language and cultural barriers, socioeconomic hurdles, and systemic racism. For example, each of the twelve clinics provides volunteers trained in the specific language and culture of the patient population they serve and sees patients regardless of financial or documentation status. However, the onset of the pandemic compromised this mission by suspending all in-person operations, further exacerbating the lack of health care access for the underserved communities of Sacramento. In response, all UCD SRCs transitioned to a telehealth model of care. While this was hugely successful in allowing some patients to continue receiving care, patients without access to internet, phones, or private and secure home environments were put at a disadvantage. Many of our patients do not have the financial means or safety privileges to isolate at home. Patients face an increased demand to work jobs with less-than-ideal safety measures in place, worsened struggles with homelessness, and fewer means to manage their chronic illnesses and obtain vital preventive care. Additionally, some services conducted by the SRCs, such as abscess drainage and ultrasound, can only be carried out in person. Due to uninsured or undocumented statuses, it is not often viable for patients to find alternate facilities for in-person care. Thus, supplementing telehealth opportunities with the potential and means for in-person visits is crucial to providing our patients with comprehensive care. Overall, with this project, we are now able to provide services to

patients who cannot access telehealth and patients for whom further in-person care is needed.

Approach

In order to address the multitude of problems that were caused by the closure of our SRCs, our project took a multifaceted approach that incorporated several aspects of systems thinking, including advocacy, management, leadership and teaming. At its core, we believe that our approach has managed to create a patient, family and community centered solution to the problems caused by the COVID-19 pandemic.

The aim of the project is to provide an adjunct to telehealth in the form of an in-person clinic. While we recognize the importance of telehealth, especially during this pandemic, we also acknowledge the shortfalls. Telehealth is great for those with access to technological resources and for addressing health problems that do not rely on physical exam findings, however, it is clear to us that the value of care with telehealth can vary widely based on a multitude of factors, ranging from medical needs to the availability of resources of the provider and patient. The barriers to telehealth are highlighted by the nature of our SRCs which lack the resources of larger health organizations. Additionally, many of our patients do not readily have access to the technologies that allow for telehealth to be successful, and many have no alternate facility at which they can receive in-person care, other than the emergency department. Therefore, we consider telehealth to be necessary but insufficient alone to properly care for the communities we serve. By offering in-person appointments to our patients, we aim to improve the quality of care our patients are currently receiving. In this way, we find ourselves as patient advocates with the ability to enact change in the management of the SRCs.

From the start of our project, we have taken the initiative to identify these existing issues and spearheaded the effort to reopen the SRCs. Our primary leadership role was in representing patient interests to numerous medical directors and faculty. We led meetings with education deans and physicians to compile recommendations and concerns. One of the biggest obstacles we were challenged with was the lack of PPE available to safely see patients. Our team decided that opening a central location would allow our clinics to cooperate with one another and consolidate their available PPE supplies into a shared clinical space. Additionally, members of our team reached out to several organizations to acquire PPE donations and established a plan with our school's administration to ensure long-term stock via our hospital's supply chain. Ultimately, our protocol was backed by leadership at UCD School of Medicine such that they have committed to supply us with PPE for the foreseeable future.

In the end, a centralized clinic would not be possible without the teamwork across the various SRCs. To this end, we worked closely with a group of fellow medical students, physicians and undergraduate personnel who represented the interest of specific patients and their respective communities. By incorporating them into our protocol's development, we ensured the ability to coordinate care for patients coming from all SRCs in the centralized clinic.

Outcomes

At this point in time, we have taken all the necessary steps to reopen and will have our first in-person clinic day on September 26, 2020. Our goal is to provide essential health care services to patients who need further in-person follow up after being seen through telehealth, as well as patients who cannot access telehealth resources. Patients will be able to access primary care and preventive care services and receive vital management of chronic illness. We will offer ultrasounds, EKGs, abscess drainage, Pap smears, pelvic exams, focused physical exams, blood pressure monitoring and in-house lab draws. We expect this will greatly improve health outcomes for patients, while also decreasing visits to the already-flooded emergency departments and surrounding health care systems. Utilizing the newest available guidance, we plan on assessing the outcomes from the centralized clinic and revising the protocol as necessary, with the ultimate goal of resuming in-person operations in all UCD SRCs. While this project is aimed at improving the health of underserved communities in the Sacramento area, we have presented this protocol to California Clinics Collaborative with the hopes that others may build off of our project to reach underserved communities throughout the state and even the country.

Personal impact

This project has been valuable to our education as creating a safety protocol during a pandemic of this scale is a unique challenge that will help us grow into stronger physicians.

First, we advanced our knowledge regarding COVID-19 and the intricacies of how a clinic operates. We achieved this by reading articles, guidelines, and the most recent COVID-19 updates to build an effective protocol. This experience honed our skills in doing background research and reading technical guidelines, both of which are very important skills to have as future physicians.

In addition, we developed key communication skills through multiple meetings with medical directors, deans and clinical faculty where we presented our work and addressed their questions and concerns. Through these meetings, we learned the importance of patience and taking a diplomatic approach when communicating with multiple stakeholders on such a long-term project. We also had to negotiate and work with the interclinic committee, which consists of two professional students from each SRC, to ensure our protocol could be used by all of the clinics. As we incorporated the numerous inputs we received, we built a greater appreciation of the importance of working alongside multiple diverse groups. Their opinions and insights provided us with the knowledge to strengthen our project, highlighted the power of unity in diversity, and ultimately helped garner support from leadership at UCD School of Medicine in implementing our protocol.

Throughout this project, we have learned the critical role advocacy has in advancing health equity. At the heart of this project, we aim to provide quality health care to marginalized communities in Sacramento. When the SRCs were closed, we were provided limited options on how to continue providing in-person care. The closures were largely supported as a method to protect student safety. However, we recognize that the closure of the clinics immediately created an inequitable health care system putting the health of the patients we serve at risk. We took on the role to find a solution to the closure of the SRCs in order to ensure our patients' access to health care — especially during a pandemic. Ultimately, we have set out to become physicians due to our passion of helping others, and we believe acting on that passion will serve us well in advocating for our patients as future physicians.

Virtual Clinical Elective in Equitable Health Care: A Health Systems Science Curriculum for Visiting Medical Students During COVID-19

Project lead
Zoe Cosner, Johns Hopkins University School of Medicine

Teammates
Dylan Hardenbergh, Kori Porosnicu-Rodriguez and Brian Lo

Faculty mentor
Rachel Marie Salas, MD, Johns Hopkins University School of Medicine

Abstract

During the COVID-19 pandemic, the Johns Hopkins School of Medicine suspended in-person rotations for visiting medical students for the 2020-2021 academic year. Medical students (from the Osler Apprenticeship Medical Education Program) in conjunction with the Office of Graduate Medical Education developed a virtual 2-week elective for visiting students to be held in October 2020. The "Virtual Clinical Elective in Equitable Health Care" was designed to recruit underrepresented in medicine (UIM) fourth-year students from outside institutions. Mornings were dedicated to specialty-specific curricula from 12 specialties, with afternoons dedicated to a health systems sciences (HSS) universal curriculum focused on equitable health care and social determinants of health. This elective provided the opportunity for students to engage and network with physicians in their preferred fields, and learn about HSS, health disparities, Baltimore's patient population, and Johns Hopkins' community. Pre- and post-elective surveys for students and faculty will be used to assess the elective's educational impact.

Project addressed/problem discovered

Residency programs across the U.S. have challenges recruiting UIM applicants. Recruitment of UIM individuals and application of HSS practices is particularly important at Johns Hopkins given the diverse population in East Baltimore. In-person visiting rotations have previously provided prospective applicants with opportunities to network with faculty and gain exposure to residency programs. Because visiting rotations were suspended during the 2020-2021 academic year and the majority of Johns Hopkins departments do not have dedicated programming and resources to recruit electronically, the ability to recruit UIM applicants was severely limited. To address this gap, the office of graduate medical education reached out to the neurology clerkship directors and Osler Apprentices for assistance in creating this elective. Our team had successfully designed and implemented a virtual neurology rounds elective, and we were able to use that experience to develop the Virtual Clinical Elective in Equitable Health Care. This elective was designed to enhance UIM recruitment by providing students with the opportunity to explore our residency programs without needing to travel.

Another objective was to promote education on HSS topics, particularly social determinants of health and health care for marginalized populations. This course provides a unique opportunity to explore concepts in equitable health care in a deeper and more comprehensive way than may be taught in a traditional medical curriculum. This elective was timely due to ongoing social tensions and health inequities uncovered by COVID-19. Our goal is to equip our students to provide high quality care to underserved patient populations, regardless of future specialty.

Approach

Curriculum development: The curriculum, created by medical students under the guidance of leaders in HSS and graduate medical education, was designed so that students spend a half-day building clinical skills and connections within their designated specialty and a half-day engaging in a universal curriculum based on the third pillar of medical education. Each specialty was responsible

for planning their own morning curriculum which included resident didactics, grand rounds, clinical experiences and case presentations. The theme for the universal curriculum, a HSS approach to equitable health care, was chosen to attract UIM students and provide these clinicians-in-training with an educational framework for understanding the role of social determinants of health, population health, value-based care and health care policy in patient outcomes. The curriculum's professional development strand focuses on building skills such as virtual interviewing, networking and leadership in team science.

Faculty and resident recruitment: Faculty and housestaff were necessary as curriculum leaders for the specialty-specific curriculum and session leaders for the universal curriculum. Specialty leaders were recruited by first identifying departments willing to participate in the elective, followed by the nomination of potential leaders from the department. Session leaders were recruited based on experience running sessions on related topics with Johns Hopkins medical students as well as academic experience in the topic of interest and involvement in HSS. Care was taken to ensure diversity in department, gender, race, ethnicity, sexuality and academic rank.

Student recruitment: Students were recruited through both directed advertisements and social media. Course advertisement was sent directly to UIM-affiliated student organizations such as SNMA, LMSA and ANAMS for distribution among student members and was posted on Twitter for wider distribution. To encourage applications and prevent further financial stress associated with COVID-19, the $500 elective registration fee was waived for students from LCME-accredited medical schools.

Survey development: Pre-surveys will be administered to all students, and post-elective surveys will be administered to both students and faculty. Student surveys focus on assessing demographic information, goals for the elective, and overall professional goals. Faculty surveys focus on familiarity with curriculum development and virtual education as well as successes and failures from the elective.

Outcomes

The Virtual Clinical Elective in Equitable Health Care is still in its planning stages, but the course will run September 29-October 9, 2020. One of the outcomes we will be assessing is recruitment of UIM students to the elective. This will provide valuable insight into our initiatives to diversify Johns Hopkins Medicine. Although we primarily publicized the course through channels to reach UIM individuals, any fourth-year medical student at a United States MD or DO school with an interest in equitable health care was eligible to apply. We will also assess how the alleviation of financial stress associated with outside electives and maintaining student safety during COVID-19 while exploring the Johns Hopkins program contributed to interest in this course.

Other outcomes will be assessed by the pre- and post-course surveys administered to all students participating in the course. In the pre-course survey, we will gather data on students' goals for the elective, their interest in applying to Johns Hopkins for residency, and their prior experiences with equitable health care scholarship or activities. The post-course survey will ask about the impact of the elective course on students' intentions of applying to Hopkins for residency and will assess whether students are leaving the course with an enhanced understanding of social determinants of health and other HSS and equitable health care topics. This survey will also elicit feedback on student satisfaction with various aspects of the course to improve possible future iterations of the elective.

We will also send a follow-up survey following the 2021 match process to ascertain how many students who participated in the elective applied to Johns Hopkins for residency, were given interviews, and ultimately matched into a Johns Hopkins residency program.

Personal impact

The OAs are fourth-year medical students who are interested in medical education and pursuing clinician-educator careers. Although the OA team had significant support from Johns Hopkins faculty, the creation of the course was primarily student-driven. Designing and

overseeing medical school elective coursework is an opportunity normally afforded only to faculty; we were grateful for the trust our institution placed in us with this project. Although we had prior HSS training as a horizontal strand throughout our preclinical education, creating this elective allowed us to become "systems citizens" in medical education. Under the guidance of educational leaders, including our HSS leader mentor, we were able to create a new elective from scratch that incorporated HSS training and topics. This experience enabled us to hone curriculum design as well as logistical and problem-solving skills that will be invaluable to us in our future careers as medical educators.

My involvement in the Virtual Clinical Elective in Equitable Health Care has provided me with the chance to directly communicate and collaborate with deans and senior faculty at Johns Hopkins, which has been an amazing opportunity to foster my professional development. I have learned more about the incredible equitable health care work being done by faculty across departments at our institution, and it has been extremely rewarding to unite these faculty into a single cohesive course. I am also looking forward to connecting with fourth-year medical students from around the country who are interested in equitable health care and learning more about the work they have done at their home institutions.

Virtual Patient Rounds in Neurology

Project lead
Kori Porosnicu Rodriguez, Johns Hopkins University School of Medicine

Teammates
Brian D. Lo, Zoe L. Cosner, Dylan Hardenbergh, Diana M. Bongiorno, MPH, Julia Wainger, MPH, Carlos Romo, MD, Doris G. Leung, MD PhD, Charlene Gamaldo, MD (all of (Johns Hopkins University School of Medicine) and Christine E. Gummerson, MD (Yale University School of Medicine)

Faculty mentor
Rachel Marie E. Salas, MD, MEd, FAAN; Johns Hopkins University School of Medicine

Abstract

In the wake of COVID-19, the Johns Hopkins (JH) Neurology Education Team, composed of educators and senior medical students, designed a two-week virtual elective titled "Virtual Patient Rounds in Neurology." Our goal was to provide students with a practice-based approach to learning telemedicine, while offering a robust virtual neurology lecture series (JHNeuroChats) during a time when clerkships were cancelled. Global medical education leaders were invited as "virtual visiting professors" to present live one-hour JHNeuroChats, with topics ranging from neurological disorders to interprofessional collaborative care and health systems science (HSS). Moreover, trainees from institutions worldwide were invited to attend the JHNeuroChats, with some faculty incorporating these lectures in their institution's virtual curricula. In total, 14 JH medical students enrolled, and an additional 337 trainees from outside institutions attended the JHNeuroChats. This virtual elective advanced HSS aims during COVID-19 by furthering telemedicine education and establishing an innovative infrastructure to promote shared learning.

Project addressed/problem discovered

Under the mentorship of established HSS leaders, we embraced the cross-linking domains of HSS to become change agents and leaders. We developed an educational elective that would address the Quadruple Aim of health care through a neurological lens. We focused on teaching our students the skills necessary to improve patient outcomes and enhance patient experiences, while reducing the cost of care and prioritizing safety in neurology during the pandemic.

Pre-pandemic, few virtual medical electives were available. When telemedicine quickly became an important modality of health care delivery, we incorporated education in this domain into the curriculum. The benefits of telemedicine include not only increased patient and team safety during the pandemic, but also the development of infrastructure that could be widely utilized to decrease costs of care and facilitate access to care for patients who could not safely travel to the hospital. By fostering telemedicine competency, we were able to contribute to long-term improvements in clinical informatics by adopting alternative health care delivery systems and value-based care.

Moreover, our JHNeurochats were an innovation in systems-based education practice that allowed for the development of new infrastructure at JH. By bringing together medical education leaders to educate students globally while in-person clerkships were suspended, we were able to provide a viable curricular adaptation for students while continuing to innovate in the field of medical education.

Approach

The Neurology Education Team met regularly to design the elective over the course of a few weeks after JH's decision to transition to a fully virtual curriculum in March 2020. Our project had three main components: (1) JHNeuroChats, (2) Virtual Neurology Rounds and (3) asynchronous educational activities.

In our JHNeuroChats, a diverse group of international medical education leaders was formally invited as "virtual visiting professors" to give one-hour live Zoom lectures on topics such as neurological disorders, health

systems science, interprofessional collaborative care and the humanities. In this manner, we were able to foster collaboration among different institutions and develop a novel, integrated health education structure with the potential for widespread impact. Our JHNeuroChats were open to medical trainees and pre-medical students worldwide, particularly those who did not have equivalent virtual offerings at their respective schools. All sessions were recorded for future viewing and made available in an online JHNeuroChats library in order to provide a collection of lectures for use by future neurology clerkships.

In our Virtual Neurology Rounds (VNR), enrollment was limited to JH students due to institutional policy. Rounding teams consisted of one JH attending, two to three medical students, and one Osler Apprentice. Faculty members participated in "just-in-time" training sessions to get acclimated to a virtual teaching platform. Students gave SOAP-style oral presentations and submitted write-ups for attending feedback twice a week, while Osler Apprentices served as peer mentors throughout. Each week, rounding teams were switched to expose students to different neurology subspecialties. This practice-based learning model was intended to increase student comfort with telemedicine, while promoting the use of novel health technology approaches in the medical student curriculum. Early introduction to telemedicine will promote its continued use in the larger health care setting, allowing providers to provide high-value care to a broader patient population, which in turn will allow for the improvement of structural inequities within the health system.

As part of asynchronous educational activities, each cohort of Hopkins students was also required to complete AMA Health Systems Science Learning Series modules and AAN NeuroByte videos by the end of each iteration of the two-week elective.

Outcomes

The virtual clinical elective familiarized students with new approaches to health technology (telemedicine), while simultaneously allowing them to learn from, and collaborate with, their peers from institutions worldwide.

Our JHNeuroChats had 14 JH medical student participants and an additional 337 trainees from outside institutions in attendance. Of these students, 9 (3%) were pre-medical students, 207 (61%) were medical students, 39 (12%) were residents, 22 (6%) were fellows, and 60 (18%) were faculty. With respect to the lecturers, 32 of the 48 JHNeuroChats were presented by invited virtual visiting professors. Each JHNeuroChat was recorded, which allowed us to develop an online repository of lectures to be used for future education purposes. This core library of learning materials, taught by experts from around the world, could be used by any medical school as part of their neurology core clerkship. Given the immense challenges that this pandemic has placed on both students and faculty, we strongly believed that the educational innovations developed as part of this elective should be available to a wider audience, thus collectively improving the educational experience for all participating medical trainees.

In order to assess the educational impact of our Virtual Neurology Rounds, surveys were administered to students and faculty before and after the course. On a scale from 1 (not confident) to 5 (very confident), students reported increased confidence in obtaining a virtual history (2.14 to 3.93; $P<0.0001$) and performing a telehealth neurological exam (1.36 to 3.14; $P<0.0001$). Virtual attendings reported increased confidence in leading virtual rounds (3.43 to 4.00; $P=0.15$) and increased comfort with virtual teaching platforms (3.14 to 4.00; $P=0.09$), although these findings were not statistically significant. By being intentional in training students and faculty in the art of telemedicine, we can improve the patient experience by allowing for a more seamless transition from in-person to virtual clinical medicine. With fewer patients traveling to the hospital during the pandemic, ensuring that they continue to have access to providers who are confident in telemedicine is of the utmost importance.

Personal impact

My experience in the OA program and working with the Neurology Education Team has had a tremendous impact on my development as a future clinician-educator. Throughout this project, I have developed many practical skills in designing curricula, coordinating sessions, recruiting speakers and assessing outcomes. This experience, along with my HSS training at Hopkins, has also allowed me to gain a newfound appreciation for the

importance of incorporating health systems science into medical education. Health systems science appeals to me because it challenges existing structures. Our decision to engage institutions worldwide was something that was initially shocking to me, as I had never before been part of an elective with so many diverse medical education leaders, all with the shared goal of collaborating on one unified product. It is fascinating to me that some of the lines that we draw around our institutions are arbitrary, and that there is a great deal of synergy in education partnership.

Dr. Rachel Salas, Director of the Neurology Clerkship, Director of Interprofessional Education and Collaborative Practice, and an AMA HSS Scholar, has been an incredible coach and guide throughout the elective creation process. My experience in developing this elective has solidified my desire to pursue a career as a clinician-educator in neurology at an academic institution. I am excited to work with everyone in the medical community to develop more integrated, efficient health systems that can provide the best possible care to our patients and the best possible education to all of our students globally.

Clinical informatics and health technology

COVID-19 Trainee-Led Educational Support Team

Project lead
Gena Lenti, University of Chicago Pritzker School of Medicine

Teammates
Kaitlyn Van Kampen, Debra A Werner and Maggie Collison, MD

Faculty mentor
Vineet Arora, MD, MAPP, University of Chicago Medicine, Professor of Medicine, Assistant Dean for Scholarship and Discovery, Associate Chief Medical Officer for Clinical Learning Environment

Abstract

The rapid onset of the COVID-19 pandemic led to a vast amount of clinician uncertainly and a prompt need for data. As a result, the amount of COVID-related literature vastly expanded, but clinicians on the front line of the pandemic had little time to critically appraise new literature to guide their clinical decision making. In an effort to provide accessible, yet critical reviews of the COVID-19 literature, medical students and University of Chicago (UC) librarians led an effort to form the UC Educational Support Team. The Educational Support Team retrieved questions from clinicians and conducted literature searches on requested topics. Students produced summaries of relevant articles and created overarching syntheses of the literature for a given query. Overall, students summarized 325 articles from mid-March to May 2020 and produced 80 syntheses. The success of the Educational Support Team led to the creation of an elective class for a second cohort of students.

Project addressed/problem discovered

At the onset of the COVID-19 pandemic, little information was known about the virus's infectious properties, its impact on patient and public health, or how to best treat and prevent infection. As the pandemic continued, academic literature was being produced and published at a rapid rate, with one estimate finding over 23,000 COVID-19 related papers being published from January through May 2020 (Science, May 13, 2020, doi:10.1126/science.abc7839). Another article found a median time of 6 days from receipt to acceptance for journal articles (Nat Hum Behav 4, 666–669 (2020). https://doi.org/10.1038/s41562-020-0911-0) The emergent need for scientific evidence during this time was quite clear, but the accelerated publishing also beckoned a need for critical appraisal of published articles given the shortened peer-review time.

While this explosion of data was taking place, busy clinicians on the hospital front line had little time to delve into the literature, much less critically analyze scholarly articles in order to address their COVID-related questions. Seeing this as a problem for our medical community, a group of University of Chicago (UC) medical students, residents and infectious disease fellows led an initiative under the guidance of Dr. Vineet Arora and UC librarians to collect provider COVID-related questions and conduct real-time literature searches on the topics of interest. The goal of the project was for students to critically appraise the literature and produce syntheses addressing submitted queries so that providers could be kept up to date with the newest COVID-related findings to apply to patient care and public health research.

Approach

In mid-March of 2020, the University of Chicago "Educational Support Team" was created and assembled, led by fourth-year medical students and hospital librarians. The team's aim was to provide thorough, yet digestible syntheses of clinical topics by summarizing the current research in a given area for clinicians working on the front line of the COVID-19 pandemic. The overarching goal of the project was to act as a form of clinical informatics, providing infrastructure for the retrieval of COVID-related data given the rapid onset of the pandemic and the volume of publishing on COVID-related topics.

Clinicians were notified of the Educational Support Team's role via daily email and at clinical conferences (i.e. morning reports, grand rounds, etc.). Once notified, physicians, nurse practitioners, physician assistants, physical therapists and hospital administrators submitted questions via email to lead librarians who, in turn, shared the clinical queries with the medical student team. A small group of students conducted the initial literature search and shared relevant articles with other members of the team who appraised articles, wrote article summaries, and developed syntheses or summaries of all the relevant articles for a given query. The syntheses completed were organized into nine overarching themes as follows: 1) COVID-19 infection control and prevention (including personal protective equipment use and COVID-19 transmission), 2) presentation (organized by organ system), 3) diagnosis, 4) management and treatment, 5) discharge, follow-up and long-term effects, 6) risk factors, 7) racial disparities, 8) pediatric considerations and 9) obstetric considerations.

The medical student team was critical to providing value during this time — by producing guidance on the above topics, UC patients could be managed, and public health measures be expanded based on the most up-to-date literature. Furthermore, medical students who had their in-hospital experiences postponed, were able to maximize their impact on the UC medical community, exercise their literature appraisal skills and stay abreast of the COVID-19 literature themselves. Based on the success of the first cohort of Educational Support Team students, an elective class was developed so that students could continue to practice the above skills and continue providing value to the UC health care system.

Outcomes

From mid-March through the end of May 2020, our team responded to over 90 queries and provided syntheses for 80 distinct questions. The difference between submitted queries and syntheses accounts for duplicate or overlapping questions and/or questions with insufficient data to be answered. Overall, the Educational Support Team summarized over 325 scholarly articles in preparation of the syntheses.

Once completed, the syntheses, along with the relevant articles and article summaries were stored online and linked to the University of Chicago Library website (https://guides.lib.uchicago.edu/covid19 & https://guides.lib.uchicago.edu/covid19/clinicians).

According to the website statistics, the COVID-19 LibGuide was viewed 2,026 times, the "Article Summaries" viewed 105 times, and the "Questions & Syntheses" viewed 211 times. A short survey was sent to clinicians who submitted queries, and the feedback received was overwhelmingly positive with one clinician noting, "This service was incredibly helpful in facilitating data-driven clinical practice" and another stating, "I would really appreciate it if they continue providing this option to assist with future projects and clinical practice." A third respondent shared, "The synthesis conducted by this team laid the foundation for why our survey on PPE practices is needed and will hopefully help us frame a publishable manuscript."

Midway through the project, an "Educational Support Team" elective course was created for a second cohort of students. Anecdotal review of the course was positive, with students noting improved critical appraisal skills and in-depth knowledge of COVID-related topics as some of the benefits. Based on the success of the elective and the feedback provided from clinicians, the team is now working to re-issue the course as a virtual rotation for visiting students and plans to expand the submission queries beyond COVID-related topics.

Since beginning the COVID-19 Educational Support initiative, the project has inspired expanded use across the country. For instance, librarians from Northwestern University and Thomas Jefferson University have requested use of the website and its literature resources for their hospital clinicians. Furthermore, emergency department residents from Brown University have requested support in establishing a similar team at their hospital.

Personal impact

Throughout medical school, I have been interested in health systems science and quality improvement, particularly as it relates to patient care. In the past, many of my projects have focused on patient experience and outcomes, but this project paid particular attention to the needs of physicians. Despite many of the obvious negative impacts on patient communities, the COVID-19

pandemic created a grueling work atmosphere for many medical professionals, and physician support and well-being often came second to patient care. Working on this project helped me to realize how small things can and should be provided to physicians in order to prevent physician burnout and promote learning in the midst of crazy work hours. Ultimately, the feedback we got from physicians was that our small project made their lives and their patient care significantly easier, which is something that will stick with me as a future physician, researcher and teacher. Additionally, this project allowed me to hone my ability to critically appraise and critique medical studies. I plan to pursue a career in academic medicine and will definitely utilize these skills as I begin my own research and apply relevant studies to future patients. Finally, this project showed me how interdisciplinary teamwork can be incredibly useful to research and health systems work. Learning from the clinical librarians on this project was invaluable and taught me how important it is for physicians to seek perspectives from other members of the care team to improve their scholarly work and patient care.

Development of a Novel Process for Crowdsourced Chart Abstraction in the Fight Against COVID-19

Project lead
Josh Gray, Johns Hopkins University School of Medicine

Faculty mentor
Ashwini Davison, Assistant Professor of Medicine, Associate Director of Education, Division of Health Sciences Informatics, The Johns Hopkins University School of Medicine

Abstract

Data from unstructured portions of the electronic health records (EHR) such as clinical notes are needed to answer many COVID-19 questions. To more rapidly transform this data into a machine-readable form, I developed software to fully automate the management of a chart abstraction project. This software was used to train and on-board chart abstractors from across the health system, distribute assignments, and track progress and quality. This software and data have been used in multiple research initiatives across departments and is the subject of a graduate level course that I have contributed to in health sciences informatics. Through this initiative, I deployed my software development skills to improve the health IT infrastructure at Johns Hopkins.

Project addressed/problem discovered

In March 2020, physicians had little evidence to guide the treatment of COVID-19. Desperate to generate insight, our health system quickly made the structured data from the EHR of patients with COVID-19 available to researchers in a machine-readable format for analysis. This included data from discrete EHR fields such as medication names, administration times, billing codes and demographic information. Most of the questions of clinical interest, however, relied on data from clinical notes and radiology reports — unstructured, free text documents.

Traditionally, physicians hoping to answer a research question from EHR free text documents create a form into which experienced clinicians can enter machine-readable data. They populate this form as they review hundreds of unstructured texts from patient charts, using human intuition and judgment to "abstract" out data of interest from potentially messy, typo-ridden documents. This is the gold standard of obtaining such data, but we faced two problems. The clinically trained abstractors were in increasingly shorter supply as they were mobilized to fight the pandemic, and there were a growing number of hospitalized patients on which data was accumulating.

We needed a system to quickly train and on-board chart abstractors from across the health system, distribute assignments, and track progress and quality — all while ensuring data remained in compliance with the IRB and HIPAA.

Approach

In March 2020, our health system began developing a rich registry of clinical data on patients with COVID-19. Many of the research questions required data only contained in the free text portions of the EHR. I assembled a group of classmates for chart abstraction, and we began collecting data in REDCap, a secure web app for clinical data collection that is used by over 4,500 institutions. Our initial task was to characterize the time course of presenting symptoms by reviewing the HPIs of clinical notes. I designed a data collection form for us. I discovered that the developers of REDCap had built in ways that the application could be almost fully controlled by computer code without needing any of the user interface buttons, allowing any action to be completely automated by external software. Using my software development experience, I was inspired to totally automate the management of a chart abstraction project.

Upon signing up for the platform I created, volunteers are automatically emailed custom training materials providing guidance on how to perform a good chart abstraction. Once they are done training, they are invited to REDCap where their abstraction skills are tested using a small set of patient notes that have been previously reviewed by faculty. Those who undergo testing are emailed a report detailing where they disagreed with the faculty, allowing them to improve. If they pass testing, they are assigned a set of patient records. The algorithm assigns documents such that each patient is reviewed by three abstractors. Data is stored in a machine-readable format and if disagreement arises among the abstractors, either the consensus is taken, or the record is marked for manual adjudication. Abstractors occasionally re-do patients they have previously seen to ensure consistency in responses. Abstractors are also compared to each other across those who have reviewed the same patients. Periodically they receive a detailed feedback report so they can continue to improve.

This process repurposes existing clinical informatics technology to improve the health system and create a scalable program for conducting chart abstraction with built-in quality checks but minimal oversight.

Outcomes

This chart abstraction system is currently being used by many research groups throughout our institution, to study things such as the surgical outcomes of COVID-19 or the radiologic features of the disease. One of its earliest applications was to rapidly obtain symptomatology data from clinical notes. Combined with other clinical data, these symptoms were used to train a model to predict in-hospital disease progression of COVID-19 using only factors present on admission with an AUC of 0.86, work which I co-authored in the Annals of Internal Medicine.

Additionally, data generated from this tool was used to enhance a commonly used clinical natural language processing package, improving its performance on recognizing symptoms of COVID-19. It now has a sensitivity and specificity for COVID-19 symptoms of 0.96 and 0.93 respectively. I had the opportunity to co-author this work which has been submitted and currently appears on the preprint server arXiv.

Johns Hopkins has a computing ecosystem called the precision medicine analytics platform (PMAP) which primarily serves to provide clinical research teams with advanced data science support and analytic capabilities. This software has been granted a permanent home in this ecosystem to support research projects for years to come. This software will also feature prominently in the 2020 annual report of the Technology Innovation Center, our center for health IT innovation.

In the first two weeks of launch, symptoms data was generated for 40 patients with COVID-19, and 15 abstractors were on-boarded. Since then, we have continued to accelerate the pace of data generation. The Johns Hopkins University School of Medicine Informatics education program launched a recurring elective entitled "Data Abstraction for the JH CROWN Clinical Registry: Applications of Informatics in Addressing Novel Infectious Diseases." This course has enabled visiting scholars from institutions including the Mayo Clinic and St. Jude Children's Research Hospital to conduct chart abstraction projects and build similar automated systems.

Personal impact

This was an incredibly rewarding opportunity that allowed me to experience a huge amount of the inner workings of an academic medical center, especially the IT infrastructure, in a short amount of time. It was also the first chance I've had to apply my software skills to a real clinical problem which was especially fulfilling given that I was able to respond to the pandemic efforts as a student.

During this global pandemic, I've found myself quickly embedded in a mission critical project within one of the core health systems science domains: clinical informatics. Perhaps most rewarding for me is that other classmates of mine have been able to contribute to the effort. The process I've helped establish has been converted into a virtual elective that will help us medical students sharpen our clinical acumen, learn about NLP and contribute to clinical registries. I am proud to be part of the growing cadre of data-driven physicians of the future. My initial dismay about not being able to contribute to the cause has been transformed into the opportunity of a lifetime.

Embracing Telehealth for Breaking Bad News as a Step Toward a Value-based System of Health Care

Project lead
Vaishnavi Warrier, Rutgers Robert Wood Johnson Medical School

Teammates
Abha Kulkarni, Stephanie Latham and Dr. Paul Weber

Faculty mentor
Archana Pradhan, MD, MPH, Rutgers Robert Wood Johnson Medical School

Abstract

Breaking bad news is a key advanced communication skill for physicians to have. While the best way to break bad news is through an in-person patient encounter, the COVID-19 pandemic forced many physicians to choose telemedicine as their primary health care delivery system. Research has shown that health care professionals feel discomfort with delivering bad news in-person, and we were curious about how this transition to telehealth would influence self-perceived comfort and confidence. We created an OSCE centered around delivering a diagnosis of colon cancer and administered it, both in-person and virtually, to graduating fourth year medical students who plan to begin internal medicine residency. Students self-reported post-OSCE confidence and comfort levels. Results showed that students were more comfortable and confident breaking bad news over telehealth, compared to in-person. Our findings suggest that physicians entering the field of medicine today are more inclined to adapt to changes in the health care system.

Project addressed/problem discovered

The ability to break bad news to patients is an essential skill for all physicians. Effective delivery of bad news requires both the disclosure of a life-altering diagnosis and the navigation of emotional challenges. Patients have frequently expressed frustration with how their physicians have broken bad news. Furthermore, inadequate delivery of bad news has been shown to correlate with increased feelings of depression and anxiety in patients. According to a 2010 article by Michael E. Porter, published in The New England Journal of Medicine, value in health care is calculated as: value = ([quality + outcomes]/cost) x patient experience. Therefore, a value-based health care system must maximize quality, outcomes and patient experience while minimizing cost. Statistics demonstrating patient dissatisfaction and reports of the negative psychological impact of poor delivery of bad news suggest that physicians are not meeting the standards of high value care. This comes at a cost to clinicians, who report emotional exhaustion and depersonalization after such encounters. The onset of COVID-19 has brought significant changes to health care processes, requiring physicians to explore new practices in breaking bad news. The implementation of social distancing guidelines has limited certain in-person physician-patient interactions, forcing physicians to utilize telehealth. Disclosing bad news over telehealth, although cost-effective, poses unique challenges for physicians, especially with making an emotional connection and providing support through a computer screen. Yet, it is important that physicians, especially recent graduates, adapt to this transition in health care structure and use advanced health care technology to deliver high value care.

Approach

At the start of the COVID-19 pandemic, as health systems began embracing telehealth, we realized that medical school graduates need to effectively deliver bad news and be comfortable doing it using a virtual platform. During the 2-week "Transitions-to-Residency" Internal Medicine course that all fourth-year students at Rutgers Robert Wood Johnson Medical School (RWJMS) pursuing internal medicine are required to take, we administered an

Objective Standardized Clinical Encounter (OSCE). In this OSCE, students were tasked with delivery a news of colon cancer to a standardized patient (SP).

This OSCE was administered to an in-person cohort of 29 students and to a virtual cohort of 34 students. In both iterations, faculty members and SPs, who acted as proxies for the patient perspective, used two validated tools to assess students: the SPIKES protocol and the Empathy and Clarity Rating Scale (ECRS). Students also assessed their own performance using these tools. SPIKES is a widely used protocol that establishes a six-step process to guide clinicians in how to break bad news. ECRS is a validated tool for the evaluation of communication skills, developed by faculty at RWJMS by using insights from focus group discussions with clinicians, actors, communication experts and community members with patient experience. Following the OSCE, students performed self-assessments on their comfort and confidence in breaking bad news to patients. These self-assessments are the foundation of our first level of inquiry: are students as comfortable and confident in breaking bad news via telehealth as they are in-person?

This project touches upon the value-based care and health systems improvement domains of health systems science. In our attempt to assess student comfort and confidence in using telehealth, we hope to identify gaps in care delivery and assess students' abilities to adapt to health systems improvement challenges that have been revealed as a result of the COVID-19 pandemic. Our goal is for graduating medical students to be able to provide high quality care in a manner that addresses all six Institute of Medicine dimensions of quality — patient safety, effectiveness, patient-centeredness, timeliness, efficiency and equitability — even while using a virtual platform.

Outcomes

Of 29 students in the in-person cohort, there were 26 respondents to the self-assessment, yielding a response rate of 89.7%. Of 34 students in the virtual cohort, there were 26 respondents, yielding a response rate of 76.5%. In the in-person cohort, 57.7% of students reported being comfortable breaking bad news independently or independently at first, followed by a discussion with a supervision physician, compared to 76.9% in the virtual cohort. Similarly, 73.1% of students in the in-person cohort reported slight or complete confidence in breaking bad news, compared to 80.8% in the virtual cohort. These findings suggest that students might feel more comfortable and confident breaking bad news virtually than in-person.

These results are important because clinician comfort and confidence are significant facilitators in the adoption of new technology. Embracing telehealth as a platform for breaking bad news may be a step toward a value-based model of health care. Research has shown that deferring health care appointments is linked to worse patient outcomes. By allowing patients to continue receiving regular care, telehealth has the potential to improve outcomes and quality of health care encounters, thereby improving patient experience. Furthermore, telehealth can be cost-effective; patients avoid costs associated with transportation, childcare, and time away from work. Notably, clinicians are reimbursed equally for telehealth appointments and in-person appointments.

Our project's outcomes establish clinician comfort and confidence in using telehealth for breaking bad news. Our findings suggest that the new generation of digital natives entering the field of medicine are more inclined to adapt to rapid changes made to improve health care delivery as part of a value-based system of health care.

Moving forward, we plan to analyze data from the SPIKES and ECRS faculty and SP assessments, and from student self-evaluations to determine how students' performance in these two domains differs between in-person and telehealth encounters. If student performance is lower in telehealth encounters, we plan to analyze how telehealth is incorporated into our medical education curriculum and improve our curriculum accordingly. If student performance is equal or higher in telehealth encounters, further credence could be lent to the adoption of telehealth for breaking bad news.

Personal impact

At the onset of the COVID-19 pandemic, third and fourth-year medical students were removed from in-person clinical rotations and our clinical experiences were re-

structured to follow a telehealth format. Six months later, at least half of non-emergent outpatient consults are still conducted on a virtual platform. In this time, we realized that while telehealth has made it easier to contact patients and follow up on their care regularly, we struggle to recreate the natural flow of an in-person appointment amidst the physical separation and various technological difficulties. We recognize that while verbalizing emotions to display empathy is still possible, crucial components of nonverbal empathy, such as eye contact and offering a comforting touch cannot be replaced. However, aspects of our body language that we can still communicate with, such as sound volume and pitch, cadence of speech, nodding, smiling and other facial expressions are further emphasized. Watching graduating medical students deliver a diagnosis of cancer to SPs over telehealth has not only helped us understand the subtleties of effective communication, but also made us hyperaware of our own non-verbal mannerisms and the ways in which we actively listen and empathetically respond to patients. This project underscored a lesson that we learned on the first day of medical school: the way in which a message is communicated is just as important as its content.

GET Access: A Medical Student Volunteer Program to Increase Video Access for Geriatric Telehealth at the Onset of the COVID Pandemic

Project lead
Cayla Pichan, University of Michigan Medical School

Teammates
Cassidy Merklen, Clare Anderson and Kinsey Vear

Faculty mentor
Dr. Mary Blazek, Clinical Associate Professor Director, Geriatric Psychiatry Clinic, University of Michigan Medical School

Abstract

In response to COVID-19, ambulatory care abruptly transitioned to virtual visits. Video visits provide more clinical information and better interpersonal connection between patient and provider than telephone visits. Our goal was to facilitate access to video telemedicine for geriatric patients by providing one-to-one guidance and practice. Medical students at the University of Michigan Medical School created an initiative to improve access to and comfort with video visits for geriatric patients. Over a 12-week period, providers whose patients worked with GET Access volunteers had a video visit rate of 43% compared to 19.2% prior to participation in the program (adjusted OR 3.38 [95% CI 2.49, 4.59]). In conclusion, a program to help geriatric patients transition from phone to video visits, using personalized virtual technological instruction and practice, successfully increased the proportion of video telehealth visits, ultimately improving patient care and safety.

Project addressed/problem discovered

The onset of the COVID-19 pandemic brought an abrupt transition from in-person to virtual visits for health care. Although geriatric patients have shown equal satisfaction with telemedicine versus in-person visits, they can be at a significant disadvantage due to their lack of access to and comfort with technology. For example, a 2019 Pew Research survey reveals that although 81% of Americans own a smartphone, only 53% of those over age 65 do. While 73% of Americans have broadband internet service at home, only 59% of people 65 years or older do. Previous publications advocate for wide dissemination of telehealth instruction, emphasizing the importance of providing support for older adults. Because geriatric patients are at increased risk of morbidity and mortality from COVID-19, it is necessary to prioritize remote connections with these patients.

Although we are unaware of studies comparing video to telephone visits, intuitively, video visits provide a better interpersonal connection and improved ability to evaluate the patient. This is especially true in psychiatry, where eye contact and emotional body language are key aspects of the patient-provider interaction. Prior to the COVID-19 pandemic, a systematic review of geriatric telepsychiatry by Gentry, Lapid and Rummans revealed that telemedicine had the ability to deliver high quality psychiatric care to older adults but was only available to a small fraction of rural patients, due to many barriers, most notably Medicare restrictions. They recommended strong public policy advocacy to remove those restrictions to provide broader access to this high value method of care.

With the onset of the COVID-19 pandemic, Medicare issued a waiver that allows for telehealth visits to be reimbursed equally as face to face visits, including both telephone and video, providing the opportunity to implement telehealth to all Medicare recipients. To do so with alacrity at the onset of the pandemic, under the constraints of an underprepared system, creative solutions were needed. What is lacking at our institution, as well as others, is the infrastructure to guide patients on how to access and effectively use video telemedicine technology.

Approach

Responding to the particular need to increase older adult participation in video visits, medical student volunteers, away from clinical responsibilities as mandated by executive order, created the GET Access initiative, Geriatric Education on Telehealth. The goals of this initiative were to 1) explore and refine educational opportunities to deliver virtual personalized training to older adults, 2) develop training materials, 3) provide patients one-to-one remote guidance, identifying and overcoming barriers, with practice sessions to increase comfort, 4) share with the larger health system, and 5) ensure the sustainability of the program.

To create the training materials, we explored modalities for video visits that were relatively user-friendly, could be used on different electronic devices, and were within compliance with the health care system. We created a volunteer manual that included a structured process for how to call patients, a walk-through of the video modalities, an algorithm for choosing which modality is best for each patient and troubleshooting resources. We created a basic three-call format — an initial call and a practice call at least one week ahead of their encounter and a follow up call after their appointment. During the initial call, the volunteer and patient decide together which video software would be best, based on patient comfort and experience with technology, functional limitations, and who needs to be present for the visit. During the second practice call, we help the patient complete the electronic check-in (E-check in) process, practice the call using the video modality, and allow for the patient to ask any additional questions. Following the patient's appointment, we call the patient for a third time to discuss what went well, any problems that arose, and to collect any general feedback. We also inquire if the patient would like a "refresher" call before their next appointment to review the process. After each call, volunteers recorded duration of call, modality of video service taught, any issues/concerns and positive feedback provided by patients.

We held virtual volunteer trainings to explore the training manual and to teach the necessary video modalities. The provider generated the list of patients they would like to be contacted and gave this to the volunteer. Along with basic contact information, we also requested that the provider give details about the patient's social situation or support network and need for family members or others to join the clinic appointment, with special attention to those with communication difficulties, cognitive impairment or dementia. We held regular volunteer check-ins to ensure volunteer retention and satisfaction and paired trainees with more experienced volunteers in a mentee/mentor relationship so that questions could be answered in a timely manner. Finally, in anticipation of medical student return to clinical rotations, sustainability was achieved by transitioning project leadership to a pre-clinical student with the continued participation of the preclinical medical students and undergraduate volunteers.

Outcomes

Quantitative Results: Between April 21 and June 6, 2020, 26 volunteers worked with 12 providers (physicians and nurse practitioners), attempting 219 total calls (including initial, practice and follow-up calls). The GET Access Program volunteers were successful in teaching and converting many visits to video that the schedulers were unable to do on a first pass. We achieved an 88.75% conversion rate (phone visit to video visit) in patients who agreed to participate in the program. The primary modality used was University of Michigan Medical School Portal Video Visits, followed by Zoom Health Video Visits. Initial call times ranged between 10-90 minutes with an average of 20 minutes per phone call.

During the 12 week-evaluation period, 1942 patients had 2865 visits to the two clinics. Of 57 total providers in both clinics, 12 received help for at least one visit after which all visits were considered to be intervention visits. The number of weeks providers were exposed to the intervention ranged from 1 to 7 weeks (mean 4.3 weeks). In the first two weeks of the project launch, assistance for 8 visits was provided; in the final week of the evaluation assistance was considered as being provided for 88 visits across all 12 providers in the study.

Of a total of 2865 visits made to the two clinics, 403 visits (14.1%) were intervention visits, i.e., provided after any support by the GET Access program, 752 visits (26.3%) to providers prior to the program, and 1,710 visits (60.0%)

were to providers who were never helped during the entire period. Averaged over the 12 weeks of the evaluation period, visits after participation in the program were associated with video format 43% of the time compared to 19.2% for visits prior to participation (adjusted OR 3.38 [95% CI 2.49, 4.59]). Non-participating providers had a video visit rate of 32.1% during the same time period (adjusted OR 1.65 [1.31, 2.08]).

Qualitative Results: Overall, feedback gathered from patients during follow up calls was positive. The strongest recurring theme was increased patient confidence with technology for telehealth, crediting the amount of time that volunteers put into guiding them step by step.

Patients appreciated the increased comfort of video visits. The husband of a 93-year-old patient who assisted with his wife's video visit stated, "We even liked it better than sitting right there. It was more comfortable being at home."

Many patients talked about how the video visit exceeded their expectations, like this 64-year-old patient with dementia, "The appointment was great, better than expected. Dr. M was on my screen, and I was on his "

Areas where patients said they ran into difficulty included working with older technology and adjusting sound and visual settings to best suit them.

Feedback from providers was overwhelmingly positive. The strongest recurring theme was that the program increased their number of video visits overall and their patients seemed grateful for the help.

"Patients were empowered and able to learn a new skill they thought would never be possible. The also appreciated the kindness and coming back for a practice session before the real appointment."

Areas where the provider thought the program could use some improvement revolved around the time-consuming task of going through their patient list and compiling the patient's information for their volunteer.

Personal impact

This project has impacted my professional development in numerous ways. I learned a lot about how to effectively work with larger organizations and functioning within their protocols. I had the opportunity to work with clinic managers, schedulers, and other administration and experienced the unique opportunity to look behind the scenes to see some of what is required to maintain a functioning health care system. I also was able to hone my public speaking skills though communicating with the necessary stakeholders by presenting information in a way that they can receive it positively in an effort to enact change at the administrative level. I was able to refine my leadership skills while being in charge of 26 volunteers, and I was able to strategize ways to keep those busy medical student volunteers engaged and interested in the project through effective communication strategies which will certainly inform my future career as a physician. And finally, this project brought (and continues to bring) me a lot of joy. Communicating with older adults, especially during a time when social isolation is at an all-time high, was the most enjoyable and special part of this project. Although I already knew I had an interest in geriatric medicine following my exposure to the field during my internal medicine rotation, this project really solidified my desire to work with this specific population of patients who often are left by the wayside.

Implementing a Telemedicine Curriculum for Internal Medicine Residents during a Pandemic: The Cleveland Clinic Experience

Project lead
David Savage, UC San Diego Health, project implemented at the Cleveland Clinic, Cleveland, OH

Teammates
Bryce Montané, Omar Gutierrez and Achintya Singh (all with the Cleveland Clinic)

Faculty mentor
Cory Chevalier, Staff Physician, Cleveland Clinic

Abstract

In April 2020, our team built and implemented a trainee-led curriculum to train internal medicine residents in effective utilization of ambulatory telemedicine in less than five weeks. This entailed creating a formal training program for residents, creating a resource guide for the different video communication tools, and training preceptors to safely supervise care in this new paradigm. We also created an assessment instrument in our education evaluation system that allows residents to receive feedback on their performance during virtual appointments. Through collaboration with experienced residents and faculty, we expeditiously developed an enhancement to our ambulatory care curriculum to teach residents how to provide virtual care and help faculty with supervision.

Project addressed/problem discovered

Until the COVID-19 pandemic, training in telemedicine was not a substantial element of most residency programs. Social distancing measures changed this. We leaned heavily on the model at the Medical University of South Carolina, who have many years of experience with a residency telemedicine curriculum. The Cleveland Clinic Internal Medicine Residency Program (IMRP) is one of the largest programs in the United States, which made the task of developing and adopting an effective, expedited telemedicine curriculum challenging. Our goal was to implement a system for teaching telemedicine care skills and supervising the care provided by residents during virtual visits.

Approach

COVID-19 emphasized the importance of considering the larger health system in the care of the patient. Not putting our patients at risk with in-person visits was a significant barrier and required our collective action to ensure we could ensure continuity. We depended on our ambulatory medical assistants to help convert in person appointments to virtual, and we used the help of our administrative coordinators to make sure that important paperwork was processed for patients. We also recognized the increased mental health burden of the pandemic, and our clinical mental health social worker was a vital lifeline to connecting our patients with community care resources. Our telemedicine project allowed our residents to see this firsthand. The domains this encompassed were population health, interprofessional care, and systems thinking.

Outcomes

Because of our enthusiasm in medical education and our commitment to our fellow residents, we were able to maintain continuity of care with our patients. We would have otherwise not had the opportunity to fully utilize telehealth within such a short period of time. Because of this, all 148 ambulatory residents in our internal medicine residency have now been trained in performing virtual visits, and they have completed more than 2,000 such visits since early April 2020. Moreover, we were able to enhance the resident education for years to come.

Personal impact

The present project tried to expedite the implementation of a telemedicine curriculum during the COVID-19 pandemic. Adapting to newer technology is a crucial aspect of developing as a physician. The study helped in coming up with novel ideas to improve community engagement like utilizing various different applications for video conferencing. We are each now more prepared than ever to offer telemedicine care to patients when in independent practice.

Protecting Patients and Health Care Workers During the COVID-19 Pandemic — Integrating Decision-making Algorithms into an Online Survey to Automate Return to Work Determinations Following Possible Exposure

Project lead
Alexander Nguyen, University of Texas Health Science Center at Tyler

Faculty mentor
Shaadi Khademi, MD, Medical Director of Occupational Health, University of Texas Health Science Center at Tyler

Abstract

During the COVID-19 pandemic, our role as the hospital's occupational health clinic has become more visible as we are relied upon to protect our hospital's essential health care workers from the coronavirus. We are responsible for determining who should return to work or remain quarantined following possible exposure to the coronavirus. The occupational health clinic medical director and I created an algorithm based on Centers for Disease Control and Prevention return to work guidelines to simplify the decision-making process. I then integrated this algorithm into an online questionnaire that consisted of pertinent questions required to make the appropriate determination. Integrating the algorithm allowed us to automate the process by adding a function in the online questionnaire that automatically displays the appropriate determination depending on how the questions are answered. This has increased our accuracy and efficiency of making the right determinations required to protect the hospital workforce that makes up the front lines of this pandemic.

Project addressed/problem discovered

The COVID-19 pandemic created a number of problems for occupational health departments across all industries. Not unlike public health departments, we were dealing with our own post-exposure contact tracing. Prior to the hospital enacting a universal masking protocol, exposures were very common. Most exposures occurred because hospital staff were unaware that a patient potentially had COVID-19, preventing appropriate measures to be taken. This would lead to a contact tracing nightmare event as patients can easily come in contact with 20 hospital staff within one hour of them being in the hospital. On any given weekday, our clinic has three registered nurses, one occupational medicine resident, and two attending providers. One exposure event may require all but one or two clinic staff to complete the contact tracing investigation, usually taking at least a couple hours. During this time, our clinic must continue to function as an occupational health clinic seeing pre-placement exams and treating work injuries. There needed to be a more efficient process to making return to work determinations in order to keep our department and other departments functioning. Imagine a hospital radiology department with 20 staff members unable to work until employee health completes the contact tracing investigation. There was always tremendous pressure placed on the occupational health medical director to not only make the appropriate decision to keep hospital staff safe, but to somehow keep the hospital adequately staffed.

Approach

I had spent one month at the Texas Department of State Health Services (DSHS) as the pandemic was beginning and learned their process of contact tracing using decision trees and call centers. I used what I learned regarding population health at DSHS and leveraged my knowledge of health informatics to create an automated function within our online return to work questionnaire. The automation of return to work determinations freed up our staff to continue their usual regular duties in the clinic while leaving most of the difficult contact tracing decision-making to the occupational health medical director. Because we were able to collect data on the exposures such

as the nature of the exposure, where exposure occurred, what personal protective equipment was used and the reason why the exposure occurred, we were able to identify the common problem areas within the hospital. We were then able to educate middle management regarding best practices to prevent future exposure events. Due to the iterative process I took in creating the automated online questionnaire, run charts were created to track the level of automation. Scenarios were programmed into the online questionnaire one by one with a goal of automating every possible scenario. Process maps were also created to give us a more consistent process when the Centers for Disease Control and Prevention changed guidelines or a bug was found in the automation requiring revision of the online questionnaire. This process usually required reverting to an older functioning version of the online questionnaire and making the revisions to an offline version with final testing performed by the medical director.

Outcomes

Since employing the automated online questionnaire, the number of phone calls fielded by the occupational health department staff per return to work determination made was reduced by 43%. It was difficult to obtain precisely which phone calls were associated specifically to return to work issues, but the total incoming and outgoing calls to and from the clinic were compared to the number of return to work determinations made each month giving us a rough ratio of calls to the clinic to each determination made. We are still almost too busy to dig deeper into the data collected from the questionnaires, but we have seen a significant reduction in the exposure events from approximately 60 per month from March to July to 16 in the month of August. There are a number of factors affecting this including the universal mask order, but we believe it to also be due to the targeted education we provided to middle management preventing future exposure events. With a rich pool of data gathered from our online surveys, we hope to also be able to learn more about exposures in our institution and the community at large. Travel patterns can also be extracted from the data as well as COVID-19 testing data. We hope to be able to extract and analyze these data points in the coming months.

Personal impact

I have always been interested in health informatics and its potential to make a significant impact on population health. With technology evolving at its current pace and its increasing adoption in all aspects of health care, I believe it is crucial that residents are exposed to the integration of technology in the health care setting. This project was the perfect opportunity for me to develop my skills in health informatics and make an impact on the hospital working population. I was not only given the opportunity to be instrumental in design of the return to work determination process, but I was encouraged to be innovative in my approach. The project allowed me to develop my technical skills in programming using my medical knowledge as the basis and rationale. The last few months working directly with the clinic staff and attending meetings with upper management has allowed me to develop some of my soft skills in communication and leadership.

Telemedicine Outpatient Dermatological Care During the COVID-19 Pandemic

Project lead
Abigail Cline, New York Medical College Department of Dermatology

Teammates
Bijan Safai, MD, New York Medical College Department of Dermatology and Juliana Berk-Krauss, MD, SUNY Downstate Department of Dermatology

Faculty mentor
Shoshana Marmon MD, Assistant Professor at New York Medical College Department of Dermatology

Abstract

Due to technological, economic and educational barriers, patients who are older, poor or non-English speakers often have difficulty engaging in telemedicine. Therefore, we designed and implemented a telemedicine workflow that bypassed the necessity of broadband capability and computer literacy through a text-based system designed around a patient's cell phone. To ensure this workflow enabled access to our vulnerable patients, we utilized clinical informatics to compare pre-COVID-19 patient demographics and language preferences to those who completed telemedicine encounters during the COVID-19 pandemic. We found no statistically significant differences between patient demographics or language preferences of patients who completed in-person visits the year prior compared with patients who engaged in telemedicine visits. Importantly, the majority of our patients (55%) sent pictures and/or video conferenced with physicians. This set-up provided continuity of care to over 3,000 dermatology patients at a safety-net hospital in NYC during the pandemic.

Project addressed/problem discovered

While telemedicine has slowly gained traction over the past few years, the COVID-19 pandemic dramatically elevated its importance to the forefront of clinical care. Although telemedicine promises the extension of care to anyone with an internet connection, the reality is far from equal. Telemedicine traditionally utilizes patient portals, wherein patients must register, log-in to a website and/or download and sign-in to an app to initiate communication with their physician. Studies show these steps, and the requirement of an email address and broadband capability, discourage vulnerable patients from seeking and receiving medical care. Indeed, electronic health record portals are unable to surpass 30% adoption, with low-income, non-white, Spanish-speaking patients significantly less likely to activate their accounts.

The "digital divide" is a well-described phenomenon resulting in the disenfranchisement of older adults, non-native speakers and the economically disadvantaged due to inadequate technological proficiency. The COVID-19 pandemic continues to widen this divide and worsen health care inequities. Our dermatology clinic operates out of a public safety-net hospital in Brooklyn, New York. We serve a racially diverse population disproportionately affected by COVID-19, with a demographic distribution of Hispanic (26%), Black (11%) and Russian (13%). Unfortunately, due to language, educational, technological and economic barriers, they are also a population that is difficult to engage via telemedicine. With this in mind, we developed and implemented a user-friendly, text message-based system specifically designed to accommodate our most vulnerable patients.

Approach

We developed a teledermatology workflow utilizing a low-cost modifiable commercially available platform (Spruce, San Francisco, California) that allowed us to call, text and photo-share with patients, a function critical to obtaining an accurate diagnosis in dermatology. Using a second free application (Doximity, San Francisco, California)

patients received a text message link that opened a video conference with their physician enabling a synchronous real-time interactive dermatology encounter. Patients had 24/7 access to text or call their providers, and non-urgent messages were returned within 48 hours. Information such as photos and text messages received from the patients presented in a comprehensive telemedicine application on the physicians' end with a sequential workflow, text message encryption, secure remote storage, password protection and internal physician-to-physician communication capabilities. This setup removed technological barriers from the patients while enabling a robust and sophisticated system for use by the physicians. The result was seamless communication and organized and efficient health care delivery.

To ensure that this workflow did not exclude certain members of our patient population, we utilized clinical informatics to analyze the demographics and teledermatology usage results via our electronic health record (EPIC, Verona, Wisconsin). We investigated age, demographics and language preference of patients with completed telemedicine encounters in the COVID-19 era (March 2020 to August 2020) compared with patients who completed in-person visits from the preceding year (March 2019 to August 2019). We also quantified the total number of visits conducted through the use of digital photography, video and/or telephone to determine if age, demographic and/or language preference is associated with a type of visit media used and/or the likelihood of completing a teledermatology visit.

Outcomes

Clinical informatics enabled us to investigate patient demographics, language preferences and activity (i.e. texting, photography, video conferencing) of teledermatology visits. Pre-pandemic (March 2019 to July 2019), the demographics of our in-clinic visits were 28% White/Caucasian, 26% Hispanic, 11% Black, 5% Asian, and 30% other/declined. During the COVID-19 pandemic (March 2020 to July 2020), the demographics of our teledermatology visits were 26% White/Caucasian, 26% Hispanic, 12% Black/African American, 5% Asian, and 31% other/declined. There was no statistically significant difference in the demographic make-up of our patients prior to and during the COVID-19 pandemic. Analysis of preferred language yielded similar results. Pre-pandemic, we conducted 39% of our in-clinic visits in English, 36% in Spanish, 14% in Russian and 11% in other languages. During the pandemic, we conducted 38% of our teledermatology visits in English, 37% in Spanish, 13% in Russian and 12% in other languages. Again, there was no statistically significant difference.

Analysis of patient activity on the telemedicine platform demonstrated robust patient activity, with the 55% of patients completing digital media encounters (sending pictures and/or video conferencing with providers) and the remaining 45% participating in telephone encounters. The demographics of the patients completing digital media encounters were as follows: 24% White/Caucasian, 34% Hispanic, 13% Black, 6% Asian and 23% other/declined. We conducted 39% of digital media encounters in English, 39% in Spanish, 12% in Russian and 10% in other languages.

Safety-net hospitals such as ours serve economically disadvantaged communities enriched with immigrants, non-native speakers and minorities. Our telemedicine system effectively bridged the "digital divide" that threatened to leave our vulnerable patients without dermatological care during the lockdown in New York City. Analysis of telemedicine usage via clinical informatics helped us refine our approach and ensure patient engagement.

Personal impact

This work has instilled in me the importance of health systems science and how it can improve patient care and health care delivery. Utilizing clinical informatics to analyze the electronic health record helped me identify barriers to patient care that our clinic needed to address to ensure greater patient access.

The Homeless and Indigent Population Health Outreach Project Promise Clinic: Addressing Challenges through Centralized Telehealth to Care for Underserved Minorities during COVID-19

Project lead
Joshua Rowe, Rutgers Robert Wood Johnson Medical School

Teammates
Vaishnavi Warrier, Michael Enich, Meagan Hawes and Ila Nimgaonkar

Faculty mentor
Karen WeiRu Lin, MD, MS, Rutgers Robert Wood Johnson Medical School

Abstract

The Homeless and Indigent Population Health Outreach Project Promise Clinic (PC) is a student-run free clinic committed to serving the uninsured patrons of Elijah's Promise Community Kitchen in New Brunswick, NJ. PC is run by over 220 medical student volunteers and 29 volunteer physicians, all associated with Rutgers Robert Wood Johnson Medical School. Thosse involved in PC came together in March 2020 to respond to the effects that the COVID-19 pandemic had on our patients and the New Brunswick community. Recognizing that the pandemic could amplify disparities in care for the medically underserved, PC established protocols to shift its in-person care model to an integrated, centralized telehealth system that preserves our unique continuity of care provided to patients. This transdisciplinary approach combines virtual patient care and coordination of services that address both medical concerns and socioeconomic determinants of health.

Project addressed/problem discovered

New Brunswick is a community of myriad races and socioeconomic backgrounds. Over 20% of the city is uninsured (July 2019) and the lack of health care is compounded by a poverty rate three times the national average. Promise Clinic, a student-run free clinic, was founded by medical students and sponsored by the medical school to help address these disparities. PC follows two core domains of health systems science: population and public health management, and value-based care. We provide longitudinal primary care by following six dimensions of high quality care (patient safety, effectiveness, patient-centeredness, timeliness, efficiency and equitability). PC has a continuity-of-care model that pairs each new patient with a team of four medical students who work with volunteer physician preceptors. Continuity care allows teams to witness the reality of their patient's medical issues in the context of their challenging social circumstances.

In March 2020, New Brunswick became an epicenter for the epidemic with a majority of cases occurring in lower income areas where many PC patients live. Unfortunately, statewide safety guidelines mandated that PC suspend its in-person services. Before COVID-19, in addition to their medical care at PC, patients had access to social services including food assistance through community partners, reduced price prescriptions, health education and medical case management services throughout the city. At the onset of the COVID-19 pandemic, the PC team worked to adapt its in-person continuity care model to a coordinated telehealth service to offer patients the same care and breadth of services as before.

Approach

Shifting to a telehealth model reinforced four domains of health systems sciences: health care structures and processes, health system improvement, clinical informatics, and population and public health.

We centralized communication between PC's student doctor teams and student steering committees, who previously acted as separate clinical microsystems, using

an online portal with easily accessible resources. To help transition care, the operations and communications committees created call scripts with COVID-19 screening and recommendations for hygiene and safety precautions. Teams were paired with internally certified student community interpreters to provide equitable services to Spanish-speaking patients.

The quality improvement committee used a "weekly patient list" to monitor the frequency of patient-encounter documentation to ensure all patients received high quality care. The pharmacy committee developed a completely electronic means of delivering prescriptions to the community pharmacy partner for greater efficiency. The laboratory committee coordinated diagnostic testing at a local hospital. To address rising anxiety levels, a mental safety emergency protocol was created, and patients received mental wellness check-ins through the student Depression and Bipolar Support Alliance team.

The operations committee then created protocols to follow in the event of a patient hospitalization to manage post-hospitalization or postoperative patients, allow the secure transfer of medical records, and maintain continuity between disparate electronic health record databases.

To address socioeconomic disparities, the social needs and community outreach committees created an asset map, identifying community partners to facilitate the distribution of hygiene kits and masks and coordinate contactless grocery delivery for homebound food-insecure patients. Additionally, PC collaborated with Archangel Raphael's Mission and the local church to install a mobile hand washing sink in New Brunswick, providing access to basic hygiene measures to those experiencing homelessness in our city amidst the pandemic. The community outreach committee will continue with the third year of VeggieRx collaboration with New Brunswick Farmers Market and Rutgers University Cooperative Extension to distribute fresh vegetables and fruits to our patients through the fall.

These initiatives dovetailed into a weekly virtual "huddle" where attending physicians, student doctor teams, and committees collectively discussed patient care and planned the allocation, delivery, and coordination of the aforementioned services.

Outcomes

Quantitative primary outcomes between March 26 and August 27, 2020 include 157 virtual presentations for telehealth appointments. Twelve patients were lost to follow up or moved out of the state, and two patients were transitioned to Medicaid health insurance and referred to our federally qualified health center in town. 116 free prescriptions were provided by electronic prescription with vouchers, and nine patients obtained medications through the prescription assistance program. Eight patients received food deliveries where they stayed. In total, four resources — the call script, weekly patient list, mental health emergency safety protocol, and COVID-19 hospitalization protocol — were developed to address PC's evolving needs. These protocols were written in a way to be easily disseminated to other free and student-run clinics and tailored to the individual needs of their own patient populations. Two patients were hospitalized with COVID-19, and their care was closely managed by their student doctor team using the hospitalization protocol to coordinate with health care teams of local and field hospitals. This included a complex post-discharge course under close supervision of a faculty adviser to PC. One patient received specialized surgical procedures, preoperative clearance and postoperative follow up in coordination with the specialty care committee.

PC student participants articulated a meaningful impact from their participation. In in-depth qualitative interviews, students reported direct exposure to systemic barriers to health care in underserved communities. Additionally, they reported changing ways in which they navigated health care bureaucracy and how they addressed ongoing medical problems in a resource-scarce environment. They also reported better understanding of their role in interdisciplinary teams, collaborated with other community-based organizations and resources, and felt accomplished in their ability to develop a positive, trusting relationship with their patients. For the remainder of 2020, PC plans to continue addressing patients' concerns using this new telehealth model. We have initiated the process of

establishing a new hybrid model of clinic to offer limited in person laboratory services which are used to further guide more complex care.

Personal impact

In the midst of the current COVID-19 pandemic, we witnessed the difficulties for rigid health care structures to respond quickly to the shifting landscapes of our world. This taught us that to adapt, health care settings must be nimble, creative and steady. Medical students are usually not privy to the nuances of health care administration; however, our experiences at PC elucidated the complexities of operating a clinic both during a state of normalcy and a pandemic. During the pandemic, many medical students around the country were removed from the health care sphere but being a part of the PC community empowered us to continue caring for patients in a new way. We felt like we were an integral member of the health care workforce with the ability to help shape it for the future. It is no doubt that the COVID-19 pandemic is one of the most devastating periods of the last decade and will have lasting impacts on health care professionals. While states have been diligent about reporting positive cases and deaths, there is an unreported statistic: the number of underserved individuals who were not able to access the information and care they required. During the last six months, we, as members of PC, were able to mitigate the effects that this pandemic might have otherwise had on the New Brunswick community, reducing the size of that statistic.

The Ochsner MedVantage Network Innovation Project: Bridging the Digital Divide for Vulnerable Patient Equity

Project lead
Diab Ali, University of Queensland - Ochsner Medical Program, project implemented at Ochsner Medical Center-MedVantage Clinic

Teammates
Monica Gillie (University of Queensland Ochsner Medical Program), Oluwabukola Akingbola (Lincoln Memorial University DeBusk College of Osteopathic Medicine) and Kierha Baker (University of Queensland Ochsner Medical Program)

Faculty mentor
Kathy Jo Carstarphen, MD, MPH, Ochsner Health

Abstract

The MedVantage Clinics (MVC) at Ochsner Health (OH) care for patients of advanced age, those with complex medical issues, expressed low health literacy, and/or experienced financial, housing, and transportation insecurity. COVID-19 and the telehealth shift disproportionately impacted these patients. Medical students rotating in MVC began a dedicated telemedicine training program, spending 358.5 hours training 309 patients. At the end of this period, only 18.8% of these patients could virtually connect to a provider. The time burden spent on telemedicine training was an insufficient solution, with persisting socioeconomic, structural, and literacy barriers in our patients. An outcome of this outreach is the ongoing development of Ochsner MedVantage Network Innovation (OMNI) project. Medical students created the first telehealth literacy screening tool, facilitated the adaptation of user-friendly tablets with simplified interface for MyChart log-in, and received an innovation grant from OH to determine if OMNI interventions will improve health outcomes for vulnerable patients.

Project addressed/problem discovered

A consequence of many hospital and clinic services transitioning to virtual services was disparate access to technology due to finances and/or literacy. Our project identified the telehealth access inequity in geriatric and complex populations during the COVID-19 pandemic. Identifying this void in the area of "population, public and social determinants of health" was an important health systems concept, as we saw the direct impact of social determinants of health on health access. The domain of "health care structure and process" revealed to us that without a specific project or workforce dedicated to our patients during this time, there would be a high possibility for loss of patients to follow up and inadequate response to patient needs as a system.

Approach

The initial approach to telehealth training involved telephone outreach to each patient or patient support person for the 309 high-risk patients on the MVC panel who had never performed virtual visits. These phone calls not only functioned to train the patients and families in virtual visits, but also included questions to monitor chronic medical conditions, compliance and access to medications, acute changes in health status, social isolation and socioeconomic barriers to care. These calls also screened for mental health issues and assessed access to food, transportation, and safe accommodation. We also managed records of successful contact, barriers to care and contact, and the needs of patients going forward.

The domain of "change agency, management and advocacy" was central to our motivation to perform this outreach to our highest need patients. We worked closely with the MVC nurses, social workers, pharmacists, medical assistants and physicians to assess those patients for safety and connect them with care. We advocated for patient needs by triaging them to the MVC staff when we identified a need for appropriate health care and social resources.

Outcomes

As described, our project uncovered areas for "health system improvement" as we identified a care gap and disparity in access to telehealth for low health literate and socioeconomically challenged patients. We brought forward our ideas on how to bridge this gap in access with the concept of "clinical informatics and technology." This resource gap in tools to measure and predict telehealth literacy led to our development of the first telehealth literacy screening tool, which is currently under review for publication. We collaborated with Innovation Ochsner (iO) and Information Systems (IS) departments to create solutions by simplifying our MyChart log-in process and provision of tablets designed for low telehealth literate patient access. We received a small innovation grant from OH called the Excellence Fund to purchase tablets for a pilot program. There are implications that the results from these interventions may be scalable for the OH Community Health Centers.

An often-overlooked health system science concept that is subtly woven throughout our project is "patient, family and community.' This has included maintaining regular communication with socially isolated and high-risk patients, engaging in difficult conversations about end-of-life care, and managing expectations during a health crisis. Improving patient outcomes required encompassing all aspects of a patient's life to have a sustainable impact on their care. The medical students coordinated calls with patients and their caregivers, ensuring they had the information to access community resources and urgent support systems. Having medical students serve as reliable points of contact for patients and their families connected patients to the MVC despite the uncertainty of COVID-19.

Personal impact

The major takeaway of this experience is the inseparable impact of psychosocial and socioeconomic determinants in shaping patient ability to partake in health care and overall health outcomes. This principle informs coordinated social service interventions in primary care for the medically complex populations that is compounded by socioeconomic barriers to health. However, as medical students, this concept was quite abstract to us prior to our work in the MVC and creation of the OMNI project during the COVID-19 pandemic. We realized not only the disproportionate morbidity and mortality COVID-19 had on patients with financial insecurity, low health literacy, mobility issues and limited access to housing or transportation, but the inefficacy of telehealth as a 'one-size-fits-all' solution.

The significant time burden spent on telemedicine training was alone an insufficient solution to telehealth adoption, with socioeconomic, structural, cognitive and literacy barriers in our patient population adamantly persisting as barriers. The conclusion here as a developing physician is that time input alone is not a uniform solution to patients with structural barriers to health care, and that the structural predeterminants of technological access and literacy must be addressed for such solutions to be successful in medicine. These solutions are otherwise not equitable in a system that favors patients with access to such privileges as smart devices and social networks of support and disadvantages those without such resources. We are inspired in acknowledging innovation is not simply the development and implementation of technology, but redesigning traditional systems surrounding that technology toward patient-centered care.

Utilizing Social Media as a Means of Spreading Credible Information Regarding the Coronavirus Disease 2019 (COVID-19) Pandemic

Project lead
Prerak Juthani, Yale School of Medicine

Faculty mentor
Neil Gupta, Doctor, Yale School of Medicine

Abstract

In recent years, social media has gained popularity as a means of disseminating information across all sectors of industry; health care is no exception (Zhu C, et al. doi:10.3390/ijerph17010192). In particular, the micro-video sharing platform, TikTok, has been used by health care professionals to engage with local residents and communicate health information. In this study, we utilized TikTok to share short, credible, educational videos regarding the COVID-19 pandemic. Video topics varied, but included overviews of epidemiological data, updates regarding the most recent COVID-19 studies, and insights into the actions that countries were taking to fight the pandemic. Between March 13, 2020 to May 12, 2020, 66 videos with an average length of 57 seconds each were created; together, these videos amassed 600,000+ views and sparked community engagement with over 1,000 comments and 80,800 likes.

Project addressed/problem discovered

The ongoing COVID-19 pandemic has been plagued by misinformation — especially from a scientific front. The goal of this project was to fight this misinformation by creating content that was not only credible, but also easy to understand. In a health system, we, as the providers, often have access to the most up-to-date information and the means of properly interpreting it. And, per the integrated health systems science model, I believe we also have an obligation to share this information with the general public — especially in the midst of a global pandemic. This is because providing large-scale education is an essential component to a successful response to a pandemic; the more people understand the reasoning behind why certain actions are taken, the more they feel comfortable with the situation. For example, one of the earliest developments of this pandemic was the COVID-19 map which was developed at Johns Hopkins University & Medicine. This visual database tracked daily and cumulative cases and was one of the first tools that highlighted the gravity of the pandemic. This tracker was disseminated widely and was one of the biggest reasons that everyone in the United States became aware of the virus's deadly impact. Seeing the visual data motivated huge societal changes — including pivotal legislation regarding masks and the closing down of economies in regions of the country where cases were spiking. Much like this tracker, my project hoped to increase educational accessibility regarding the COVID-19 pandemic and to combat public fear with education.

Approach

Clinical informatics and health technology: The crux of this project was to utilize the power of social media to spread meaningful, scientifically sound information regarding the COVID-19 pandemic. Each day, the team would read the updated literature regarding the virus and decide what data ought to be shared. For example, on March 18, 2020, there was literature showing how the cases in the U.S. were paralleling the cases in Italy — but they were simply offset by 11 days. We created a video summarizing these data, and the video amassed more than 400,000 views and was something that made the viewers aware of how dire our situation could (and has) become.

Population, public, and social determinants of health: This project addressed this facet of health systems science via education. One of the biggest facets of population health is education. The better the public understands the situation at hand, the most empowered they can

be to take actions that align with scientific principles. This is especially important when describing scientific phenomena that the general public may not have much knowledge about. For example, in one of our videos, we explained the fundamentals of a "cytokine storm." Viewers genuinely appreciated this video because it elucidated coronavirus pathophysiology in a way that they could visually understand. The video amassed over 30,000 views and was shared hundreds of times by viewers.

Value in health care and health system improvement: We hoped to showcase the positive power of social media through this study. Social media emanates every aspect of society, and we hoped to utilize it to combat misinformation. Every video was based on objective, peer reviewed studies and hoped to answer frequently asked question regarding COVID-19. We believe this improved the existing health care system because it added value in a novel way. Social media is already where many individuals get their news, and thus, we sought to utilize that very domain to bring credible information to their fingertips.

Outcomes

Over the time period of this study (March 13, 2020 to May 12, 2020), we created 66 videos — each of which had an average length of 57 seconds (maximum limit allowed on the TikTok domain was 60 seconds). These videos addressed the epidemiology of COVID-19 (prevalence, incidence, geographical hotspots), pathophysiology of SARS-CoV-2, and even compared the current pandemic to prior coronavirus pandemics (SARS and MERS). The total views across all the videos amassed to over 600,000 (~9,091 views/video) with a total of 80,800 likes (~1,224 likes/video) and over 1,250 comments (~19 comments/video). These numbers represent approximations as these values are dynamic and change on a day-to-day basis.

Moving forward, we hope to compare our videos' metrics to those of other health care providers on the TikTok platform to gain a better comparative understanding of our impact. We also hope to do a qualitative analysis of the comments on each video to see which videos in particular stimulate community engagement and which videos are not as effective. Through this analysis, we hope to get a better understanding of how to better convey scientific news in a way that can reach the most people and foster the most engagement.

Personal impact

This work has made me realize that I am never too small to make a difference. Going into the pandemic, I felt fearful. However, I realized that one way to combat that fear was through education. The more people know, the more likely they are to make the scientifically sound decisions. Often times, the less someone knows, the more likely they are to feel overwhelmed in the face of challenges. Even though I am not an infectious disease expert, I felt that, as a medical student, I still had the ability to read and disseminate credible information in hopes to alleviating panic and providing comfort. Surprisingly, my videos resonated with hundreds of thousands of people across the globe — many of whom felt empowered by the videos and appreciated how they were able to simplify concepts that they previously could not understand. What I found to be even more empowering was to hear first-hand from individuals who had themselves been infected with the virus or had loved ones who had been infected. Seeing that they appreciated my videos and that I was able to answer questions that they didn't have the courage to ask was immensely powerful. Moving forward, I believe it will be important to harness the power of social media to spread meaningful, scientifically sound information. If done properly, I believe this has the potential to help millions across the globe.

Virtual Physical Exam Training in Medical Education

Project lead
Chi Le, Vanderbilt University School of Medicine

Teammate
Manasa Bhatta, Vanderbilt University School of Medicine

Faculty mentor
Dr. Robert Miller, Patricia and Rodes Hart Chair in Medicine, Vanderbilt University School of Medicine

Abstract

Due to the coronavirus pandemic, telehealth services surged to continue high-quality care delivery. However, there are no reported approaches to virtual physical exam training in medical education. To promote comprehensive assessment, our quality improvement initiative aimed to improve providers' confidence and frequency in conducting a patient-assisted physical exam by video platform.

We developed an education handout based on existing literature and expertise from primary care physicians and specialists at our institution. We also formulated a template to record exam findings in the electronic health record. At our student-run free health clinic, training for 3rd and 4th year medical students seeing primary care patients was implemented.

We demonstrated that the training improved both confidence and documentation of thorough physical exams. Thus, our developed tools can be implemented in medical education at other institutions for clinical providers to improve rates of completion of the virtual physical exam.

Project addressed/problem discovered

Due to the impact of the COVID-19 pandemic, telehealth gained momentum as an effective measure to continue delivering high-quality care while minimizing risks of exposure for patients and clinicians. The surge in telehealth demand created a need for new capacity-building and development of workflows to effectively evaluate patients. For instance, at our own institution the number of telehealth appointments per day rose 100-fold during the month of March 2020. A few institutions have developed resources on how to conduct a virtual physical exam. To our knowledge, there are no reported approaches to incorporate training on conducting the physical exam by video platform in medical education.

Our setting of interest was Vanderbilt's Shade Tree Clinic, a free, comprehensive care student-run clinic affiliated with Vanderbilt University School of Medicine. Between July and September 2020, 85% of visits were done via telehealth, with 29% of telehealth visits being done by video. We observed that the majority of medical students opted to defer the physical exam when seeing patients through video. As the physical exam contributes to objective evaluation of patients, its deferral leads to incomplete assessments for both acute and routine primary care visits. To better understand the problem, we first met with stakeholders, including the faculty and student directors of the clinic and medical student volunteers. We determined that some of the primary drivers of the lack of physical exams conducted virtually were lack of knowledge, video/audio quality, and time restrictions.

Approach

Our team designed a quality improvement initiative to promote comprehensive assessment during telehealth visits at our free student-run clinic. To address the training gap that may hinder high value care, we brainstormed that providing educational materials could improve knowledge and ultimately confidence in conducting virtual physical exams. Based on the growing literature of patient-assisted physical exam, our team drafted an informational handout to guide providers through video evaluation of nine systems: constitutional, HEENT, cardiovascular, pulmonary, abdominal, musculoskeletal, neurologic, psychiatric and

skin. We also sought expertise contributions from 11 primary care clinicians and specialists to formulate a robust resource with high clinical utility. As a test of change, we provided the handout to clinical volunteers (senior medical students) by email to review before each clinic date.

While the guide improved medical students' confidence in performing the exam, we found that there was a paucity of its documentation in the clinic notes. This was felt to be related to time restrictions as well as delay in behavior change. Furthermore, the default visit note template indicated deferral due to telehealth limitations. From our discussions with the stakeholders, we developed a physical exam template with potential findings by system to leverage health technology and improve the health care process. To avoid erroneous documentation and direct providers' attention, we also incorporated wildcards, a feature in our electronic health record system that requires the notewriter to review each exam portion before signing the note. As our second test of change, we integrated our physical exam template into the default telehealth visit note.

To track our progress of improvement, we established and collected data for two outcome measures. For medical students' self-reported confidence in performing the virtual physical exam, clinical volunteers were sent a questionnaire after each clinic date to rate their confidence on each of the exam portions on a Likert scale of 1 to 5 with 1 signified "not at all confident" and 5 represented "very confident." The second measure was the proportion of telehealth video appointments during which physical exams were performed on at least three systems, which was obtained by chart review.

Outcomes

- Our quality improvement initiative achieved the following outcomes:
- The median proportion of video visits during which at least three systems were evaluated increased from 0% at baseline to 50% after both interventions.
- The median self-reported confidence for conducting the overall physical exam virtually rose from 1.4 out of 5 at baseline to 2.2 out of 5, which represented a 150% increase.
- By system, the pulmonary and constitutional exams were completed at 50% of the video telehealth visits. In comparison, obtaining vital signs, HEENT, cardiovascular and abdominal exams had the lowest completion rates post-intervention. The median confidence after at least one of our interventions was the highest for the constitutional exam at 3.5 out of 5 and lowest for the cardiovascular exam at 1 out of 5. The highest percent change in median confidence was observed for obtaining vital signs and musculoskeletal exams at 150%.
- The educational handout is now incorporated into Shade Tree's regular informational email sent out to medical student volunteers before their clinic shift. In addition, the template for the virtual physical exam remains a part of the default telehealth note utilized by the clinic. We are continuing to update our data as these interventions remain in place.

The project also delivered the following novelties:

- The first guide to the virtual physical exam for a primary care clinic visit with medical trainees as targeted audience
- A training approach for performing and documenting patient-assisted physical exam over video platform in medical education that could be implemented at other institutions

Personal impact

Among health care technology, evaluations through video platforms have significant potential to improve access to care. With my background in computer science, I was keenly interested in the intersection of medicine and technology. As telehealth services expanded, my conversations with physicians revealed its immense and lasting impact across specialties. Thus, the quality improvement initiative was a valuable learning opportunity for me to delve into telehealth training and apply health systems science concepts to improve patient care. I gained the experience of developing a medical education resource and utilizing quality improvement tools to understand the clinical problem and measure results from our proposed interventions.

These skills will be invaluable as I embark on a year out to complete a Master in Global Health at Oxford. Along with other global health experiences, a month-long rotation at a neurosurgery department in Vietnam strengthened my aspirations for a global surgery career. In addition to observing and assisting in the ORs, I gained valuable insights into the barriers of treating neurosurgical emergencies. The lack of specialist access unfortunately leads to critical diagnostic delay. Therefore, I plan to harness the knowledge I gained from this work toward future telehealth capacity building and training in low-and-middle income countries in a team- and system-based approach.

As a medical student, I greatly appreciated the opportunity to implement a quality improvement project. This work would not have been possible without significant and equally impactful contribution from my teammate Manasa Bhatta and patient guidance and supervision from our mentor Dr. Robert Miller.

Health care policy and economics

COVID-19 Prenatal Support Project

Project lead
Susan Carlson, University of Michigan Medical School

Teammates
Seth Klapman, Jonathan Y. Siden, Allison Powell, Nadine Makki, Chloe Biermann, Annie Minns, Hanna Berlin, Nabeel Salka and Nicole Byl

Faculty mentors
Dr. Maya Hammoud, Professor of Obstetrics and Gynecology, University of Michigan Medical School
Dr. Alex Peahl, Michigan Medicine, Clinical Lecturer and Director of Outpatient Prenatal Care

Abstract

The Prenatal Support Project was created to provide information and guidance for prenatal care changes during the COVID-19 pandemic. The project, created by the maternity department at the University of Michigan, is comprised of 55 medical student volunteers, midwives, and physicians from obstetrics and gynecology, maternal-fetal medicine, and family medicine. A new prenatal care model was created using health systems science principles that integrated multiple departments, social and institutional resources, and policy reform while maintaining patient and community safety and quality of care. In order to ensure these changes were shared with patients, student volunteers were recruited to call over 1,500 patients in 10 days. Student leaders created an internal student-led translating service to reach non-English speaking patients, connected patients with community and educational resources, and helped coordinate social work referrals for mental health and material needs. Additionally, by virtually training medical students to provide education about telehealth, prenatal care, at-home blood pressure monitoring and EHR documentation, this project developed medical student competencies while reducing the risks of viral exposure.

Project addressed/problem discovered

To keep patients, providers, and communities safe during the COVID-19 pandemic, the University of Michigan launched a new prenatal care model leveraging reduced visit schedules and telemedicine. While it was essential to implement the new prenatal care model swiftly, maternal care leaders recognized the need to provide nuanced, individualized patient counseling to reassure patients. The reduced visit schedule also made it harder for other health professionals to provide additional resources and counseling to patients about breastfeeding, childbirth and triage resources.

Additionally, there were concerns that patients may be facing new financial and social burdens caused by the pandemic. The social services team at the University of Michigan were overwhelmed by a hierarchy of community and patient needs and were unable to provide the same 1:1 needs assessments they were able to provide prior to the pandemic. To address these needs for over 1,500 pregnant patients in the health care system, medical students were trained to call low-risk prenatal patents directly, and provide 3 key services: 1) explain changes in prenatal care including home device use; 2) share new resources available during the COVID-19 pandemic including group prenatal care; 3) connect patients to social work if additional financial needs were identified; and 4) help patients connect to the electronic health record portal for telemedicine.

This program utilized key principles of health systems science including leadership, teaming, social determinants of health, health care structure and process and value in health care to implement and support patients through the new prenatal care model.

Approach

The project began with a small group of medical students researching and creating patient-facing materials about at-home monitoring devices to assist the maternity

department with the new prenatal care model. The department of obstetrics and gynecology then reached out to these students to assist them in contacting 1,500 low-risk patients about changes to their prenatal care. In 3 days, over 50 students were recruited and trained to begin calling patients and documenting encounters in the EHR. A call script was created by students and the department of obstetrics/gynecology to help medical students provide high-quality standard counseling within their scope of practice. The script included 5 key areas: new prenatal care model counseling, social and material needs assessments, at home monitoring education, willingness to participate in virtual support groups, and portal creation. Students were trained by the lead physician, EHR specialist and student lead.

A leadership team of senior medical students handled the daily flux of workflow and included: a student lead, data analysis lead, social work liaison and technical EHR lead. Eight students were in charge of call teams made up of 4-6 students, each carrying their own divided portion of the patient list. Leadership opportunities arose as additional project needs arose including: translator services, adolescent obstetrics, blood pressure cuff distribution, literature review and onboarding. A shared folder of resources was created to provide additional counseling to callers on changing policies and labor laws at the University of Michigan, all of which were discussed during daily leadership meetings.

The medical student lead and the physician lead were available every day for logistical questions. Medical questions, social concerns, and emergency needs were forwarded to the physician lead via the internal triage system.

Leadership and successful team management were apparent areas of strength throughout this project. Students stepped into roles they were passionate about and developed leadership and organizational skills to better patient care and health care utilization. Students provided value to the health care system by treating the "whole" patient with education, counseling, and social determinants of health in mind to achieve better patient care as a health care team.

Outcomes

Patients: We identified 1,469 eligible patients from the EHR. Within ten days, students made 2663 calls and reached 1,021 patients (69.5%), 27 (2.6%) who required a student interpreter. Students connected patients to many supportive services, including financial assistance for remote monitoring (6.5%), social work referrals (0.9%), and the online pregnancy support group (47.8%). Student callers managed most patient encounters: only (6.4%) required assistance from the physician lead. Almost half (47.8%) of patients were interested in joining our virtual support program.

Students: Students reported a statistically significant increase in confidence for six of the seven corresponding EPAs, including EPA 3, 5, 7, 8, 9 and 13. The EPAs with the most considerable improvement in perceived confidence were EPA 5: documenting a clinical encounter in the patient record, (pre: 2.58 ± 0.60; post: $2.89 \pm .32$, $p<0.01$) and EPA 8: giving or receiving a patient handover to transition care responsibly (pre: 2.32 ± 0.73; post: 2.79 ± 0.42, $p <0.01$). Students reported that many of the documentation skills were novel for their training, and the program provided real-time experience navigating the EHR. The majority of students (81%) recommended this project continue after the pandemic.

Other outcomes: The PSP model was extended to high-risk pregnant patients at the University of Michigan, including an addition of over 500 patients. The PSP model was replicated by two other departments (neurology and family medicine) at the University of Michigan to create better telehealth programs that allowed students to participate in patient care during the pandemic.

The program also became a national example of how students could participate in patient care and develop academic competencies, showcased in the AMA webinar on April 1, 2020, with over 1,200 participants. The student-lead was also able to serve as a consultant to other medical students at outside institutions to build similar patient-based and community projects.

Students from the PSP project continued to support maternity care initiatives following the student calls, including the virtual support program: "Stay Home, Stay

Safe, Stay Connected." Over 250 patients contacted through the PSP program went on to participate in this program.

Personal impact

Before this project, my scope of practice was centered on individual patient encounters and standardized tests. I had little experience with policy, both at the institutional and state level, and was less aware of systems thinking while creating high-quality care models. This project allowed me to see how change happens at all levels to achieve the same outcome – better care of the whole patient. This project helped me understand the complexity of health care delivery, the critical role each team member has to play, and the necessity of teams in accomplishing patient-centered care.

Before this experience, I thought doing my best for each patient was the highest level of success I could envision as a future physician. The excitement and fulfillment I found from this project, leading fellow students, creating documentation to support students and patients, and participating with administrators and medical professionals showed me a place for policy, leadership, and administration in my future as a physician. I also felt rewarded as my peers replicated the processes we created as a team to adapt to their different specialties and better serve patients. I was inspired by the ability to make a difference in a health care system as such an early learner and am excited about the opportunities I will have in the future as my credentials and experiences continue to grow. I am extremely proud to be able to represent the dedicated and passionate team I was able to lead and the impact we had on our community.

Medical Education and Advocacy Intersect — COVID-19 Health Policy Student Task Force

Project lead
Nicole Cumbo, Penn State College of Medicine

Teammates
Arsh Khokhar, Nathaniel Long, Olivia Zucaro, Michael Anderson and Shyama Sathianathan

Faculty mentor
Joshua M. Eisner, MPA, State Health Relations Associate, Office of Government and Community Relations, Penn State University Penn State Health

Abstract

In February 2020, the COVID-19 pandemic changed the world as we knew it. Efforts made to preserve resources and prevent spread removed most medical students from the clinical setting. A group of students passionate about health policy came together to help ease the burden of the many dynamic policies and changes occurring due to COVID-19. Through the Penn State Health Office of Government and Community Relations, we addressed and helped bring changes to Penn State Health and state level protocols that were simply not working in practice. We created many policy briefs, topics including first responder operations, telemedicine and insurance legislation, access to certification testing, malpractice immunity for front-line workers, and racial health disparities in Pennsylvania. Our previous learning regarding advocacy, telemedicine, structure and process in care delivery, and payment parity within health systems science were essential to our success in informing the policies Penn State Health and other governmental officials produced.

Project addressed/problem discovered

Issues quickly arose with the ever-changing policies implemented to aid in the control of COVID-19. The Health Policy COVID-19 medical student task force was put together to combat the unintended consequences of these policies. For instance, first responders did not have the protected health information necessary regarding COVID-19 status while going on calls to appropriately use personal protective equipment and adequately clean their truck following patient use. Pennsylvania closed testing centers which left those in fields requiring board certification to practice without licensing. Telemedicine became much more widely used than ever before, but Pennsylvania does not have legislation requiring insurers to pay for services rendered. The communities Penn State Health serves are diverse and cover a vast amount of area, including five different counties, one with a large proportion of the population identifying as Black and another with a large population identifying as Hispanic or Latino. Health care structure and operations were disrupted by COVID-19, exacerbating already-existing health disparities. All of these policy issues affect our health system on every level, and we worked to write policy recommendations that improved the entire system and protected vulnerable populations in the face of the pandemic.

Approach

Our goal was to create a document brief enough that the administration creating policies could educate themselves quickly and efficiently with informative and relevant data. We approached problems by first identifying protocols that were altered due to COVID-19 and then working to educate ourselves on the circumstances surrounding the change or problem. We would divide the different areas of research between the six of us, including background information, precedential information on other state's or country's management of the issue, potential impact at the Penn State Milton S Hershey Medical Center, and risk/benefit analysis. We would then meet to discuss and form our recommendations and use our discussion to form conclusions for the reader of our documents. We would receive feedback from Josh, our adviser in the Office of

Government and Community Relations, about how our policy briefs were received, and he forwarded them to the appropriate offices. This project was a team-based advocacy effort that covers almost all of the domains of health systems science. My peers and I are all Lean Six Sigma White Belt certified, which helped us to work strategically and think critically about the consequences of policy change at every level of health care delivery, including structure and operations, technology and telemedicine, populational and social determinants of health, and ultimately remembering patient-centered care and value should be of the utmost importance.

Outcomes

During the initial months of the COVID-19 pandemic, our health care system was overwhelmed by all of the changes that occurred so quickly. As medical students, we helped support the system by addressing health policy affecting both physicians and patients that needed to be reviewed and updated as the situation changed. The policy briefs that we researched and wrote were used by the Penn State Health policy office and were sent to government officials to impact the functioning of the health system. Our recommendations and research helped the Penn State Health system determine how to address COVID-19 testing for first responders. Our research directly impacted the stance the Penn State Health system eventually took on telehealth and reimbursement for telehealth visits. Another outcome associated with our project is the opening of testing centers for professional board certifications. Our brief outlined the need for essential workers to have access to board certification testing in order to continue to work. We did this work during a tumultuous time for the health care system and our contributions took a burden off the health care system at a time when our entire community was overburdened and needed support. We provided recommendations for more frequent and specific community need assessments and a team tasked with combatting the barriers to care of the diverse community Penn State Health serves. It was our hope to advocate for systemic change to begin to mitigate the racial disparities existing in health care.

Personal impact

I have recently begun to explore the routes of advocacy I can take as a medical student and as a physician. This group increased my knowledge twofold: it amplified and solidified my interest in advocating for positive change for both my patients and my colleagues as well as increased my interest in public health. I now have a better understanding of what exactly that entails and how policies are formed and brought into legislation. I know I can use this knowledge to better advocate in the future for health care, medical education, and more. Advocacy used to be a very daunting task for me, since I was not familiar with the system, but now I understand the research that needs to be done and how it can create effective change. I feel much more confident in my ability to present significant data in a succinct fashion to those who may not be as well-versed in the operations of health care at the clinical level. Through the policy brief we wrote on racial health disparities, I discovered the community health needs assessment Penn State has, and wherever I may practice in the future, I hope to be able to reference a similar document to see exactly the population I am serving so I can give the best care possible and better advocate for the population I am serving. I hope to earn my Master of Public Health degree in the future, so this experience provided hands-on learning in an area I am passionate about that I have not yet had much time to explore.

Health care structure and process

Coordination of COVID Testing Intake and Food Insecurity Response at a Rhode Island Community Free Clinic

Project lead
Neha Reddy, Warren Alpert Medical School of Brown University

Teammates
Sam Mickel, Sylvianne Shurman, Sarah Nuss, Ligia Fragoso, Katya Lavine, Nicole Bencie and Hannah Kerman

Faculty mentor
Dr. Joseph Diaz, Associate Dean for Diversity and Multicultural Affairs, Warren Alpert Medical School of Brown University

Abstract

Clínica Esperanza/Hope Clinic (CEHC) is a free clinic located in Providence, RI dedicated to breaking down barriers to accessible health care and reducing health disparities. Medical students at Alpert Medical School of Brown University regularly volunteer at the clinic, providing logistical support and assisting in the provision of care. However, beginning in March 2020, in person student activities were halted due to the COVID-19 outbreak.

CEHC began serving as a COVID-19 testing site on April 13th, 2020. To support this effort, medical students began performing remote intake calls — calling patients prior to their testing appointments to screen for symptoms and social determinants of health (SDOH) and making appropriate referrals. Medical students also began coordinating and delivering food to patients that screened positive for food insecurity during intake calls. Students have made over 1,100 intake calls to patients testing for COVID-19 and have conducted over 300 food deliveries.

Project addressed/problem discovered

Clínica Esperanza/Hope Clinic (CEHC) is a 501(c)(3) organization in Providence, RI that is dedicated to breaking down barriers to accessible health care and reducing health disparities. The clinic offers culturally-attuned and linguistically-appropriate medical care and linkage to social services through the work of Navegantes (bilingual community health workers). The patients who visit the clinic are uninsured and low-income, and most are Spanish-speaking immigrants from Central and South America.

It is now known that Latinx people have been hardest hit by COVID-19. Soon after the pandemic began, clinic staff and medical student volunteers became aware that CEHC's patients were likely at higher risk of being impacted by the virus. Patients often live in crowded settings making social distancing near impossible. Many are essential workers holding positions in the service industry, construction and factories which have high exposure risks and no option to work from home. Finally, due to economic ramifications of the outbreak, many patients lost their jobs and were ineligible for government stimulus aid — putting them at great risk for food and housing insecurity.

In April 2020, CEHC became a free COVID-19 testing site to increase access and provide epidemiological data to support the disparity in disease burden born by Latinx and low-income populations. We as medical students came on board initially to help with calls to patients prior to their testing appointment. These calls provided screening opportunities for certain SDOH and led to the coordination of food deliveries when a large number of patients reported food insecurity.

Approach

Our project was initially connected with the health care structure and process and health care policy and economics domains of health systems science. In order to receive funding to perform COVID-19 testing, CEHC was required to report certain data including patient symptoms and exposures. One of the initial goals of our intake calls was to document this data. Additionally, we had to design our project's structure and process.

We established calling protocols including scripts in Spanish and English, screening guidelines, and referring protocols for certain SDOH. We established lines of communication between medical student volunteers, a student volunteer coordinator, and CEHC staff members. This included organizing and maintaining remote access to CECH's electronic health record (EHR) for volunteers, as well as our own documentation for call tracking.

Our efforts additionally involved clinical informatics by facilitating the creation of testing results data within a population that was not being tested due to lack of access. Additionally, we recorded symptomatic data in CEHC's EHR that could then be reported out to the department of health and other stakeholders.

Most significantly, our project's approach was connected with the population health and SDOH domain. We supported a program that increased access to testing and follow-up referral for CEHC's patients, other uninsured residents of RI, and — as one of the first walk up testing sites in the state — for residents without cars. More specifically, our project's second goal was screening for SDOH and providing referrals to appropriate social services. We began screening and referring for food insecurity, interpersonal violence, rental assistance and the RI WER1 fund, which provides financial support for people who do not qualify for other forms of public assistance like unemployment.

Within a week of making these calls, we realized roughly half of the patients we spoke with screened positive for food insecurity. Many of the food pantries in the state that we would normally refer to were overburdened or at capacity, so we decided to utilize the resources that we had available to us as medical students to coordinate a food insecurity response in collaboration with clinic staff members.

Outcomes

In Rhode Island, 45% of positive COVID-19 patients are Hispanic/Latinx, representing the highest rates of any racial or ethnic group — although they make up just 16.3% of the state's population. CEHC has played a crucial role in extending access to COVID-19 testing and quality care for Latinx residents. The clinic has performed over 1,500 COVID-19 tests for patients since testing began in May, conducting drive-thru testing more than six days per week and linking patients to follow-up care, as necessary. Medical students have made over 1,100 intact calls to patients and their families, screening them for COVID-19 symptoms, collecting demographic information and referring them to community resources. We continue to make intake calls three days a week.

With the support of the Rhode Island Food Bank and multiple community organizations, we have continued to make no-contact home deliveries. From the end of April to early September 2020, we have made greater than 300 deliveries to patient households (average household size 3.95 people), distributing more than 600 boxes or bags of food. Even now during the school year, medical students make food deliveries every Saturday. We continue to collaborate with clinic staff who identify food insecure patients, and we have applied for additional funding to hopefully sustain the program as the pandemic continues to rage ahead. Our newest initiative has been working to link patients to fresh produce and foods in order to combat high rates of chronic disease among patients.

Personal impact

Volunteering to support CEHC's COVID-19 response has illustrated firsthand the importance of having a physician workforce that is attuned to and committed to addressing patients' social and structural determinants of health. This pandemic has illuminated the flaws within our health care system and the disproportionate impact on communities that are systematically-marginalized, such as the patient population at CEHC. It has given further evidence regarding the importance of multidisciplinary, cross-professional approaches to supporting the holistic health and well-being of patients. Health does not operate in a vacuum removed from social context, neither should physicians.

Additionally, supporting CEHC's COVID-19 response required creating structures and protocols from scratch in a time when the information that these protocols were based on were rapidly evolving. This required us to keep informed of the ever-changing landscape of COVID-19-capable health care providers and social services, to maintain strong lines of communication via multiple

platforms, and ultimately to be ready to adapt to a new set of circumstances at a moment's notice. Not only will these skills be relevant to us as clinicians, as future physician leaders this experience will allow us to build better, more inclusive health care structures.

CritiCall Connections — Communicating during COVID-19

Project lead
Rylie Pietrowicz, Cooper Medical School of Rowan University, Temple University Hospital Internal Medicine Residency, project implemented at Cooper University Hospital, Camden, NJ

Teammates
Melissa Olsakowski, MD and Karen Baddoura, MD,

Faculty mentor
Emily Damuth, MD, Critical Care Intensivist, Cooper University Hospital

Abstract

Family members with a loved one in the intensive care unit (ICU) may experience increased anxiety and depression and may be at risk for the development of PTSD. These symptoms are exacerbated when family members are unable to visit their loved one. To decrease the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), hospitals implemented visitor restrictions for several months during the pandemic. These restrictions compromised communication between treatment teams and families. Consistent communication between health care providers and families is essential; however, means of virtual communication were lacking at the onset of the COVID-19 pandemic. Our goal was to develop a standardized system with the following objectives: 1) Improve communication between the treatment team and patient's families due to visitor restrictions, 2) Provide students with valuable experience in family communication, 3) Help streamline clinical workload when clinical demands are high and resources are limited.

Project addressed/problem discovered

SARS-CoV-2 has had a profound impact on hospital operations and the practice of medicine. Hospitals were forced to place a moratorium on visitation, preventing family members from visiting their sick loved ones in the hospital. Critically ill patients flooded ICUs, placing increased demand on physicians and nurses to be available at the patient's bedside. Families provide vital medical history and can significantly impact the experience and recovery of these patients. Moreover, the absence of family at the bedside limited the ability of critical care teams to provide consistent communication, something that was already compromised by the surge in volume and acuity of illness.

Studies show that families experience anxiety, depression and additional signs that increase the risk for PTSD when their loved ones are admitted to an ICU. One systematic review identifies five categories of family needs: support, assurance, proximity, information and comfort (JBI Database System Rev Implement Rep. 2016;14(3):181-234. doi:10.11124/JBISRIR-2016-2477). Barriers in communication result in a failure to meet the needs of families, leading to frustration with the health care system and ultimately dissatisfaction in patient care.

Critical care teams face evolving challenges of SAR-CoV-2, needing to creatively meet the needs and expectations of families without sacrificing high-quality, patient-centered care. We developed a standardized approach that enabled graduating medical students to participate in virtual patient rounds followed by daily phone calls to families to communicate clinical updates and answer questions. This process did not replace phone calls from physicians, but rather ensured that we maintained a patient-family-centered care approach through remote conversation.

Approach

Project Creation: Student administrators partnered with ICU physicians to create a manual that compiled physician and student expectations, call scripts, and resources for both physicians and student volunteers. Student administrators piloted the program, affectionately named 'CritiCall Connections,' with the assistance of the ICU and palliative care physicians to identify challenges in flow or difficult communication scenarios that student volunteers may face. Fourth year medical students were asked to provide 4-5 volunteer hours daily to participate in the program.

Project Implementation: When a patient was admitted to the intensive care unit, an ICU physician made the first phone contact with the family, allowing the opportunity to establish trust, set expectations, and introduce the CritiCall Connections program. Following admission, student administrators assigned a medical student to follow that patient throughout their ICU stay. Students had remote access to the electronic health records (EHR) allowing them to acquire information about the patient's medical conditions and current health status. The student volunteer contact information was listed in the EHR and was accessible to members of the care team. During daily rounds, the ICU team called the student volunteer to listen in on the report and participate and ask questions to gain an overall understanding of the patient's clinical picture. Following rounds, student volunteers called family members to provide medical updates, offer comfort and support, and answer questions. After the phone call, students documented the conversation in the EHR with a family communication note. The note included questions from family that the students were unable to answer or critical information that the family wanted to share with the ICU team. An ICU physician from the patient's team followed up on the note later in the day and often called family members to answer any remaining questions and provide support. Student administrators checked in with student volunteers daily to offer support and weekly with ICU physicians to review successes and challenges during the week. Whenever possible, student volunteers followed the same patient and family, providing continuity for families.

Outcomes

Data for CritiCall Connections were gathered to assess satisfaction with participation in the program. An electronic anonymous survey was sent to students who volunteered in at least one day of virtual rounds and made at least one phone call to a family member of a patient in the ICU. Physicians who interacted with the medical students in virtual rounds and with family communication also received a survey. Lastly, clinical staff made phone calls to obtain verbal family satisfaction. The surveys assessed satisfaction with a 5-point Likert scale as well as open-ended questions. Families met inclusion criteria for the survey if they participated in at least three phone calls from the student between April 6 - May 13, 2020 and were English speaking. A total of 38 families were surveyed.

Ninety-seven percent of families reported being satisfied or very satisfied with medical student communication with 100% satisfaction in ability to understand the information provided. Family member comments regarding the student's communication style included: "very helpful, excellent, patient, empathetic, clear and caring." The family scored satisfaction with clinical team communication at 94.7%. Families commented on how "helpful, educated, easy to talk to" students were. Others wrote that students were "consistent" and "empathetic, warm, clear" in their communication.

All twenty-four senior year medical students participating in the program responded to the student survey. There was 100% satisfaction with participation in clinical rounds, 100% agreement that the program improved in communication skills, and 100% agreement that the program improved empathy in health care. Comments included, "This has been so helpful to my education."

Nine attending physician responses were collected. There was 100% satisfaction in their participation in the program. Eight of nine (88.9%) reported satisfaction with time spent on clinical rounds and seven of nine (77.8%) believed that the student EHR documentation was helpful. Lastly, 100% agreed that medical student participation in rounds helped improve family communication. Some comments included, "This program is phenomenal, awesome. I appreciate the medical students' help."

Personal impact

Nearing graduation, we were aware that we would soon enter a world in which we would be tasked to care for patients with COVID-19, a scenario not taught to us in medical school. Through CritiCall Connections, we had the opportunity to join our mentors and teachers as they learned how to battle this novel disease. We listened intently to the ventilation strategies, choices of anticoagulation, and the difficult decisions to escalate care. Although we could not attend rounds in person, we gained knowledge as if we were present in the hospital. We were part of the team. Our determination to learn stemmed from the responsibility we felt to educate the families that expected our phone calls.

We became confident in our ability to provide information, offer support, and instill confidence and trust in the medical team. We felt the importance of clear communication. We delivered difficult information and gave families time for silence, opening the door for questions and often allowing for tears. We cared deeply about these partnerships and adapted quickly to offer condolence without physical presence. At the end of medical school and amid forced isolation, we finally understood the definition of "humanism in medicine." The transition to resident physician is notoriously difficult and even more so during a pandemic. CritiCall allowed us to profoundly connect with people while working alongside brilliant, compassionate care teams. Because of this, we are confident that we will be better physicians.

Engaging Medical Students in Communication with Primary Care Patients through the Patient Portal: Lessons During COVID-19

Project lead
Abraham Cheloff, Harvard Medical School, project implemented at Beth Israel Deaconess Medical Center

Teammates
Garret M. Johnson, Nicholos P. Joseph, Leonor Fernandez, Jennifer L. Cluett, Gila R. Kriegel and Amy R. Weinstein

Faculty mentor
Katherine Wrenn, Instructor of Medicine, Harvard Medical School

Abstract

With the rise of secure messaging between patients and physicians, medical education must adapt to help trainees develop skills to effectively communicate with patients online. This pilot consisted of 4 student-faculty pairs in which students were assigned to reply to patient messages under faculty supervision in a primary care setting. Objectives were to gain a better understanding of patient portal messages and to assess the educational value of the program. Students felt they strengthened their written communication and triage skills; faculty felt the program allowed them to stay more connected to students in virtual teaching. This program demonstrates that engaging medical students in direct electronic communication with patients is a promising method for helping students build written communication and patient care skills. Integrating patient messaging into medical school curricula is an important step in modernizing education and preparing trainees to be effective, competent physicians.

Project addressed/problem discovered

Increasingly, patients communicate with their physician through patient portals, sending electronic messages. Despite mixed opinions and uneven uptake by faculty and residents, the number of patient messages received by physicians tripled between 2001 and 2010. As managing electronic communication with patients becomes a growing part of a physician's duties, medical education must help prepare trainees to practice this type of communication. Future physicians must learn to communicate effectively with patients online in the same way that they develop a clinical "voice" used when talking to patients in person.

In addition, the COVID-19 pandemic led to disrupted learning for medical students, with cancelled clerkships and curricula shifted to virtual learning. The pandemic thus created a need for remote learning opportunities, to enable students to continue building their knowledge and clinical skills.

Our project sought to address both of these problems at once. By engaging students in directly responding to patients' concerns through electronic messaging, this pilot sought to help students develop the skill of communicating electronically, while also creating a meaningful opportunity for remote clinical learning. We built on prior work, which showed the value of developing a resident curriculum for electronic patient-physician communication and which established that medical student interaction with simulated patients via email can build knowledge, professionalism and communication skills.

Approach

In this pilot program, four medical student-faculty dyads were followed for eight weeks. The students were medical students who had completed at least some of their core clinical clerkships, whereas the faculty members were attending physicians in primary care.

Beth Israel Deaconess Medical Center (BIDMC) uses PatientSite, a proprietary patient portal, for communication between health professionals and patients. Students were given access to this online system, and all patient messages sent to the assigned faculty member were forwarded to the respective student. Students triaged concerns and drafted replies on behalf of their attending physician. Furthermore, students tracked message types using predetermined

categories in order to better understand patient utility of the online system.

The organizers considered multiple facets when designing this project. Through the lens of clinical informatics and health technology, PatientSite, as a core program at BIDMC, requires continuous improvement at the program level as we consider the use of the program and how it can be applied to our patients' care. From a systems level, health system improvement is required as we consider how this program is connected to others at BIDMC, as well as its utility in both patient care and medical education. While medical education is the crux of this project, medical students further hoped that their contributions, especially during the COVID-19 pandemic, would add value in understanding the health care provided.

Outcomes

The outcomes associated with this project can be classified into: 1) gaining a better understanding of patient portal messages and 2) educational value.

During the pilot, students responded to 399 unique messages, not including replies regarding the same issue. On average, each student responded to 14 unique messages per five-day week. Including replies, students responded to 859 total messages. Each unique message was categorized into one or more categories depending on the subject. The majority of messages (52%) concerned non-urgent clinical concerns. Urgent clinical issues requiring same-day follow-up made up 10% of messages. Similarly, 11% of messages related to COVID-19; these messages ranged from questions about symptoms to requests for testing and guidance on social distancing. Eleven percent of messages were related to scheduling telehealth or in-person appointments. Finally, 4% of messages involved prescriptions, refills and/or prior authorization.

All participating students felt that the project was valuable for their medical education.

Medical students reported gaining an understanding of how to categorize messages received from patients based on acuity, how to communicate medical needs to the appropriate clinical entities, and eventually by the end of the pilot, how to advise patients clinically regarding common primary care concerns as well as issues related to COVID-19. Both students and faculty felt that this pilot helped to improve students' written communication skills. Through similar projects, medical students could receive early dedicated educational exposure to triaging and responding to patient needs, skills that are certainly transferable in their future careers.

Personal impact

We as students benefited immensely from participation in this project. First and foremost, it exposed us to a new medium of communication with patients, one which required triaging concerns and converting important information from medical jargon to language more accessible to patients, especially since a physical human presence was not available to clarify nuance for patients. During the COVID-19 pandemic, the project allowed us both to build our understanding of the novel disease and the skill of translating new and confusing scientific information into understandable terms for patients.

Further, it built our primary care knowledge and understanding of how to manage common issues in primary care. Finally, it increased our understanding of how management of a patient is coordinated between primary care physicians and specialists. We observed that lapses in communication could result in great consequences for patients in their care. Given we function in a large academic center with dedicated means of coordinating care, this becomes increasingly important in those practices outside such a system.

Overall, receiving training in management of a patient portal is an experience that we as students are certain will better prepare us to care for our future patients. This early exposure in our training is something we hope can take root as a model in other areas around the country.

NYU Family Connect: An Innovative Program to Provide Critical Communication to Families During the COVID-19 Crisis

Project lead
Hannah Karpel, New York University Grossman School of Medicine

Teammates
Sneha Sharma and Marissa Alsaloum

Faculty mentor
Dr. Katherine Hochman, Associate Professor of Medicine and Associate Chair of Quality in the Department of Medicine at NYU Langone Health

Abstract

In response to the COVID-19 pandemic, NYU Langone restricted hospital visitors and the School of Medicine removed students from clinical rotations. Front-line providers faced a patient surge, leaving little time for communication with families. NYU Family Connect was created to bridge this gap. Medical student volunteers paired with mentoring physicians were trained to remotely gather clinical information from patients' charts, attend virtual rounds, deliver key clinical daily updates to family members and document these conversations. NYU Family Connect included over 115 students and 151 physicians. Over 14,000 calls were placed to families of more than 1,700 patients. 88% of front-line staff agreed the program was critical to updating families. 89% of medical students agreed that participation in this program was formative to their education. This program became a triple win: families received daily clinical updates, medical students benefited from an authentic experience and front-line staff could focus on patient care.

Project addressed/problem discovered

The COVID-19 pandemic disrupted numerous aspects of health care systems globally, including medical education. In March 2020, New York City emerged as the nation's original disease epicenter, with swift and enormous impacts on its dense population. At the same time, students at the NYU Grossman School of Medicine were removed from clinical responsibilities due to safety concerns. However, there was an overwhelming desire among students to contribute to the pandemic effort. In addition, medical educators sought to preserve authentic academic opportunities in the midst of unprecedented circumstances. Most importantly, the NYU Langone Health system was inundated with the immense surge of COVID-19 patients.

In an effort to mitigate the spread of the virus, family members and friends of hospitalized patients were restricted from visiting their loved ones in the hospital. Front-line teams immersed in clinical care were unable to provide family members with regular updates. It was in this space that the NYU Family Connect Program (NYUFC) sought to have an impact by assembling a large team of students and attending physicians dedicated solely to bridging this communication gap. It was a novel effort to address several dislodged pieces of the puzzle: medical students were afforded an opportunity to safely aid with the crisis, medical educators could employ a framework within which students could continue to gain important clinical skills, and front-line staff could focus directly on patient care. Most importantly, families and patients had the reassurance of being provided with proactive daily updates from medical professionals about their loved ones.

Approach

The goal of NYUFC was to leverage existing health systems resources in staffing and health information technology to deliver high-value information to families of hospitalized patients on a proactive and daily basis. We created NYUFC in the context of a rapidly-changing health care environment; within one week of the surge, the health

care structure and process was conceptualized and piloted by student and physician leadership and administration professionals:

1. Chart review: Participants conducted daily chart reviews of assigned patients to gather key COVID-related information, including risk factors, comorbidities, oxygen requirement trends, disease markers, therapies, and treatment responses.

2. Team Rounds: Participants were assigned to interdisciplinary care teams and 'virtually' attended daily work rounds via WebEx. In addition to gathering key information about each patient's condition and care plan, clarifying questions were answered.

3. Phone call: With a guided script, participants called health care proxies daily to report patient status as the same, improving, or worsening, and to relay care plans for the day. Scripted guidance included key information as well as expressions of empathy and reassurance that the patient was receiving close care and attention; end-of-life discussions were beyond the scope of calls and were handled by palliative care teams.

4. Documentation: Participants wrote brief, templated notes in the electronic health record detailing bidirectional information conveyed.

After developing initial training materials and protocols, future participants were trained using these materials as they onboarded. Senior students on advanced clinical rotations were assigned to the ICUs, where patient status was most critical. Each medical student was paired with an attending physician; within their assigned care unit, these pairs divided patient lists variously according to preferences and comfort levels with preceptors readily available for student consultation. Preceptors also played a supervisory role in reviewing and signing student notes. Team communication was further facilitated by using a HIPAA-compliant electronic health record chat function. This allowed for streamlined communication between the front-line staff and the Family Connect team.

Outcomes

NYUFC operated from April 6, 2020 through June 30, 2020 and mobilized 115 medical students and 151 attending physicians. Over 14,000 calls were placed to families of more than 1,700 distinct patients. Medical students completed 48% of these calls and documented these conversations in the EHR. Although the notes do not capture the full extent of the relationships with families, these documented conversations provide a sense of the many hours dedicated to keeping families updated and connected to their loved ones while they were in the hospital. Students reported that families continually expressed gratitude for the daily phone calls and appreciation for the effort to include them in the dialogue concerning the ongoing care of their loved ones.

To evaluate the students' experiences, as well as their perceptions of the impact of NYUFC on their medical education, a survey was distributed to all participating volunteers. The completion rate was 59%, of which 88% felt that NYUFC was an important part of their medical education; 87% cited that the program improved their ability to interact with an interdisciplinary team; and 70% cited that it improved their ability to communicate medical knowledge with other physicians. Comments were overwhelmingly positive, citing improvements in communication skills and personal growth, gratitude to be able to help during the pandemic, and appreciation for the invaluable relationships formed with patients.

Front-line inpatient providers were also surveyed about their experiences working with medical students as a part of NYUFC. The results were positive, as 78% strongly agreed or agreed that these notes were valuable for patient care; 86% strongly agreed or agreed that NYUFC facilitated focus on direct patient care; and 88% felt NYUFC provided a critical resource to families. In the space provided for comments, front-line staff wrote, for example, that medical student support was "absolutely essential in allowing us to focus on direct patient care." They also credited NYUFC for giving family members "the attention they deserved." One clinician called it "a lifeline, comfort in time of bewilderment."

Personal impact

We were involved in this project during one of the most integral parts of medical school — clerkship year, a time when we are first introduced to the reality of health systems and choose which specialty we would like to pursue. We initially thought the pandemic interrupted this year, but NYU Family Connect proved to be one of the most transformative experiences of medical school. We were delivering good news and bad news to family members day in and day out, placing ourselves in some of the most intimate and tender moments of their lives. It was a privilege to be involved in these conversations, helping family members understand what was happening to their loved ones and offering support and hope when it was appropriate. It was also a once-in-a-lifetime experience to watch science and medicine unfold before our eyes, as COVID-19 care changed from day to day. We were able to understand what "lifelong learning" meant as we watched inpatient providers pivot treatment plans as new data was released. By training and organizing 115 medical student volunteers, we grew as leaders, a role we hope to continue to refine throughout our development as physicians. We also learned about the health care field from a systems perspective, watching the behind-the-scenes operations that need to occur in order to create change. Because of these reasons, we feel that our understanding of what it means to be a physician was strengthened in ways it could never have been during a "regular" clerkship year.

Stay Home, Stay Connected — Connecting Pregnant Patients Virtually for Psychosocial Support During the COVID-19 Pandemic and Beyond

Project lead
Monica Choo, University of Michigan Medical School, project implemented at Michigan Medicine

Teammates
Chloe Ramirez-Biermann, Yoni Siden, Annie Minns and Kelsey Carman

Faculty mentor
Alex Peahl, Clinical Lecturer & National Clinician Scholar, Michigan Medicine

Abstract

Due to COVID-19, many ancillary prenatal support programs such as birthing classes were canceled across the Michigan Medicine health system and the larger community. To provide additional psychosocial support and anticipatory guidance, we created Stay Home, Stay Connected (SHSC), a virtual support group for pregnant and postpartum patients. Participants engaged in weekly small and large group sessions with interdisciplinary prenatal care providers and students to discuss various prenatal care topics. Our initial QI surveys (n=61) reported high participant satisfaction overall; over 90% of participants "agreed" or "strongly agreed" that SHSC addressed their patient education needs and helped them feel supported through a community of pregnant individuals. SHSC, which is embedded in the larger prenatal care redesign to connect the medical and non-medical needs in pregnancy while strengthening interprofessional collaborations (OB/GYN, midwifery, social work, psychiatry), is currently informing national guidelines for future prenatal programs.

Project addressed/problem discovered

In response to the COVID-19 pandemic, health care systems limited non-essential in-person medical services to reallocate resources and reduce infectious spread. Obstetric providers across the country quickly adopted a new prenatal care model, including reduced prenatal visit schedules and telemedicine. Simultaneously, many of the ancillary prenatal classes available for patient education on subjects such as breastfeeding, childbirth and infant care were canceled, in many cases without virtual alternatives.

In addition to changes in prenatal care, many pregnant patients faced significant life stressors such as changes in employment, social distancing, financial concerns, and uncertainty about the impact of the pandemic on pregnancy and childbirth. Preliminary surveys of pregnant patients in our institution during this time revealed high rates of positive depression and anxiety screens (>40%). Recognizing that pregnant patients were facing unprecedented stress, the Department of Obstetrics and Gynecology (OB/GYN) at Michigan Medicine sought to create an additional support system through a virtual community of pregnant individuals to help patients in these challenging times.

Approach

In collaboration with the Dept. of OB/GYN, five students supported the creation of "Stay Home, Stay Connected" (SHSC). This is a virtual support group program for pregnant and postpartum patients designed to provide supplementary anticipatory guidance and psychosocial support. Participants (n=180) were divided into groups of 10-12 patients facilitated by 1-2 interprofessional students (medicine, social work or midwifery) and one prenatal care provider (OB/GYN, midwifery, family medicine) who follow the small group through pregnancy. Participants engaged in monthly small groups via Zoom to discuss various prenatal topics (e.g. breastfeeding). In the weeks that small groups did not meet, participants attended large group sessions which featured three topics alternatively (coping skills, wellness, self-care strategies) and were led by social workers, psychiatrists or community guests. Finally, participants had a private Facebook group facilitated by

students to form a virtual community for continued social support. SHSC reinforces several health systems science domains:

- Health care structure and process: SHSC began as a substitute for canceled prenatal services in a pandemic, but it will remain a permanent addition to prenatal care which provides supplementary education and psychosocial support throughout pregnancy. Additionally, SHSC provides a unique avenue for interprofessional collaboration among health care providers, a core competency identified by the AMA. Physicians, midwives, social workers, psychiatrists, and students of medicine, social work, and midwifery collaborate weekly to facilitate discussion groups. Finally, SHSC offers unparalleled longitudinal patient care experiences for learners by engaging with their small groups throughout the pregnancy and postpartum course. Our innovative efforts to provide more comprehensive prenatal care via SHSC are informing national prenatal care guideline considerations.
- Population, public and social determinants of health: the virtual format of SHSC will lower the barriers for accessing prenatal support groups, including a lack of transportation, childcare, or group session costs. We prepared reduced-cost internet options for patients with financial difficulty in accessing the internet, as well as a formalized referral process to social work for anyone with material needs.
- Clinical informatics and health technology: SHSC effectively translated pre-existing prenatal support group services into a virtual platform by incorporating widely available technology (Zoom, Facebook) into greater prenatal care.

Outcomes

Our initial QI survey revealed that 75% (122/162) of participants were white, 93% (151/163) were privately insured, and 53% (87/163) were first-time mothers. It also identified a significant need for additional psychosocial support among our participants; about 36% (n=61) reported GAD-7 score >4 and 5% (n=8) scored positive on PHQ-2. When asked if participants "felt nervous or stressed," 77% (125/163) indicated at least "somewhat." **Three key themes of psychosocial needs emerged from iterative thematic coding of their qualitative responses for joining SHSC (n=142):**

1. Community: participants desired a community of pregnant individuals during social distancing to share pregnancy experiences and receive social support,
2. Mental health support: participants wanted mental health support to help cope with their stress in the setting of social isolation, and
3. Anticipatory guidance: participants sought additional education in the setting of canceled prenatal classes, particularly for first-time mothers.

Follow-up surveys after two small group sessions (n=61) reported high participant satisfaction overall; over 90% of patients "agreed" or "strongly agreed" that SHSC addressed their anticipatory guidance needs and helped them feel supported through a group of pregnant individuals (57/61 and 60/61, respectively). Thematic analysis of qualitative responses about the small groups (n=59) reveals that small group sessions effectively created a community where they felt comfortable sharing pregnancy experiences. Additionally, they strongly valued direct interactions with prenatal care providers in small groups for further patient education. Based on survey feedback for more structured small groups and greater participant engagement, we implemented a more guided discussion format by distributing pre-determined discussion prompts and patient resources prior to sessions. Responses for large groups were also positive with 98% (67/68) indicating that large groups are "very helpful", "somewhat helpful" or "slightly helpful". Qualitative responses (n=19) indicate that these sessions provide valuable mental health support by offering a variety of stress coping strategies from behavioral health experts.

Collectively, SHSC has successfully added a new holistic dimension to our prenatal care system by addressing the gap in psychosocial support throughout the pregnancy, as well as providing resources for patients to seek more patient education outside of their prenatal appointments.

Personal impact

As an aspiring OB/GYN, SHSC was pivotal in fostering a new vision of comprehensive, interprofessional, and patient-centered pregnancy care. I started envisioning what it would be like to train alongside my social work colleagues to learn the subtle yet crucial art of communication surrounding mental health in pregnancy. I imagine a rich learning environment with my midwifery colleagues to witness the holistic dimensions of pregnancy.

As the data manager, I became empowered to use data to leverage my vision and assess the critical elements of prenatal care. For example, it was immensely rewarding to see the impact we've made on medical education evidenced by data; our student facilitators (n=20) reported overall high satisfaction with interprofessional partnership (4.0 on 5-point Likert scale, SD 0.9), along with significant improvements in self-reported interprofessional competencies after participating in SHSC, including collaboration with interprofessional health care providers (before: 4.0, after: 4.5, $p < 0.05$).

Most profoundly, SHSC has taught me the power of a team. Our team of five brilliant medical student co-leaders forged precious connections by pursuing a common vision and leaning on one another for support. Several prenatal care providers guided us on program development and execution as the liaison to the Dept. of OB/GYN; their sacrifice and advocacy demonstrated their deep commitment to our patients' well-being. Stay Home, Stay Connected represents a beautiful synchrony of health care providers striving toward high-quality care in the midst of an unprecedented challenge to health care systems — I am truly honored to be part of this team.

Student Community OutReach and Physician Support (S-CORPS): Educating Medical Students and Enhancing Patient Support During the COVID-19 Crisis

Project lead
Lydia Tam, Stanford University School of Medicine

Teammates
Mike Dacre, Jonathan Lu, MS, Marcello Chang, Jordan Chavez, LCSW, Tamara Montecute, MD, Matthew Mesias, MD and Erika Schillinger, MD

Faculty mentor
Dr. Olivia Jee, Clinical Assistant Professor of Medicine-Primary Care and Population Health, Stanford University School of Medicine

Abstract

The COVID-19 pandemic has increased burdens on our health care system and exacerbated patient anxieties. Physicians are overwhelmed, vulnerable patient populations are experiencing detrimental mental health impacts, and preclinical students are unable to continue their education in health care settings. To address these issues, we created a medical school elective course for preclinical students titled Student Community OutReach and Physician Support (S-CORPS). This virtual course pairs students with physicians and leverages their talents to reach out to vulnerable patient populations in primary care clinics. This effort provided continued medical education despite unprecedented times, extended physician reach and provided patients increased access to care and improved overall well-being for vulnerable patients.

Project addressed/problem discovered

The global COVID-19 pandemic has caused increased burdens on our health system and heightened patient anxiety. Preclerkship medical students, though highly motivated to provide care for patients in times of crisis, are unable to enter hospitals and clinics due to personal protective equipment (PPE) shortages and safety concerns. Beyond the health risks that SARS-COV-2 poses to infected patients, the social isolation required by the pandemic causes even more widespread mental health impacts on all patients. Physicians are also busy and overwhelmed while simultaneously adapting to the challenges of telemedicine. A novel medical student elective was created with the goals of (1) continuing to educate medical students through connection with patient experiences during shelter in place while (2) supporting faculty and vulnerable patients and (3) assessing if such a program could contribute to the development of students' professional identity formation.

Approach

We piloted a course titled Student Community OutReach and Physician Support (S-CORPS) in hopes of improving physician reach to vulnerable patients while providing medical students a way to contribute to health care. The course pairs preclerkship students with a faculty preceptor in the Stanford Primary Care and Population Health clinics with an aim to provide emotional support to vulnerable patients in the preceptor's panel via weekly phone/video calls. To better equip students to provide support via telehealth, they are given training via weekly didactics. Students also participate in weekly debrief sessions with course faculty to promote team-based troubleshooting and are mentored one-on-one by their faculty preceptors. Students completed pre- and post- call and program surveys that assessed professional satisfaction, confidence with telemedicine delivery, and the content and quality of the individual calls. Preceptors were asked to complete course surveys, evaluating the impact to their workload, benefit to patients, and assessment of the learning opportunity for their students. 25 first and second year Stanford medical students have participated in the course

over two academic quarters, precepted by 21 faculty members. Eight didactic and debrief sessions were held via Zoom each quarter.

Outcomes

Students logged 111 phone calls and 51 video calls. Post course survey of students (N=16) showed that 100% of students agreed that "I am providing value to the health care team." Post course survey of preceptors (N=12) showed that 100% felt the program benefited their patients" and "This course provided an authentic experience for my preclinical student." 87.5% of students agreed that "I feel that I have the tools to support vulnerable populations in this crisis."

Programs such as S-CORPS can (1) create authentic virtual learning experiences that leverage the talents of preclerkship medical students while adding value to the care of patients today; (2) extend physician reach and provide patients with better access to care; (3) reduce anxiety for vulnerable patients during the COVID-19 pandemic.

The S-CORPS model enables continued medical education even in difficult times, while simultaneously extending physician reach to meet the needs of vulnerable patients.

This innovative model does not need to be limited only to the COVID-19 pandemic. We are planning to create an easy-to-implement curriculum to share throughout Stanford and other institutions to allow others to easily take advantage of, and build upon, this concept. Students can readily add value to the medical team, while simultaneously learning to be excellent clinicians.

Personal impact

Participating in S-CORPS during the COVID-19 pandemic has reaffirmed my desires to become a physician. This experience has reminded me how important it is to advocate for vulnerable patient populations, taught me how to effectively provide patient care through telemedicine, and provided me and my peers a much needed avenue of hands-on medical education during this unprecedented time. Importantly, as one of the course creators, I have also realized my passion for medical education and leadership. As I progress in my training, I will undoubtedly continue to integrate the many valuable lessons I have learned through this experience.

Health system improvement

Medical Student Response to the COVID-19 Blood Shortage

Project lead
Anya Greenberg, MBA, University of California, San Francisco

Teammates
Hope Schwartz, Ashok Nambiar, MD, Amanda Sammann, MD, MPH, Clifford Lowell, MD, PhD, John Roberts, MD

Faculty mentor
Dr. John Roberts, Professor of Surgery, University of California San Francisco

Abstract

The COVID-19 pandemic presented an unprecedented shortage of blood supply nationally, while academic medical centers offered a unique environment for response to this health care system crisis. Engaging a multidisciplinary team of hospital and blood supplier leaders, educators and students, we led a three-step response to the impending blood shortage. We analyzed University of California, San Francisco (UCSF) blood utilization and case volume data to identify drivers of reduction in blood product demand; formed the UCSF Virtual Blood Drive Working Group to create and implement a model for safe blood donation; and established the Emergency Design Collective (EDC) Blood Services team to broadly disseminate our blood drive model and associated tools. These interventions not only ensured that the UCSF health system maintained an adequate blood supply to meet clinical demands and allowed for a unique medical student educational experience in crisis-response, but also impacted the health care system more broadly through the formation of new multidisciplinary partnerships.

Project addressed/problem discovered

The onset of the COVID-19 pandemic and rapid implementation of shelter-in-place policies across the United States led to immediate concern about a national blood shortage. Over half of the national blood supply comes from community-based drives, and following the closure of community spaces, thousands of blood drives were cancelled across the United States. In response, national blood suppliers called upon community donors to continue donating blood, an activity that is safe and considered necessary under shelter-in-place restrictions.

UCSF Health is a large academic health system whose surgical services rely heavily on the availability of blood products at multiple operating room sites. As the crisis developed, the authors (two medical students) were approached by leaders in the Departments of Surgery and Laboratory Medicine to address the immediate blood shortage and re-establish the pipeline of donations. We quickly assembled a multidisciplinary team of UCSF Health & School of Medicine leadership (including our faculty sponsors in the Departments of Surgery and Laboratory Medicine), administrative and operational personnel, and our partner blood supplier.

Throughout this project, health systems science informed both our identification of the problem as well as our approach. Clinical informatics and health technology systems allowed us to gain insight into historic and real-time blood usage across the medical center and potential areas of shortage. UCSF's health systems improvement curriculum gave us shared language and tools to complete a root cause analysis and prioritize potential interventions. Interprofessional collaboration allowed us to understand the problem from several diverse perspectives to develop an effective response.

Approach

To address the impending blood shortage at UCSF, we implemented three multidisciplinary interventions in collaboration with the Department of Surgery and perioperative leadership, the UCSF Transfusion Service, and UCSF administrative leadership, which occurred alongside the cancellation of elective cases at UCSF in concordance with ACS and CMS national guidelines.

1. **Identifying drivers of reduction in blood utilization at UCSF**
   Using the systems science tool of clinical informatics and health technology, we collected data on blood utilization by product and service from the UCSF Transfusion Service to plot utilization prior to and following cancellation of elective surgical cases. We compared the changes in blood utilization to decreases in surgical case volumes obtained from internal medical center operations data.

2. **Creation and implementation of safe blood drives to increase blood supply**
   We formed the UCSF Virtual Blood Drive Working Group to plan and execute a series of blood drives on UCSF's campus as a mechanism to address the dwindling local blood supply. Using health systems improvement methodology including rapid Plan-Do-Study-Act cycles, we developed a novel model for blood drives during the COVID-19 pandemic. As planning progressed, our working group aligned with leadership in the School of Medicine and UCSF Medical Center, as well as representatives from UCSF facilities, security, and the COVID-19 command center. Sixty medical student volunteers were engaged to support the operational aspects of the drive, in partnership with our blood supplier partner.

3. **Collaboration with External Organizations to Address National Supply**
   After the successful execution of the UCSF Blood Drives, the UCSF Virtual Blood Drive Working Group team members collaborated with the Emergency Design Collective (EDC) Blood Drive team to share our model. The EDC was co-founded by a UCSF faculty surgeon and uses human centered design methodology to address issues related to the COVID-19 pandemic. Together with the EDC Blood Services team, we developed a Blood Drive Playbook, a community facing instructional guide to help community members organize blood drives. By disseminating our model beyond the setting of academic medicine, we were able to take a leadership role in addressing the national blood shortage, scaling our efficiency and impact.

Outcomes

The impact of the three system-level interventions is described below.

1. **Identifying drivers of reduction in blood utilization at UCSF**
   Total blood utilization was 24% percent lower in March and April 2020 compared to January and February 2020, and our analysis showed that elective surgery cancellation was a key driver of this reduction. Compared to January and February 2020, the number of surgical patients discharged was nearly 50% lower in March and April. Of note, during this period, urgent and emergent cases were able to proceed without restriction, and all organ transplantation surgeries continued without interruption.

2. **Creation and implementation of safe blood drives to increase blood supply**
   Under the leadership of two medical students and two senior faculty champions and in collaboration with Vitalant, UCSF's secondary blood supplier, a new model for safe blood drives was rapidly prototyped and implemented at a series of blood drives at two UCSF sites. Over the course of seven blood drives, 100% of appointments were filled and 239 donors gave blood. Due to targeted outreach to the UCSF community, the majority of donors were UCSF affiliated health care workers, and 58% of individuals who registered at the blood drives were first-time donors, indicating a high level of motivation and understanding of the need for blood products within this community. Blood drive volunteers were recruited from a highly engaged pool of interested medical students who were eager to find ways to participate in the pandemic response in light of disrupted clinical education.

3. **Collaboration with external organizations to address national supply**
   In collaboration with EDC designers, we created and widely disseminated the UCSF Blood Drive model as a step-by-step playbook accessible to individuals and organizations outside of health care systems. This playbook adapts the protocols used at the UCSF Blood Drives to be broadly generalizable to a variety

of blood drive settings. It includes guidelines, best practices, timelines and materials developed at UCSF for planning blood drives. The playbook is available for free download on the EDC website. Additional initiatives to increase community awareness around eligibility and ongoing need for blood donation are underway.

Personal impact

The impact of the pandemic on health systems across the United States is profound and long-lasting, and includes disruptions to patient care, research and education. By bringing together national leaders with expertise in their fields, faculty mentors, educators and energized learners, academic medical centers create an environment of creative and dynamic partnerships with high impact potential.

For us as students specifically, this pandemic — and specifically our efforts around addressing system-level blood shortages — represented an unprecedented opportunity to step up in non-traditional roles, to contribute to the health care system and gain invaluable preparation as future health care leaders. Although our curriculum is fundamentally impacted, understanding system-level blood supplies, tracking blood utilization in the context of clinical services, and developing, implementing and disseminating a safe model for blood drives was a hands-on crash course in crisis response within the living classroom of the health care system.

Creating meaningful learning opportunities in the midst of educational uncertainty demands initiative and creativity from trainees, as well as support and investment from faculty. The mentorship of our faculty sponsors was vital to our effort — they provided guidance and shared with us their deep expertise in health care systems. Our experience is just one example of how trainees are finding ways to have a system-level impact in the midst of the COVID-19 pandemic. We are grateful for the opportunity to combine valuable learning with a meaningful contribution to the crisis, both with wholehearted support from physician leaders and role models.

SANIPACK: An On-The-Go N95 Mask Sterilizer

Project lead
Doreen Lam, Perelman School of Medicine at the University of Pennsylvania

Teammates
Lina Ibrahim, MS, Omar Abdoun, Zonia Moore, Khaled Abdoun, ME, Ahmed Aly, PhD and Daniel Akuma

Faculty mentor
Horace M. DeLisser, MD, Associate Professor of Medicine, Perelman School of Medicine

Abstract

Continuing global N95 respirator shortages are leaving providers and patients at risk and further contribute to the ongoing spread of disease in countries around the world. This has led to unsafe clinical practices such as reuse beyond mask lifetime. Thus, there is an urgent unmet need for a resterilization device that improves provider and patient safety during the COVID-19 pandemic. We have developed a portable device that robustly resterilizes N95 masks to increase patient and provider safety by minimizing the viral load on the N95 mask surface, while extending the N95 mask lifetime. A personalized UV-C re-sterilization device will increase how often N95 masks can be safely used, allow for mask sterilization between patients and restore provider confidence.

Project addressed/problem discovered

Standard practice for N95 usage includes discarding masks after one use during an aerosol-generating procedure. NY Presbyterian predicts this amounts to up to 2.1 million masks per month, and previous pandemics, such as severe acute respiratory syndrome (SARS), have shown that supply chain acceleration cannot quickly address mask shortages. Providers have resorted to the unsafe practice of storing N95s in paper bags for up to a month with little guidance on how to clean them. Without an effective means of sterilization, moisture prevention and protection of fit when N95s are reused, the risk of disease transmission increases, endangering patients and providers.

Through our health systems science curriculum, we workshopped solutions for a variety of theoretical health systems and patient care scenarios. The onset of the COVID-19 pandemic became a real and time-sensitive opportunity for our team to devise a solution based on health care economics principles to address personal protective equipment (PPE) shortages. With strategic investment in an effective solution prolonging N95 usage, the deficit in PPE supply can be alleviated while keeping providers safe and decreasing transmission. This investment can lead to longer term cost reduction in areas of PPE supply and acute care costs.

Safely reusing N95 masks for even a few times can greatly extend supplies. Validated techniques for decontaminating N95s include autoclaving, ethylene oxide, vaporized hydrogen peroxide and bleach. However, chemical disinfectants are time-consuming while gaseous systems require expensive, specialized equipment and ventilation systems (Lindsey et al 2016). In contrast, UV-C germicidal irradiation is a fast, easy and proven effective decontamination method.

Approach

Our objective is to develop and validate the design of a personalized UV-C re-sterilization device that will increase the time a N95 can be safely used. Current UV-C applications are large-scale sanitation approaches that encourage congregation of staff in high-risk settings or require a 24 hour turnaround for mask return. Furthermore, the lack of portability and high cost of these solutions impedes their use by paramedics, first-responders, providers in low resource environments or by health care settings lacking funds or accessible power supplies.

SANIPACK is led by an interdisciplinary team of MD and MD/PhD students at the Perelman School of Medicine dedicated to improving patient outcomes and physician experience, with backgrounds in biomedical and

mechanical engineering, consulting, social sciences, basic sciences and entrepreneurship. In the research and design of SANIPACK, we leveraged 20+ years of collective innovation experience across medical device development, medical technology solutions and systems innovation. The combination of interdisciplinary and real-world experience positioned our team to quickly ideate and define an impactful solution with the necessary considerations of design engineering, virology, product market fit and global health.

Through opportunities at Johns Hopkins Center for Bioengineering Innovation & Design and MIT's Africa Takes on COVID-19 challenge, we received valuable feedback to improve our design from mentors in the engineering and global health space, with SANIPACK ultimately winning prizes at both challenges. Our ultimate approach to the problem is geared toward optimizing SANIPACK's potential as a change agent in decreasing risk of COVID-19 transmission while addressing provider safety when supply chains are unreliable during this chaotic time. We designed SANIPACK to be a cost-effective resource utility that would benefit providers in low resource settings and ambulatory scenarios that receive less focus than the inpatient environment. We are currently testing the efficacy of SANIPACK as a sanitisation device through the Weiss Lab at UPenn's Center of Research for Coronaviruses and Emerging Pathogens. Results to date are promising and have shown a quantifiable reduction in viral load on N95s post-SANIPACK use. To date, we have continued to further optimize SANIPACK and to seek feedback from front-line providers in a variety of settings.

Outcomes

The shortage of N95 masks and other PPEs has led to dire consequences and unsafe clinical practices that threaten the lives of patients and providers. There is undoubtedly an urgent unmet need to provide a low cost solution that is adaptable to various health care environments in developed and low resource settings. While current bulk UV-C sterilization protocols are a promising first step, they are inadequate and do not protect the providers and patients between COVID-19 encounters, require modification of workflows and are not feasible in unconventional settings. The goal of the project is to develop and validate the efficacy of a portable low cost device that can address the current limitations and allow for improved safety for patients and providers, alongside improving mental confidence of providers. If successful, we plan to implement this device with industry and academic collaborators locally and internationally with the help of our collaborators in Nigeria through Ahmadu Bello University Teaching Hospital and in Cairo, Egypt through a partnership with Cairo University. We also expect to implement this device locally in Philadelphia and in Detroit to decrease the ongoing cost of N95 mask acquisition for health care clinics, decrease rates of provider infection and increase morale by empowering them to sterilize their own masks. This will allow for the health care systems to reduce dependence on a strained PPE supply chain and effectively protect providers and patients for longer durations. We have partnered with the University of Pennsylvania's Center of Research for Coronaviruses and Emerging Pathogens to conduct efficacy testing that ensures our UV sanitization device is effective. The leader of this lab, Susan Weiss PhD, received Centers for Disease Control and Prevention certification in March 2020 for BSL-3 testing, which allows for the use of the novel SARS-CoV-2 virus. Thus far, we have validated a viral plaque assay protocol, with promising preliminary results. Penn State's Manufacturing & Sterilization for COVID-19 (M.A.S.C.) initiative will support us with clinical field testing of SANIPACK to ensure its appropriateness in clinical settings, as well as testing to determine the number of sterilization cycles beyond which N95 masks lose their filtration integrity.

Personal impact

Working on SANIPACK has taught me how to effectively collaborate with teammates who had no previous experience working with each other and with each person possessing a different domain expertise such as mechanical engineering, immunology, bioengineering, technology and consulting. This experience will undoubtedly help me be a better provider within a larger interdisciplinary care team — the composition of which can often change — and ultimately help me better care for patients with complex conditions. The SANIPACK team became productive in a short amount of time because we trusted each other's experiences and expert opinions and quickly aligned on a goal. We were willing to both learn from each other and

respectfully challenge assumptions. Our team was formed at the very beginning of the COVID-19 pandemic, which spurred an immediate sense of urgency. In the spring, many of our traditional mentors were quickly overwhelmed with clinical duties and health systems obligations. Despite the challenges presented by COVID-19, we developed and maintained relationships with experts at BIO Ventures for Global Health, UPenn Center of Research for Coronaviruses and Emerging Pathogens, Penn State's Manufacturing & Sterilization for COVID-19 and Ahmadu Bello University Teaching Hospital in Nigeria who have continued to be invaluable resources for our team. This taught me about the breadth of resources that are available if the mission is right and the need for a product is validated. In the future, I plan to continue to supplement my career as a provider by leveraging my entrepreneurial background to build cross-functional teams that develop innovative solutions to better empower health systems to provide high quality care to patients.

Telemedicine during COVID-19: Clinician Perspectives in Primary Care

Project lead
Zi-Yi Choo, University of Chicago Pritzker School of Medicine, project implemented at University of Chicago Medicine

Teammates
Gena Lenti and Jason Castaneda

Faculty mentors
Dr. Maria Alcocer Alkureishi, Associate Professor and Clerkship Director, Department of Academic Pediatrics, University of Chicago Pritzker School of Medicine

Dr. Wei Wei Lee, Associate Professor and Associate Dean of Professional Development and Engagement, Department of General Internal Medicine, University of Chicago Pritzker School of Medicine

Abstract

COVID-19 has drastically altered the outpatient experience for clinicians and medical trainees. Rapidly, telemedicine was widely implemented to provide a safe and convenient alternative to in-person care. There are few studies that explore the primary care clinician's telemedicine experience pre- and post-COVID-19. With that in mind, our objective was to survey all primary care clinicians in the Departments of Medicine and Pediatrics at University of Chicago Medicine to 1) compare clinician perceptions of telemedicine visits 2) identify clinician perceived benefits and barriers 3) define ongoing training or support needs and 4) address identified training needs. Our overall response rate was 39% (200/517). Compared with in-person visits, many clinicians said video visits took longer to prepare (33%, n=65), conduct (32%, n=64) and document (25%, n=49). However, during video visits most clinicians could promote shared decision making (78%, n=156) and connect with patients (53%, n=105) similar to in-person visits. The top clinician barriers to successful telemedicine visits were patient-facing barriers: lack of technical knowledge, access to technology and reluctance. Overall, clinicians' responses were positive. More than half of clinicians enjoyed conducting video visits (60%, n=119) and wanted to continue video visits (75%, n=150). As virtual visits become the new normal, we hope this project enables purposeful quality improvement and enables advances in care delivery.

Project addressed/problem discovered

COVID-19 and telemedicine have together risen to the forefront of health care delivery. As video visits became the new normal, little was known about impacts on clinician workflows, patient-provider communication, or the trainee experience. Prior to COVID-19, telemedicine use in psychiatric and post-surgical care showed potential to maximize clinician and patient time and resources. However, the primary care clinician's telemedicine experience pre and post-COVID-19 remains less explored. Given balancing efficient technology use while maintaining a patient-centered interaction can be difficult to achieve in-person, it is important to know how this dynamic changes, if at all, in the virtual setting. As hospitals enter this new frontier of outpatient medicine, we found it essential to identify institutional impacts on primary care clinician workflows and patient-clinician communication, as well as any implementation needs or barriers. Lastly, but perhaps most importantly, few studies have addressed the integration of us, medical trainees, into new telemedicine workflows. With that in mind, our project sought to compare primary care clinicians' overall perceptions of telemedicine, capture their perceived benefits and barriers to telemedicine with and without trainees, and to define any ongoing training or support needs with the ultimate goal of improving clinician, trainee and patient telemedicine experiences. As COVID-19 continues on, it is crucial to understand and optimize virtual health care, as well as to promote a rich educational environment for our trainees.

Approach

Due to COVID-19, telemedicine video visits were used for outpatient primary care services in the Department of Medicine (DOM) and Department of Pediatrics (DOP) whenever possible beginning March 2020 at the University of Chicago Medicine (UCM). In an observational cross-sectional study of primary care clinicians, we surveyed all DOM and DOP clinicians at UCM to 1) compare their overall perceptions of telemedicine 2) identify clinician perceived benefits and barriers 3) define ongoing training or support needs and 4) address training needs. Our objective was to elucidate key areas of telemedicine implementation that enable health system improvement. With the continued need for social distancing and virtual visits, we hope this project serves as the start of ongoing quality improvement efforts in telemedicine at UCM. This project received formal quality improvement determination according to UCM policy.

First, we conducted a literature review focusing on telemedicine implementation, patient and clinician telemedicine satisfaction, and effects on clinician and trainee workflows. These areas were identified because they are essential areas for ongoing health systems improvement. We had conversations with key stakeholders to develop a primary survey to capture clinician perceptions and needs toward telemedicine implementation. Our final survey consisted of 54-items focusing on: benefits and barriers (n=20), workflow impacts (n=5), overall satisfaction (n=4), current training or support needs (n=6), and trainee integration and education (n=7) using a combination of Likert and open-ended questions. We need to better understand our clinicians' everyday experiences conducting virtual visits in order to identify ways to improve virtual care delivery.

The survey was administered electronically over 6 weeks during Summer 2020 to all 517 actively practicing DOM (n=325) and DOP (n=192) clinicians including physicians and advanced practice providers. Data was analyzed, and when appropriate tests for differences in proportions were performed using two-proportion z-tests. Overall departmental and section-specific reports were generated for all DOM and DOP section chiefs, and we (trainees) presented our findings to UCM leadership to enable them to understand how to best support their clinicians.

Outcomes

Our overall response rates were 39% (200/517); 42% (135/325) DOM and 34% DOP (65/192). Comparing video with in-person visits, most clinicians said video visits took similar amounts of time to prepare (57%, n=114), conduct (37%, n=73) and document (52%, n=104). However, nearly one-third said video visits took longer to prepare (33%, n=65), conduct (32%, n=64), and document (25%, n=49) indicating potential increases in clinician burden. When comparing video with in-person visits, most clinicians (78%, n=156) could promote shared decision making and over half (53%, n=105) could connect with patients similar to in-person visits. This is reassuring, and suggests clinicians' continued ability to foster the patient-provider relationship through a virtual platform.

Interestingly, the top barriers to successful telemedicine visits were not clinician-specific barriers but patient-facing barriers: lack of technical knowledge (70%, n=139), access to necessary technology (66%, n=132), and reluctance (38%, n=75). This highlights the importance of understanding patients' telemedicine barriers which is our next area of focus. The top barriers for clinician preceptors were "concerns about integrating them into video visit workflows" and "uncertainty about trainee documentation rules." In response, we developed training for faculty and students on telemedicine best practices and virtual workflows to support medical education during social distancing. Our training was well received, with 60 respondents to our post-session survey. The majority of medical students thought our session content was clinically relevant (87%, n=40) and felt they gained useful information they could apply to patients (69.6% n=32). Our faculty session provided key tips to help our educators adjust to the new landscape of teaching and clinical care.

Overall, more than half of clinicians enjoyed conducting video visits (60%, n=119), thought its benefits outweighed potential negatives (69%, n=137), and wanted to continue video visits (75%, n=150). Telemedicine is an essential method of health care delivery. Having identified clinician needs, our focus is on further developing educational training for clinicians and trainees as well as understanding the patient perspective to maintain telemedicine as a durable alternative to in-person care.

Personal impact

As a physician I hope to make incremental changes in health care delivery that serve to improve the patient experience. My research interests lie at the intersection of health care delivery and quality improvement especially in understanding how technology can positively impact the clinician and patient experience. With the COVID-19 pandemic, our lives changed so dramatically and so did the way we deliver care. Telemedicine was pushed to the forefront of care delivery and is continuing to be an important way for patients to connect with their clinicians. As an aspiring future physician, it was inspiring to work with a great team and mentors to understand how these changes impacted clinicians and their workflow, because this can drastically change the quality of care for our patients. The most exciting part of this research was identifying areas of departmental and section improvement at UCM. These were tangible areas of improvement, and our team is actively working to address many of the barriers to telemedicine now, particularly since the top three clinician barriers to successful telemedicine use identified were patient barriers. We are working on a study to directly elicit patients' perspectives on their telemedicine experiences and to explore how we might overcome the obstacles that both minimize their access and widen the digital divide. This is particularly important for our minority and elderly patients. This project has truly inspired me to continue research in quality improvement and understand how we can efficiently deliver quality care for all.

University of Chicago Internal Medicine Residency COVID Units

Project lead
Alexandra Rojek, University of Chicago Pritzker School of Medicine

Teammates
Jonathan Lattell, Stephanie Kelly, Jennifer Coopperrider, Hannah Roth, Valerie Press, MD, MPH, John McConville and Vineet Arora, MD, MAPP

Faculty mentor
Julie Oyler, MD, University of Chicago Medicine

Abstract

The University of Chicago Internal Medicine (IM) residents provided 24-hour care on inpatient floors and ICUs dedicated to patients who were COVID-positive. Across academic hospitals nationally, an assessment of respiratory isolation units (RIUs) for COVID-19 patient care showed that only two to three had resident involvement out of a total 46 hospitals using RIUs. We staffed our newly created inpatient service on a volunteer basis and designed the service to provide better care in a variety of health systems-inspired ways. We employed master adaptive learning to improve quality and efficiency of care as the pandemic evolved, implemented a resident-led team training model for new residents and faculty joining the units, and worked within our health care delivery systems to conserve personal protective equipment (PPE), adapt our resuscitation protocols, and championed the use of innovative helmet ventilators in our role as the primary providers in the COVID-19 ICUs.

Project addressed/problem discovered

As COVID-19 rapidly emerged as an impending threat in the U.S. and locally Chicago became a hotspot in March 2020, it became clear that our hospital would need to move to a dedicated, cohorted model of care to accommodate the patients we were seeing admitted. The residents immediately volunteered and lobbied to be involved in planning the COVID-19 cohort units, contributing ideas for structure of staffing and patient care, and were thus established as key stakeholders in the units. We were driven by a desire to improve the emerging system of care at a time when very little information was available about the pathophysiology, infectious risk, and recommended treatments for COVID-19 patients.

Once we were taking care of patients in the units, our work to standardize care of patients and aim to improve outcomes was influenced by shared work with our faculty mentors in the units, including creating new AgileMD pathways with our health IT colleagues. We were motivated to reduce the mortality of critically ill patients after seeing initial data indicating that our delayed intubation strategies were reducing mortality of patients to half the level of local hospitals, with a population that was at higher risk than that of our neighboring communities. We were motivated to streamline care so that our infectious disease colleagues who were championing other new trials could work with us to aim to reduce length of stay for less acute patients.

Approach

Our project of resident-led patient care in the cohorted COVID-19 units was centered around improving patient care and safety, streamlining workflows, implementing early evidence-based data into our care, and growing into master adaptive learners — all while also trying to protect clinician well-being in unprecedented circumstances. As early providers in the units, we served in a reverse mentoring role for our faculty and fellows who later joined us. We continuously adapted our processes to evolving circumstances, thus demonstrating our capacity to become master adaptive learners.

We factored in ethics and equity of care early on in our discussions with our COVID-19 teams about the ethics of resuscitation efforts in critically ill patients, while also

advocating for equity for our most disadvantaged patients — particularly when we serve a community of racially and socioeconomically underserved patients who were disproportionately affected by the pandemic. We also incorporated interprofessional care of our patients, such as working with nurses to limit number of etxposures to aerosolizing rooms and collaborating with respiratory therapists to teach all levels of staff about using our non-invasive ventilation helmets which involved a high learning curve of equipment and oxygen titration changes.

As the hospital-level testing structure changed with population incidence, we also adapted our workflows, shift schedules and staffing numbers to best adapt to evolving needs. The residents were fluid in their schedules that would frequently change shifts and time on service. They stood by on-call as we expanded our units. We additionally adapted our schedules to best suit a continuous admitting structure and balance out acuity among various ICUs — with patient requirements ranging from high flow nasal cannula, to helmet ventilation, endotracheal intubation and ECMO.

Throughout all of these changes, residents stayed focused on providing the best patient care possible with equity, while also seeking to improve outcomes and systems structures. They supported each other by creating a buddy system for supporting each other throughout their time working in the COVID-19 units and committed to working in the units as long as needed to preserve a seven-on, seven-off structure to reduce burnout and protect health and well-being in these times.

Outcomes

From April until the end of May 2020, residents had discharged 649 floor patients, not including ICU patients cared for, and totaling more than 65% of all COVID-19 patients admitted at the University of Chicago, with an average length of stay of 8.65 days. These units continued to function through the end of June. 86 residents volunteered for these units for multiple week rotations, served to actively protect peers who could not volunteer, and preserved learning opportunities for residents in other specialties who avoided redeployment. Additionally, by implementing safe conservation of personal protective equipment (PPE) methods and limiting exposure risks, no residents (or other staff members) actively contracted COVID-19 through their work in the cohorted units during their entire duration.

In an assessment of respiratory isolation units (RIUs) across academic hospitals nationally, only two to three had resident involvement out of a total 46 hospitals using RIUs (Auerbach et al, 2020, JHM). The reported mean number of residents caring for COVID-19 patients was five, compared to our total of 86 and more than 20 on any given day. The unprecedented and volunteer-basis involvement of our residents at the University of Chicago in itself demonstrates the success of such a model, in addition to other strategies for improving patient care models. Our residents served as master adaptive learners in these units, rising to the challenge of adapting to evolving situations and teaching faculty and fellows who joined the units later about care of COVID-19 patients, practical challenges and adaptation to the dynamic evolution during the pandemic, as well as incorporating what few evidence-based decisions were available. The residents were awarded a Notable Healthcare Heroes Award by Crain's Chicago Business for their work and dedication to these COVID-19 units.

Although our cohorted units have now dissolved, residents have continued to be involved in outcomes research from our COVID-19 units, taking their experiences from firsthand patient care to analyze data to improve future outcomes of such patients and also transform what we know about fields such as non-invasive ventilation, ARDS, and anti-coagulation in critically ill patients.

Personal impact

Our generation will be one that attended medical school in an era of relative privilege, where HIV may be more treatable than hypertension, where we dare to use the words "cure for cancer," and where ever-emerging technologies change the landscape of treatment. COVID-19 was a stark contrast to anything we had been taught or experienced, and being a member of the teams that walked in each day ready to adapt our work and our patient care to the newest information and challenges has changed our outlook on health systems and how we can improve them. We have learned to adapt our care

of patients in ways we were never challenged to before and learn through practice how to be master adaptive learners. We have learned what it means to challenge ourselves to provide equitable care in the most acute settings to those at a greater disadvantage to a virus, to be sensitive to the unique ethical challenges of a pandemic and scarce resources, and how to continually improve our own processes and care on a timescale unmatched by any other challenge, driven by the devastating spread of the virus. While we return to the career paths we each set out on, we have all adapted to a new normal, in which we have taken with us these lessons of adapting to new obstacles and challenging the status quo of care we can provide to ultimately benefit our patients and the health care delivery systems we are all a part of.

Leadership

Health Policy and Emergency Preparedness Training: An Innovative Approach to Creating a New Elective in the Post-COVID-19 Era

Project lead
Sonia Bhala, Rutgers Robert Wood Johnson Medical School

Teammate
Kate Kim

Faculty mentor
Dr. Paul Weber, Associate Dean for Continuing Medical Education, Rutgers Robert Wood Johnson Medical School

Abstract

The "Health Care Policy and Emergency Preparedness" electives provide an innovative approach to the health systems science curriculum at Rutgers Robert Wood Johnson Medical School. The curriculum, adaptable to both a virtual format and the inclusion of dynamic current events, includes the fundamentals of health care policy, health insurance and reimbursement, advocacy and the legislative process, the role of social media in health care, and the roles of various health care stakeholders. Students will learn from field experts, as well as their peers with significant health policy experience. In addition, self-directed learning will be infused within the courses. The non-credit elective version is aimed at pre-clerkship phase (M1 and M2 students), while a clerkship phase version (M3 and M4 students) will meet degree elective requirements. These courses provide an opportunity for students with a common interest in health policy to form mentor/mentee relationships across all stages of their training.

Project addressed/problem discovered

The problem addressed by our project was the lack of knowledge that future generations of physicians held regarding health policy and emergency preparedness. Given that doctors are on the front lines directly interacting with and caring for their patients, it is critical that they understand the workings of the health care system, including insurance and payment models, testing regulations and guidelines, etc. In addition, 2020 is a presidential election year, one that has spurred a lot of discussion about new policy changes that could profoundly impact the way current clinicians practice medicine and patients receive care. Thus, it is critical that the next generation of doctors are confident in navigating this changing space.

The recent COVID-19 pandemic acted as a catalyst to expedite the formation of this elective because it brought to light how we as a nation and as a health care community need to be better prepared to care for our patients, especially in a time of crisis. Using lessons learned from the coronavirus pandemic, we hope to encourage medical students to become advocates for their future patients in the policy space and integrate information toolkits on topics such as pandemic management within individualized patient care. Given how crucial teamwork is in the clinical setting and in emergency preparedness, this elective emphasizes diverse interdisciplinary partnerships, which consist of health care managers, government and policy leaders, and health care providers. This novel curriculum trains future physicians to work as part of policy and crisis management teams to assess, coordinate, and improve health care.

Approach

The longitudinal aims of our elective include the quintuple aim and its application into advocacy, both of which touch upon all aspects of the major health systems science domains. Each of our sessions touches upon all, if not almost all of the specified AMA domains by design, as our team reviews these domains and longitudinal threads of the elective with each speaker while developing each talk. Thus, our elective curriculum, which supplements the health systems science formal training at our school, is based off of the AMA health systems science domains. We specifically requested Dr. Weber as our first-choice

mentor for our project due to his position as an AMA Health Systems Science Scholar with long term familiarity and expertise educating others on these domains. From our experiences thus far, we have further improved both our theoretical and real-world application understanding of the AMA domains through collaborative learning with diverse speakers and our peers.

An example of utilizing these domains in our curriculum were seen in our kickoff event this year on the role of environmental sustainability in health policy. During this talk, our speaker, Dr. Catherine Chen, discussed the long-term positive economic impact of putting resources into green sustainability and recent environmental initiatives affecting the health care structure of the Robert Wood Johnson University Hospital. We also discussed green sustainability in the context of health system improvement. Dr. Chen served as a role model for physicians playing simultaneous roles as leaders and collaborative team members to advocate for green sustainability in the hospital. She also touched upon the ethics of why sustainability is important in health care as well as its value and effect on public health, in both a local and global context. The talk was interactive and featured a component where students discussed current health technology and health care protocols and how these processes could be made more sustainable. Future components of the elective for this semester include talks on the Choosing Wisely Initiative and the importance of high value care, as well as an interdisciplinary talk on drug pricing, among many more diverse health policy training events.

Outcomes

Our project provides an innovative curriculum for training future physicians in the field of health policy.

The novel outcomes of our project include academic, self-directed, longitudinal and field work enrichment for medical students. Our two main longitudinal aims, integrated into each class meeting, are the interdisciplinary academic components of the quintuple aim of health systems science and its real-world application, where students can use the skills taught in the elective to immediately engage in productive dialogue and advocacy.

We aim to enhance the students' ability to fluidly integrate the quintuple aims of health systems science into the early stages of their academic career. These quintuple aims focus on the following aspects of health policy: 1) payment (reduce the per capita cost of health care), 2) population health, 3) performance (improve the patient experience), 4) physician burnout/resilience (improve the provider's experience), and 5) equity (social determinants of health and disparities in access to care). Furthermore, our curriculum includes a self-directed, research-oriented approach toward applying what is taught in the classroom. At the end of this elective, students should be proficient in critically analyzing different modes of media communication surrounding health policy and making a case for or against controversial current issues in health policy.

By providing a diverse range of speakers, including health policy professors, practicing physicians, hospital administrators, legislators and peers, we hope to foster a better understanding of the diverse roles within health policy. By including current students as speakers, as well as offering mentorship opportunities, students will gain confidence in their health policy proficiency and in their ability to make a tangible difference at their current educational level.

Since this elective has just started, these outcomes are pending.

Personal impact

This work has honed our knowledge of health systems science in a way that will support our roles as physicians in a dynamic world. Historically, within physician culture, there has been more of a separation between the legal and political aspects of health care versus the biomedical science that students were required to master. However, the COVID-19 pandemic has illuminated the need for physician-advocates who are well versed in health policy and emergency preparedness more than ever before. As members of the next generation of physicians, our experience gave us more confidence to combat the unexpected challenges that may arise with the rapidly evolving health care space — whether that is future

medical emergencies/pandemics, changing medical technology, etc.

We developed our organizational, leadership, and presentation abilities, which are skills that we will need as practicing physicians. As we shifted into a virtual learning environment, we demonstrated our adaptability and problem-solving skills to accommodate these changes without losing any of our educational objectives and anticipated outcomes. We relied on our resilience during a time of limited funding, where we presented a strong enough case for our educational elective to potential speakers, securing a myriad of distinguished lecturers who were willing to help our cause pro bono. In this way, we served as advocates in the health policy educational space in the interest of our class. As future physicians, we hope to bring our capacity to innovate and advocate in times to crisis to improve care for patients in need.

Medical Student Led Drive-Through COVID Testing Efforts in the Midsouth

Project lead
Lydia Makepeace, University of Tennessee Health Science Center

Teammates
Chloe Hundman, Austin O'Connor, Andrew McBride and Hannah Allen

Faculty mentor
David Schwartz, Chair, Department of Radiation Oncology, University of Tennessee Health Science Center

Abstract

Undergraduate medical students at the University of Tennessee Health Science Center were relieved of all academic duties in March 2020 due to COVID-19. Medical student leaders immediately worked with senior administration at the College of Medicine to design, deploy and staff a large drive-through community COVID-19 test site. Students drafted all training, testing and safety protocols in partnership with faculty mentors and city leaders. Over 170 medical, nursing and dental student volunteers staffed and managed testing over a 6-week period. The site was financially supported by the Mayor's office as the region's largest testing site and was soon joined by a second site. Students ultimately served over 3,600 Memphians before transitioning the site to permanent staffing to facilitate students' return to coursework. Local community recognition of the students' work was strong. Participating trainees and faculty uniformly reported high levels of satisfaction and personal growth. To our knowledge, this remains the only medical student-run COVID-19 community testing center experience in the United States.

Project addressed/problem discovered

On March 17, 2020, following guidance from the Association of American Medical Colleges (AAMC), third- and fourth-year students in the College of Medicine at the University of Tennessee Health Science Center were relieved of clinical responsibilities. This announcement created a temporary highly knowledgeable workforce that was eager to get involved and serve the community. At the same time, there was incredibly limited access to testing for SARS-CoV-2 in the Memphis community with the majority of testing in the area confined to hospitals. Based on our knowledge of our community and of the virus at that time, we identified an opportunity to provide high-value care focusing on first responders and underserved populations hit especially hard by the pandemic. Additionally, based on our own training and the limited available evidence regarding the virus at the time, we recognized the need for a strategically designed outdoor drive through testing site. In the early stages of the pandemic, it was critical that testing be made available to the public in order to both understand the presence of the disease in our community and slow its spread.

Approach

On the day students were removed from clinical rotations, the President of the Medical Student Executive Council (MSEC) under the direction of the Senior Executive Dean of the College of Medicine tasked a team composed of five third- and fourth-year medical students to lead the testing site initiative. The next day, these student leaders gathered with staff from a university affiliated clinic, representatives from the Memphis Fire and Police Departments, and the faculty member who would be leading the efforts. This committee subsequently selected third- and fourth-year medical student volunteers to undergo training in personal protective equipment (PPE) techniques, testing procedures, and electronic health record software the following day. While onsite, multiple developmental designs and re-designs were trialed before a workflow process was established. First responders from the Memphis community were prioritized and served as the first "patients" while the workflow was fine-tuned. Student volunteers played key

roles in the development and implementation of protocols alongside a core group of faculty, residents and fellows. Medical students also served as the primary workforce for both the drive-through testing site and the call center. Additional faculty, residents and fellows participated in the initiative by volunteering to supervise students in their roles and oversee operations at the sites. Duties at the call center included screening patients, obtaining consent and scheduling tests in the electronic health record. At the testing site, responsibilities included verifying patient information, packaging testing kits, collecting NP samples and providing follow up instruction. Third- and fourth-year student leaders oversaw new volunteer orientation, daily operations, safety-focused check outs, lab courier pick-ups, and PPE and testing material inventory as well as supply chain, volunteer recruitment, result caller onboarding, and testing site safety and quality improvement. Safety and operational procedures were analyzed daily to ensure ongoing optimization. In addition to medical students, other health professional students were incorporated into the volunteer force based on their level of clinical training. In accordance with AAMC guidelines, students received no course credit or financial compensation for their work, and all involvement was strictly voluntary.

Outcomes

Over the 6-week period, over 170 students from the Colleges of Medicine, Nursing and Dentistry volunteered over 7,900 hours and tested over 3,660 patients at two testing sites in Memphis, TN. Students were able to volunteer in a variety of roles with varying amounts of patient contact. In this way, we were able to provide opportunities for all students including individuals with personal health concerns or high risk loved ones at home. As a team, we paid special attention to social determinants of health. We were able to provide testing free of charge, and we worked with city officials to overcome barriers to care for underserved populations throughout the city.

Following this experience, volunteers were sent an IRB approved survey regarding their experiences. We believe that further analyzing student and faculty experience and development throughout this testing initiative will help to guide the way for similar initiatives in the future. Preliminary data and quotes from that survey are included below.

Medical students represent a trained workforce to meet a need in the city that was previously unfilled during the pandemic. The use of students as the primary workforce at a university-backed testing site limited the number of health care providers needed on site which allowed the majority of our physicians to focus their efforts in the hospital and in their clinics. Student involvement allowed for rapid evolution of policies and procedures while maintaining the highest degree of safety. In fact, there were no reported high-risk exposures of volunteers to any patients tested at the site over the course of student involvement, and 100% of the student respondents felt safe while volunteering. Students were eager to help, and this experience provided an opportunity for students to care for our community in a meaningful way at a time when we were not allowed to continue our clinical rotations. This testing initiative provided opportunities for us to grow clinically but also had even further implications than we had initially realized. One volunteer stated, "It was incredibly empowering to be a part of this initiative, and it made me happy to see some of my peers adopt leadership role[s] while others, myself included, learned to step aside and allow ourselves to be led. Medicine requires teamwork, and this experience truly taught me how efficacy results from meaningful structure that everyone in the team ascribes to and actively supports."

The evolving nature of the pandemic allowed students to step into leadership roles and practice problem solving and the monitoring and implementation of quality improvement measures. As one of our volunteers stated, "I learned extremely useful skills in developing team-based strategies, quality-improvement for safety assurance and clinical skills in a pandemic setting". This similar sentiment was shared by the majority of our student volunteers. In addition to our student volunteers, our faculty, fellow and resident volunteers reported that this experience had a significant impact on the development of their personal leadership, teamwork, clinical knowledge/skill and personal fulfillment. This novel situation allowed students and faculty to interact in new ways.

At the end of the initial six weeks, we were able to facilitate the transition to a permanent workforce as our students returned to their clinical duties. Our procedures have now been implemented at multiple other testing sites around the midsouth.

Personal impact

The UTHSC COVID-19 Initiative provided the ideal learning opportunity for the student operation leaders to develop the skills necessary to becoming physician leaders one day. By leading the daily operations, recruiting student and faculty volunteers, developing and executing orientation and training, providing feedback, and asking for, reviewing, and addressing safety concerns, we were able to improve our leadership skills. By adapting to everything from car batteries dying in the middle of the testing lane to changing weather conditions, we improved our problem-solving skills and practiced patience and flexibility. By holding daily safety huddles and check-outs focused on safety events after each shift, we gained insight on how to report and address safety events. By completing modified root cause analyses and implementing specific tactical interventions, we worked to promote a culture of safety. By collaborating and working alongside the Memphis Fire Department and the Memphis Police, we learned how to be better communicators and team players. By providing PPE training and onboarding orientation to all new volunteers, we improved our teaching skills. Above all, this work has reaffirmed our admiration for the heart of service of the physician volunteers, the first responders, and our fellow classmates, as they did not hesitate to respond to the community's need in this unprecedented time.

Smart Glasses — A Solution for the Limitations to Medical Education Brought Upon By COVID-19

Project lead
Lekha Devara, University of Louisville School of Medicine

Teammate
Briana Coleman

Faculty mentor
Jeff Baker, MD, University of Louisville

Abstract

The onset of COVID-19 and the mandates of quarantine and isolation have brought upon a plethora of unforeseen changes to medical education. One of the biggest changes has been the lack of shadowing and preceptorship opportunities for pre-clinical students. Being in a hospital setting is often the best way to bridge the divide between didactic material and what it means to be a physician in the real world. An unanticipated but much appreciated solution to this problem has been the increasing popularity of smart glasses. Smart glasses have been a part of the conversation for the past few years but have often been put on the back burner in the world of health care education due to the perceived priceless experience of physical presence in a health care setting. The dawn of COVID-19 provided the perfect platform to put smart glasses to the test, and the results proved surprising and optimistic. This past summer, University of Louisville School of Medicine students had the opportunity to experience the brilliance of smart glasses first-hand through a virtual shadowing opportunity in the emergency department. Students were able to be in the emergency department without actually being there. The result was an interface that allowed medical students to see procedures and interpersonal doctor-patient interactions at an unprecedented level. The advent of smart glasses has opened a door of endless possibilities in medical education.

Project addressed/problem discovered

In tandem with all other medical schools, in March 2020, The University of Louisville barred any students from entering the clinical setting, due to the spread of COVID-19. The pandemic isolated pre-clinical students and detached medical education from the realities of medical practice. Systems thinking helped unveil this problem that limits students from receiving a well-rounded didactic education. Shadowing and preceptorship opportunities allow students to get an early idea of what specialty they would like to pursue. Oftentimes, these experiences are the primary way didactic students determine their career and medical school goals. The pandemic has made it impossible for students around the country to safely get the desired exposure to patients and practicing physicians and to be able to make personal decisions.

In April 2020, Dr. Jeff Baker, an emergency medicine faculty member at the University of Louisville got involved with Dr. R. Brent Wright, the Associate Dean for Rural Health Innovation at the University of Louisville and his idea to use Vuzix smart glasses for telehealth in clinics heavily impacted by COVID-19. The smart glasses were ultimately not used for telehealth in the emergency department, but Dr. Baker adapted the idea and implemented a virtual shadowing program for pre-clinical medical students. Influenced by systems thinking, we felt inspired to take this prototype and amplify it throughout our health system. Our hope is that smart glasses will be able to bridge the divide between health care education and practice and become a tool to overcome the hurdles to medical education that have resulted from the pandemic.

Approach

Prior to approaching our mentor, we came up with different branches of the project that needed to be addressed. We grouped all the aspects of the project into three categories — communication, infrastructure and technology.

Communication involved reaching out to Dr. R. Brent Wright who pioneered the implementation of smart glass technology for telehealth in the rural medicine program. Once we spoke to him, we got in contact with members of the University of Louisville School of Medicine administration and faculty who could help implement this project. We worked with Dr. Jeff Baker, who first used the smart glasses for student shadowing, to build the infrastructure of our project. Finally, we communicated with the legal departments of the hospital and school to make sure that smart glasses could be seamlessly and safely implemented.

The infrastructure involved developing a protocol that could be distributed to the student groups and physicians on how to use the glasses, creating demonstration videos on how to integrate Zoom and smart glass platforms for student use, and creating a system for renting out and managing the glasses.

The final and arguably most important part of our project was the technology. We campaigned for the idea within the student body and were able to get numerous student interest groups to partner with us to apply for funding for the glasses from the university. There was enough interest that the university gave us the budget to purchase three pairs of Vuzix M400 glasses for use specifically by medical students. Through the process we also had to learn how to use Zoom and the Vuzix platforms successfully.

Correlated to the health systems science concept of teamwork, there are a lot of moving parts to making virtual shadowing a reality. This project integrates physicians, patients, students and technology in a virtual platform that requires the interconnection of all parts to succeed. As managers of this project, we took this opportunity to practice leadership, a core value in health systems science. We embraced the task before us and worked to find solutions in the most efficient and productive ways.

Outcomes

Our project's outcomes have proven to be two-fold. The direct impact of smart glasses include being able to offer shadowing opportunities in a multitude of specialties to about 320 students who would otherwise be lacking this aspect of their medical training. This is critical, as most medical students are only able to shadow a few specialties prior to entering medical school. In fact, with today's regulations, the current University of Louisville first year class would not have been allowed to shadow until the beginning of their second year at the earliest. Furthermore, students have been able to get an unprecedented view of doctor-patient interaction and procedures that were previously difficult to witness during conventional shadowing. The glasses have given students views of everything from suture technique to nuances in nonverbal communication between patients and caretakers.

The second part of the outcomes of this project are the future possibilities for the use of smart glasses. We are currently exploring how to implement the glasses in gross anatomy labs to supplement a virtual anatomy curriculum and methods for third and fourth year clinical faculty to use the glasses to record procedures, demonstrations, etc. to supplement their teaching. Smart glass technology has opened the door for countless possibilities to benefit medical education, and we see it becoming a mainstay.

To develop our project further, we plan on collecting and organizing student and faculty feedback following each shadowing session. We will be asking questions about the technology aspects, but more importantly we will be asking whether students feel as though the shadowing benefitted them in ways traditional shadowing would not be able to. We hope to publish this data to present an overall opinion of the use of smart glasses, and barring significant negative feedback, we plan to implement this shadowing type as a permanent method for didactic students to explore various career paths.

Personal impact

Briana Coleman: The largest hurdle this project has helped me to get over is my tendency to micromanage. When working on any large project, I tend to convince myself that I need to have a hand in every aspect to ensure its quality will be up to my standards. Since we have worked with so many different excellent people and departments on this project, letting go of control and trusting others, who are of course much better at their job than I could dream to be, has been key to allowing the project to proceed quickly and efficiently.

Lekha Devara: Through this project I learned more about the crucial skill of communication and how to work with professionals and mentors within the health care field. This project has been a wonderful way to explore the administrative side of medical education and has helped me realize that it is a path I would like to pursue. I also learned that despite just being a medical student, there are many avenues to make an impact upon my education and that of my peers through advocacy and perseverance. The positive impact that this project can make is a priceless reward.

Visual Thinking Strategies: A New Role for Art in Teaching Physicians About Implicit Bias And Empathetic Interviewing

Project lead
Heba Osman, Detroit Medical Center, project implemented at Detroit Medical Center and Wayne State University

Teammate
Suma Alzouhayli (Wayne State University School of Medicine)

Faculty mentor
Ijeoma Nnodim Opara, MD, Wayne State University School of Medicine & Physician Group,

Abstract

As COVID-19 spread across the globe, the outbreak created an unprecedented burden on the health care system and halted medical education for months. Although the immediate focus to care for patients was justified, the disruption of medical education now requires prompt attention from educators. The need to prepare future physicians has never been as imperative as it is now after existing health and social inequities were amplified by the pandemic. As graduate medical programs struggle to provide effective learning experiences about health disparities and implicit bias, our Visual Thinking Strategies (VTS) workshop, both in-person or virtually, can provide an effective methodology to strengthen cultural competency for trainees. It is an efficacious tool for teaching critical thinking on social justice and community engagement as it immerses learners in the community and out of the clinical setting. This enables physicians-in-training to provide higher quality of care and contribute to decreased health disparities.

Project addressed/problem discovered

The literature is clear on the link between institutionalized racism in health care and health disparities. Implicit bias among physicians is a manifestation of this and has been associated with poor health outcomes in many marginalized populations. Increasingly, there has been a call for health centers and graduate medical institutions to improve the education of medical trainees in health disparities. More recently, Michigan's governor signed an executive directive which directs the Department of Licensing and Regulatory Affairs (LARA) to require implicit bias training for licensure, registration and license renewals of all health professionals in Michigan. The need for this executive directive was emphasized after the COVID-19 pandemic was shown to have a disparate impact on people of color. However, implicit bias training along with institutional changes can make a positive difference and help eliminate health care disparities. Furthermore, graduate medical programs include minimal time for training future physicians in implicit bias recognition and response which led to the development of our collaborative education program to address implicit bias using VTS.

VTS is a teaching method used in museums locally and internationally and now in many schools and colleges. VTS uses art to help students improve critical thinking, and communication skills and requires a trained facilitator to engage students with a work of art using a rigorous process of seeking an interpretation. Vygotsky, a prominent psychologist in the 19th century, believed learners would learn better in social contexts where they could collaborate to construct meaning and build upon each other's ideas.

Approach

We present a unique partnership through a collaborative educational activity to address implicit bias using VTS. In alliance with one of the most visited museums in Michigan, the Detroit Institute of Arts (DIA), our Wayne State University/Detroit Medical Center Internal Medicine Residency program, the largest in Southeast Michigan, delivered a two-hour VTS workshop in the DIA, to elicit reflections on implicit bias. VTS-trained DIA facilitators delivered the workshop as the residents engaged with art.

Our VTS workshop entailed three components:

1. Open ended questions about a work of art designed to provoke participants to look closer, put observations into words and provide visual evidence for what they were seeing.

2. Practice of learned skills in front of visual art and receive feedback to strengthen their understanding of VTS

3. Reflective group discussion to help participants understand how VTS can be used in patient interactions and how to reduce implicit bias.

Social distancing being the most effective preventive strategy since the emergence of COVID-19 has precluded students from gathering in groups. However, we were able to not only succeed with our goal of expanding this workshop to include more physicians-in-training but also to adapt it to a virtual setting due to the restrictions placed. We included this educational activity during the virtual orientation of 50 resident physicians prior to starting their clinical duties in June 2020. Our goal was not only to push for health system improvement but to also address some of the health care disparities our patient population faces in the process, specifically ones highlighted by the COVID-19 pandemic.

Outcomes

Prior to each VTS workshop, we ran a pre-test assessment survey that revealed that fewer than 10% of the residents who have attended our workshops were aware of VTS, none had ever used VTS methods and only a few had visited the DIA. After the workshop, a post-test assessment survey revealed that over 90% of residents reported satisfaction with the experience, increased appreciation for art and the DIA, and increased awareness of their implicit biases. Furthermore, 50% of resident physicians found that art and VTS has a use in medical training and believed that this workshop will be useful in a patient encounter. 40% of participants attested that it will change the way they practice medicine.

VTS appears to increase team building as residents work together, challenging each other to form a cohesive idea about the art form studied. Furthermore, it increases listening skills, as each resident respectfully listens to their colleagues' viewpoints, and can increase the trainees' listening skills during patient encounters as well. It has also been shown to improve analytical thinking as students "decode" the images seen in the paintings and reflect on the biases they may bring to the table when decoding these images.

We now have an established partnership with the DIA and their facilitators to run this workshop yearly, in person or virtually, prior to residency orientations. Furthermore, this workshop has been successfully recognized in the state of Michigan as it has been accepted to the largest medical humanities conference at Western Michigan University this year. Our goal is for surrounding graduate medical programs and health care institutions to adopt the curriculum we have developed, to further promote an environment of collaborative learning by integrating medicine with the humanities and to promote community engagement by immersing learners in the community and out of the clinical setting.

Personal impact

This workshop has been a true learning experience, fostering both my creativity and leadership skills. The recognition this workshop achieved has even allowed me to be set apart as a leader in this emerging space. Because we have built it from the ground up, we can take ownership of its trajectory and ensure the content doesn't become diluted. This project fueled my desire to transform medical training to reduce systemic inequalities at the population level. It has offered me the opportunity to learn about different methods of learning and how to use a visual arts teaching method to improve our current health system. As a result, I have gained increasing appreciation for the power of arts and humanities as a tool for reducing health disparities by impacting the minds of health care professionals. It can affect the larger issue of systemic inequalities and implicit bias we have on hand. The existing health disparities highlighted during the COVID-19 pandemic have made it clear that there is more work to do to ensure that everyone has the same access to the same quality of health care. I sincerely believe that as physicians we must take ownership of our own contributions to the

problem. And while many graduate medical programs have recognized the importance of learning about health disparities, many programs face the difficulty of integrating it into their curriculum in a creative method that is also effective. I hope further advancement of this innovative project will influence all health care graduate programs to follow our lead.

Population, public and social determinants of health

A novel Screening Framework for Social Needs in an Ambulatory Practice Setting

Project lead
Allison Hare, Perelman School of Medicine at the University of Pennsylvania

Teammates
Divya Vemuri, Terren Drayton and Nicole McHenry

Faculty mentor
Anna Morgan, MD, Assistant Professor of Clinical Medicine, Perelman School of Medicine at the University of Pennsylvania

Abstract

Social determinants of health are conditions in which people live that are shaped by the distribution of money, power and resources. Through screening for the social needs of our patients, we can address manifestations of these determinants on an individual level. Here, we created a novel framework and executed a pilot run for social needs screening within ambulatory practices at a large academic health system. We identified patients who were at high risk for worse health outcomes and asked about their degree of financial strain, food insecurity and access to transportation. If patients with needs indicated interest in assistance, they were referred to a social worker or to resources directly through an online resource database. Our ultimate goal is to implement this intervention on a system-wide scale, and in doing so, better address the factors that lead to poor health outcomes for our most vulnerable patients.

Project addressed/problem discovered

Defined by the World Health Organization, social determinants of health (SDOH) are conditions in which people are born, grow, live, work and age that are shaped by the distribution of money, power and resources on global, national and local levels. If special attention is not paid to SDOH and patients are viewed solely through the biomedical lens that separates their physical maladies from the contextual factors that may precede them, we will almost certainly fail in efforts to eliminate health disparities. This is particularly relevant in the diverse urban center of Philadelphia in which we practice. According to the "Health of the City" report released by the city's Department of Public Health in 2019, life expectancy is lowest in communities with the highest rates of adverse behavioral and economic determinants, including poverty, substance use and violence. Such communities are unequally occupied by Hispanic and non-Hispanic Black Philadelphians — despite Philadelphia's diversity, it continues to be segregated along racial lines, with one race or ethnic group representing the majority in 84% of the city's 381 census tracts. The Robert Wood Johnson Foundation found that the factor with the largest weight contributing to health outcomes in Philadelphia was not clinical care (20%), but instead social and economic conditions (40%), reflecting expert consensus that these factors have the most powerful influence on population health. Accordingly, as practitioners in Philadelphia, we cannot provide fully holistic care to our patients without paying mind to these factors.

Approach

Through screening for the social needs of our patient population, we can assess and address manifestations of SDOH on an individual level through connecting patients to resources, while simultaneously enhancing our ability to predict and understand patient needs and service utilization, setting the stage for future intervention. Our project's approach lies at the nexus of the health systems science domains of SDOH and clinical informatics, harnessing the power of the electronic health record (EHR) to systematically identify patients with the greatest social needs and subsequently both document their SDOH and provide them with resources through an EHR-linked platform.

We initially identified active patients within two ambulatory general internal medicine practices at Penn Medicine who were at high risk for worse health outcomes, as determined by factors including admission frequency, emergency department utilization, chronic disease (e.g., diabetes, hypertension, cirrhosis) and Medicaid status. Then, we executed a pilot run of our proposed screening workflow, in which a medical assistant called these patients, assessed their willingness to participate and asked them questions regarding their financial strain, food insecurity and access to transportation. If patients screened positive for needs in any of these categories and were interested in assistance, they were referred to a social worker at their practice. A smaller cohort of patients was referred to resources directly by the medical assistant through an online resource database searchable by patient zip code, which was linked to the EHR in a way that allowed for patient record-linked referral tracking.

Outcomes

In total, 129 patients were identified for screening in our pilot run. 64.3% (83/129) were reached, and 61.4% (51/83) of those reached answered the questions. 13 of these patients were referred to social work, and 5 were referred to resources through the online resource database. 41% (n=21) patients reported some degree of financial strain, 27% (n=14) patients reported some degree of food insecurity and 23.5% (n=12) patients reported difficulty with access to transportation. On average, screening calls took less than 5 minutes, and the medical assistant conducting the calls overall found it to be a positive experience connecting with patients. Social workers felt most referrals were appropriate.

Through a straightforward telephone and EHR-based screen, we demonstrated that patients in our practices have social needs that can be connected to resources or a social worker in a time-efficient manner. Next steps include expanding this screening framework to all patients at our practices within the health system and, later, using a tablet-based screen at the beginning of all appointments in order to capture the highest proportion of patients. Our hope is that we will be able to better address the factors that lead to poorer health outcomes for vulnerable populations and implement these measures on a health system-wide scale, and in doing so, provide more equitable care to our patients.

Personal impact

I entered medical school under the premise of self-actualization through improving the lives of my patients, without understanding that my efficacy would be far more constrained by the system in which I was embedded than my will to do right by others. As I progressed down the winding path of my clinical interests, however, I gained insight into the realities of our health system and the role a physician can play within it. My patients repeatedly told me of the devastating physical and emotional consequences that resulted from barriers to care and resources, and I learned that physicians cannot fully alleviate suffering if they are unable to address these core determinants that underlie human disease.

This lesson sparked my motivation to help bring this project to fruition. Through it, I've confirmed that I feel connected with my greatest sense of purpose when given the ability to address determinants of poor health outcomes in vulnerable populations. Looking forward, I will be taking a year out of medical school to complete a fellowship in clinical informatics in order to continue coupling my interest in health technology to my desire to form evidence-based interventions that alleviate barriers to health equity. I feel compelled to continue working in this niche not only to maximize the personal meaning I take away from my work as a physician, but to create a system that works better for all of us — and most importantly, our patients.

A Novel Telehealth Follow-up Program for Ambulatory COVID-19 Patients Shows the Potential to Improve Patient Care and Medical Education

Project lead
Sophia Uddin, University of Chicago Pritzker School of Medicine

Teammates
Steven Server, Matt GoodSmith and Annie Zhang

Faculty mentor
Jonathan Lio, Assistant Professor of Medicine, University of Chicago Pritzker School of Medicine

Abstract

Most COVID-19 patients do not require hospitalization and must recover at home under isolation. COVID's unpredictable disease course raises concern for decompensation, while widespread shutdowns and social distancing exacerbate health disparities. With the goal of helping patients through these challenges, we created a telehealth follow-up program staffed by medical student volunteers.

Our program included four teams of ~12 volunteers each headed by a student leader under the supervision of an attending physician. Volunteers contacted ambulatory COVID-19 patients by phone to monitor their symptoms, identify unmet needs and provide education. Volunteers followed patients longitudinally until ending criteria were met.

Student volunteers provided clinical, social, and emotional support to 416 ambulatory COVID-19 patients, of whom 62% were women and 68% were Black/African American. After red flag symptom review, 32 (8%) of patients visited the emergency department, and 11 (2.7%) were admitted. Volunteers provided access to primary care and clinical trials for 36 (9%) patients, and work notes, grief counseling and referral for housing and financial support to 50 (12%) patients. Students reported high satisfaction.

In summary, we created a novel telehealth system for supporting and triaging ambulatory COVID-19 patients. This program has applicability to low-resource settings in which patients would benefit from close follow-up and social support.

Project addressed/problem discovered

A major health systems challenge during the COVID-19 pandemic has been the sheer volume of ill patients, particularly in the early months of the pandemic. With colossal efforts focused on hospitalized patients, few resources were available for those convalescing at home. Clinics closed while robust telehealth systems had not yet been implemented. Emergency departments were overwhelmed by COVID-19 patients. These circumstances drastically limited access to primary and non-COVID-related care. The many unknowns surrounding the disease, rapidly-changing recommendations and inconsistent media messages led to public fear and confusion.

In the patient population surrounding the University of Chicago (UC), comorbidities (e.g., diabetes, hypertension) that can worsen COVID-19, as well as barriers to care, were common. Given these challenges along with the unpredictable COVID-19 disease course, UC students and primary care and infectious disease physicians felt that many of our ambulatory patients could benefit from follow-up to monitor for signs of worsening illness. We also anticipated unmet needs for social support in our community beyond direct medical advice, e.g. lack of insurance, food insecurity, and housing and income instability. We expected the conditions precipitated by COVID-19 to both create and exacerbate such challenges. We hoped to address these needs through our program and planned ongoing project evaluation to continually review ways to address the needs identified. This was intended to allow rapid innovation to compensate for the pandemic's fast-changing conditions.

Meanwhile, problems in medical student education also were identified in March 2020. With the influx of COVID-19 patients, students' clinical rotations were suspended due to limited PPE, efforts to implement social distancing and temporary limitations in faculty availability for teaching. With telehealth recognized as a promising avenue for improving access to care, a telehealth follow-up program had the potential both to reach patients efficiently and teach students important skills remotely. Because clinical learning opportunities had paused, students in their clinical years were available as volunteers capable of basic patient follow-up. A follow-up program supervised by an attending physician therefore had the potential to a) fill patients' needs and b) supplement medical students' learning by providing hands-on telehealth experience.

Approach

Our program used medical student volunteers to support and triage ambulatory COVID-19 patients with the goal of providing patient-centered care. In health systems science, it addressed areas of health care structure and process, social determinants of health, health technology and health system improvement.

Our project was a direct response to pandemic-imposed health care constraints and offered a unique health care structure: it was staffed by medical student volunteers who delivered medical and social support remotely. The project was overseen by an attending physician who assisted volunteers by phone. Three volunteer teams were each run by a student leader who managed the patient list, monitored progress, assisted volunteers and contacted the attending with questions. Timeliness and availability of care were priorities: new patients were accepted daily (excluding weekends) to the team on call, and we collaborated with a volunteer support call line to allow patients to obtain COVID-related information quickly.

Protocols emphasized patient-centered care, seeking to provide patients with maximal knowledge, resources and agency to manage their recovery. On initial calls, volunteers reviewed red flag symptoms with instructions to visit the emergency department if such symptoms developed. They covered COVID-specific care, e.g. isolation measures. They also discussed social determinants of health, having been provided with a list of patient resources (e.g., contact information for primary care groups accepting uninsured patients). If volunteers identified needs they could not address, they worked with the attending (and later an interdisciplinary team) to connect the patient with food, isolation housing, transportation, finances and/or mental health resources. At closing, volunteers addressed patients' questions. To provide the timeliest help for patients, volunteers also gave the number to a separate COVID-19 support line.

Follow-up was longitudinal, based on principles of continuity of care and its connections to better outcomes and patient satisfaction. Volunteers called patients every 24-48 hours depending on level of concern to ensure timely identification of new problems. After the initial call, volunteers regularly assessed symptoms, reminded patients about red flags, addressed questions, and provided emotional support. Calls were stopped if any of these conditions were met:

- Patient opted out
- Patient improved on two consecutive calls
- Patient was asymptomatic
- Patient was hospitalized

One week after completion, chart reviews were conducted and further developments (e.g. hospitalizations) were recorded.

The program underwent rigorous quality improvement consisting of weekly student and faculty leader meetings to address challenges. This allowed adaptation to constantly changing pandemic conditions. As examples, we added a fourth volunteer team with weekend call to deal with increasing patient load. We also initiated collaboration with a patient navigator group and social workers to address more complex situations.

Our program was based on a fast-growing area of health care technology: telehealth. While outpatient telehealth visits are common, newer remote health services (e.g., tuberculosis therapy) show promise. For us, telehealth was the ideal avenue for providing care in a situation requiring

social distancing, and in a setting lacking the resources to follow these patients in person.

Outcomes

In total, our medical student volunteers contacted 416 ambulatory COVID-19 patients and followed each for an average of 4.5 days. Only 6% were lost to follow-up. Sixty-eight percent self-identified as Black/African American, 11% white, 4% multiracial, 2% Asian and 16% unknown. Nine percent were Hispanic, and 62% were women. The most common comorbidities were obesity (40%), hypertension (33%), diabetes (22%) and asthma (20%).

Volunteers provided concrete services for patients in a time of extremely limited access to health care. All patients received the COVID support line number for timely responses to COVID-related questions. Thirty-six (9%) patients were connected with access to primary care and clinical trials, 4 with housing, 3 with financial resources and 2 with unemployment resources. Volunteers completed work notes for 39 patients. Volunteers also caught concerning symptoms that may otherwise have gone unnoticed: 32 (8%) patients were referred to the emergency department and 11 (27%) were hospitalized after volunteers identified red flag symptoms. This is crucial in our population which is at high risk of severe disease due to high rates of comorbidities and barriers to care.

In their survey responses, volunteers highlighted other benefits to patients, especially emotional support and companionship; several volunteers noted that patients thanked them for this. Volunteers also mentioned patient education. One wrote: [My patient] had no understanding of what COVID-19 was and had no idea that she was able to be isolating at home…she had totally fallen through the cracks and been sent home without any education.

After several weeks, medical student volunteers had the opportunity to complete a 16-question survey, which used a four-point Likert scale to measure agreement with statements about the program. It also solicited free responses. This was a step in the ongoing improvement process, with the goal of judging the value of our program and implementing future improvements.

Volunteers' survey responses overwhelmingly indicated that the program improved their medical education. Of 42 (79%) respondents, all agreed that the program was valuable to their medical training and allowed them to make meaningful contributions to patient care. Over 90% agreed that they gained confidence regarding factual knowledge about COVID, answering questions about COVID-19 and evaluating patients over the phone. A large majority (83%) gained confidence triaging patients for emergency department visits over the phone.

Importantly, 98% of volunteers felt that they gained insight into patient experiences of COVID-19, gained understanding of psychosocial factors affecting patients' COVID-19 experiences, and felt a stronger sense of connection to patients in the community. In their free responses, 81% of the volunteers reported a sense of fulfillment from providing emotional support. They also mentioned other benefits to medical education, such as self-reflection, educating patients and having difficult conversations about a frightening, life-threatening pandemic, isolation, and depression.

Almost all (95%) participants found the program well-organized with adequate mentoring. Free responses identified one main shortcoming: volunteers wished they had had more training before beginning their activities. In future iterations of the project, the training could be extended or incorporate a hands-on example.

Personal impact

This work presented a unique learning opportunity for me as it was staffed entirely by medical students with no residents, therefore providing experience working toward patient-centered care independently with attending backup as needed. The limited-resource setting encouraged me to collaborate with patients to solve problems creatively in ways that best suited their situations and abilities. In these collaborations, I learned to better explain medical information. It was a good setting in which to practice this skill, as the time constraints on our calls were more lenient than on a clinic visit. I could thus practice teaching at different levels of health literacy.

I observed the benefits of continuity of care by following patients longitudinally. This allowed for growth of meaningful relationships with my patients, which built incredible trust. It also strengthened my knowledge of my patients' detailed medical and social histories, which allowed us to come up with the best care plans.

I also learned about value in health care by using the simple resources at hand to deliver quality care as efficiently as possible. By following patients closely, we identified concerning symptoms and unmet needs in a timely fashion. We addressed these problems by coordinating care with an interdisciplinary team.

I gained comfort discussing social determinants of health with patients. Medical students may assume that someone else will broach sensitive topics such as food security, illicit drugs, and home safety, or that such discussions can be deferred because the visit concerns a seemingly unrelated problem. However, as a callback volunteer in a time of unprecedented load on the health care system, I was the main contact for my patients. I knew that if I did not ask these questions now, it could be months until they could be addressed, and stressors could worsen under the pandemic in the meantime. This situation encouraged me to discuss these topics matter-of-factly.

Aside from patient care skills, I also believe that my role as a team leader helped me develop important health care system quality improvement skills such as problem-solving through teamwork and developing efficient workflows. Finally, telehealth will continue to be an important avenue for medical care in the future, even after COVID-19 wanes. This project helped develop my ability to connect with patients over remote technology and increased my comfort with the logistics of telehealth.

Addressing Social Isolation and Health Disparities in Hospitalized Patients during the COVID-19 Pandemic

Project lead
Michelle Lee, Harvard Medical School, project implemented at Beth Israel Deaconess Medical Center

Teammates
Youjin Jenny Jang, Abraham Cheloff and Sophia Yin

Faculty mentor
Zahir Kanjee, MD, MPH, Hospitalist, Beth Israel Deaconess Medical Center

Abstract

The COVID-19 pandemic has increased feelings of social isolation in our communities and has also revealed tremendous health disparities in patients who are racial/ethnic minorities, low income individuals, and elderly. Focusing on the health systems domain of social determinants of health, we designed an intervention to combat social isolation in our most vulnerable hospitalized patients during the COVID-19 pandemic. In our program, medical students provide social support to hospitalized patients via phone by providing assistance connecting with family members, having informal conversations and check-ins, and performing a patient life narrative project. From April to August 2020, we reached out to over 100 patients identified by their primary medical team as vulnerable to social isolation and provided specific social support to 36 patients, including writing 15 life narratives. Through feedback, we were able to demonstrate benefit to patients, medical teams and medical student volunteers.

Project addressed/problem discovered

The COVID-19 pandemic's social distancing, shelter-in-place orders, and business and school closures have had a tremendous impact on feelings of social isolation and loneliness in the community, with some studies showing that loneliness increased by up to 30% within the first month of the pandemic. COVID-19 has also revealed tremendous health disparities, as vulnerable populations such as communities of color, low income individuals, and the elderly are disproportionately likely to experience infection and severe outcomes including hospitalization. Thus, the same patients who have been disproportionately affected by COVID-19 are also the ones at greatest risk for social isolation. Furthermore, patients hospitalized during the pandemic are at especially high risk for social isolation; they are separated from family and friends due to visiting restrictions, and the time restrictions and extensive personal protective equipment construct physical and emotional barriers to connecting with their providers. In addition, medical students are a skilled and underutilized workforce during the pandemic who have been largely excluded from direct care of hospitalized patients with COVID-19.

Focusing on the health systems domain of social determinants of health, we designed an intervention to combat social isolation in our most vulnerable hospitalized patients to promote humane, compassionate and equitable care. In our intervention, medical students helped patients hospitalized at Beth Israel Deaconess Medical Center connect with various sources of social support including family members and medical student volunteers via phone. Part of our intervention included the patient life narrative project My Life, My Story, which was based on an existing model at VA hospitals and other Boston hospitals.

Approach

Our project goal was to address social isolation and health disparities by promoting compassionate and equitable care for hospitalized patients during the COVID-19 pandemic. We addressed the health systems domain of "population, public and social determinants of health" by focusing on patients at increased risk of social isolation including those with limited English proficiency, limited social supports or

severe illness as well as those of older age. Our previous coursework and research in health systems science helped us recognize important behavioral and psychosocial factors influencing health disparities; these include historically negative interactions with the health care system and social/cultural differences which create barriers to connection with the health care team.

Thus, we created a social support outreach program to promote connection between medical teams and vulnerable hospitalized patients both with and without a COVID-19 diagnosis on the general medicine floors at our medical center. We partnered with inpatient medicine teams to identify specific needs of patients most at risk of social isolation. **Medical student volunteers connected with patients by phone to check in, provide social contact and offer the following social interventions, which were then documented as notes in the electronic health record to share with the entire medical team:**

1. "My Life, My Story": a patient narrative project where the student elicits a life history from the patient, writes up the narrative, then shares with the medical team via the electronic health record. This project helps provide social contact for the patient and helps the medical team get to know the patient better to provide more holistic and humane care. My Life, My Story is part of a national model that has been implemented at other hospital sites around the country including the VA and Brigham and Women's Hospital.

2. Help connecting with family members through technology: To help patients connect with their loved ones, students offered patients assistance in operating technology they needed to virtually communicate with loved ones.

3. Informal conversation with the patient about how they are feeling, how their hospital stay is going, as well as anything else the patient wants to talk about.

Outcomes

From April to August 2020, 14 medical student volunteers (including student leaders) reached out to over 100 patients identified as vulnerable to social isolation by their primary medical team. We provided specific social support to 36 patients, including 15 life narratives which were each shared with the medical team through the electronic health record. In addition to the above outlined roles, several students formed longitudinal relationships with patients over the course of their hospitalization and took initiative to advocate for their patients by relaying questions or points of confusion back to their medical team.

We have had tremendous feedback so far on the impact of our intervention on patients, providers, and student volunteers. Patients expressed thankfulness for the companionship and the chance to "feel listened to for the first time." One patient described it as a "meaningful and moving experience," and many patients asked for copies of their narratives to keep and share with loved ones. Medical providers appreciated how the intervention helped them better understand their patients and improve their care. One provider reported: "Wow. Just, wow. What an amazing story you tell/she tells, and it does so much to make me really understand this woman not as a patient w a comorbid malignancy presenting w an acute infection, but as a real. human. being. To say it puts her disease in context is an appalling understatement... this kind of note would change how I would care for her." Another volunteered: "The patient was very thankful she was able to share her story and that we greatly appreciate her perspective. Thank you everyone for allowing us to take even better care of the patient." Lastly, student volunteers found it very meaningful to connect with patients, with one saying, "It was a very touching experience...we ended up talking over the course of a few days, and it was great to build a relationship with [the patient] over that time."

We hope to continue this project even after the pandemic, with the goal of offering every hospitalized patient the opportunity to receive social support and share their life narrative.

Personal impact

This project connected with my previous coursework as an anthropology major in college and with my research experiences in public health, as I witnessed the power of patient narratives to advocate for populations who are vulnerable to health inequities and social isolation. I learned the importance of promoting compassion and

human connection at the center of health care during the COVID-19 pandemic, when there are increased barriers to communication between patients and medical teams. I also saw how medical students, who have been underutilized in the COVID-19 pandemic, in direct contact with hospitalized patients with COVID-19 can serve an important role in helping to fill this gap. I was inspired by how this project had a positive impact on so many members of the health care system, from medical providers to student volunteers to patients, and gained invaluable skills of how to work together and manage an interprofessional team toward a common goal.

Empowered by my work on this project, I will continue to strive to promote humanism, compassion, and equity at the center of how I deliver care as a physician. I hope to keep exploring the health systems frameworks to improve our health care systems, including learning how to address structural and social factors that contribute to our health inequities through hospital and health care systems-level interventions. I plan to pursue further work on patient social support and narrative medicine interventions on a larger scale by expanding and sharing this model with health care settings around the country.

Community-based Online Approach to Providing Health Education to Non-English Speakers during the COVID-19 pandemic

Project lead
Amanda Zhang, University of Chicago Pritzker School of Medicine

Teammates
Julia Ran, Anthony Hung, David Cao, Zi-Yi Choo, Sarah Sun and Allen Zhu

Faculty mentor
Karen Kim, MD, Vice Provost for Research, Professor of Medicine, University of Chicago; Associate Director, University of Chicago Medicine Comprehensive Cancer Center; Director, Center for Asian Health Equity

Abstract

As the COVID-19 pandemic emerged, language barriers prevented minority communities from accessing care and crucial information about healthy behaviors at home. Noticing this problem in my own Chinese immigrant neighborhood, I banded together with other student leaders at a free clinic to implement a community-based online initiative to fight medical misinformation, link patients to resources and provide much-needed reassurance to Chicago's Chinese-speaking community. We conducted multiple question-and-answer sessions, allowing community members to pose pressing medical concerns to experts at UChicago Medicine as knowledge about the virus evolved over time. We also conducted a video tour of the emergency department to help viewers to understand how hospitals address patient safety and to regain trust in the health care system. Finally, we created a mutual support group on the leading Chinese social media platform WeChat, which allowed us to connect with patients and disseminate our resources nationwide.

Project addressed/problem discovered

The COVID-19 pandemic poses a particular challenge to millions of Americans who are limited English proficient (LEP). LEP individuals lack access to routine public health advice, and thus are disadvantaged at making informed decisions for their health. This leads to health risks, exacerbates disparities in health care, and undermines public disease-control efforts that require widespread participation (Thomas et al, 2014). In March 2020, as student leaders of a Chinese-speaking free clinic serving a large LEP population in Chicago's Chinatown (70% LEP, 76% foreign born), we recognized the need to provide for our community during the pandemic. **Based on personal interactions with the Chinese community of Chicago, we identified two major problems relating to language access:**

1. Reliable information about self-protection practices are plentiful, but few resources are available in non-English languages. Furthermore, the distribution channels (webpages, English-dominant social media) do not match those used by our Chinese-speaking patient population. Non-English speakers are already disadvantaged in other ways — they tend to be older and have fewer educational opportunities. The lack of language-concordant resources marginalizes this group even further.

2. Misinformation and mistrust are consequences of this lack of communication. Personal interactions with community members revealed that Chinese speakers were avidly sharing COVID-19 myths (such as brewing herbal concoctions) on their own social media network (WeChat), without assurance of scientific validity. People also reported fear of entering hospitals due to disease, language barriers and documentation status.

Approach

Our overall goal was to improve access to COVID-19 health information for underserved Chinese speakers with limited English proficiency. Our approach focused on three aims: creating content relevant to our community, providing the

content in an accessible language, and distributing the content through appropriate channels.

1. Our first aim was to create medical content that is clear, accurate and relevant to our patient population. We conducted two rounds of community question and answer (Q&A) sessions in which community members anonymously submitted COVID-19 questions through an online form. Medical students then posed these questions over video to physicians at UChicago Medicine involved with the pandemic response. This ensured that the content was tailored to our patients' concerns and addressed by medical experts. Next, since community members expressed fear of hospitals and general unease about the pandemic, we partnered with the emergency department at our academic medical center to film a virtual tour demonstrating the extensive safety precautions undertaken to instill trust in the medical system. All of our video content — as well as other tailored resources including a map of neighborhood testing sites, phone numbers to COVID-19 hotlines with language interpretation, and up-to-date public health announcements from the Centers for Disease Control and Prevention and the city of Chicago — were collected in a website that acted as a centralized resource repository that we updated weekly.

2. Our second aim was to package this content in a way that is accessible to Chinese-speaking immigrant communities. We created all of our content in both English and Chinese. We recruited volunteer undergraduates fluent in Chinese to translate video transcripts and captions. Since the majority of our patient population is above the age of 50 and uninsured, we created infographics of the video content for those with technological limitations.

3. Our final aim was to share our resources through channels that our target audience used and trusted. We mobilized partnerships with local organizations and created a mutual support group on WeChat, the leading social media platform for Chinese speakers around the world. Using this new tool, we were able to meet our community on networks they used frequently and trusted. It also allowed us to reach a broader audience beyond Chicago.

Outcomes

In response to community outreach, we received a plethora of COVID-19 related questions including: "Can I avoid getting severe COVID-19 symptoms?" "What medicines can I take if I have COVID-19 and am recovering at home?" "Can I go to hospitals for non-COVID related illnesses?" and "Can mosquitos spread COVID-19?"

In the span of two months, our team produced a variety of dual-language content including 22 informational Q&A videos, 10 infographics, a 3-part virtual tour of the UChicago Emergency Department and a website repository of testing and care-seeking resources. As the pandemic progressed, we updated our Q&A with answers relevant to the stage of the pandemic. For example, at the beginning of the pandemic, we addressed concerns about the effectiveness of mask-wearing. As the pandemic steadied, we educated viewers on how to safely return to work.

Our videos received over 5,000 views based on YouTube and WeChat analytics. Our core group of WeChat followers quickly grew to more than 500 members. Partnerships with community-based organizations helped us broadcast our content to families across the country.

In July 2020, we shut down the WeChat group due to volatility surrounding the Black Lives Matter movement and our inability to monitor chat discussion. However, to this day, we are communicating with our constituents over other WeChat groups and directly with individuals.

Personal impact

COVID-19 has posed a distinctive challenge for medical students serving in free clinics. The suspension of clinical activities pushed us to reevaluate our assets as future doctors and reimagine our engagement with our patients. Our approach combined multiple approaches and involved all levels of people: filming videos, communicating with patients using atypical platforms, and mobilizing undergraduate interpreters, providers, and community and national organizations to help us reach our target. Our path was not smooth. We ran into many challenges, including making the difficult decision to disband our WeChat group when the political climate became tumultuous and our forum posed a threat to public safety. Throughout this process, I learned a lot about how to lead, adapt and persevere in the face of challenges.

Growing up beside Chicago's Chinatown since age ten, I observed firsthand how language barriers impact access to care: patients with limited English skills waited long hours at the Chinatown clinic for the chance to speak directly with a provider that shared their language. My grandmother is such a person who only visited Chinatown providers. Unable to understand English television or radio, her primary source for any kind of information is WeChat. When she learned about our project, she enthusiastically watched our videos and shared them with her friends.

Throughout this project, I leveraged my familiarity with my home neighborhood to inform what strategies would be most effective. I learned the important lesson that health care needs to be local: providers need to understand their patients' thoughts and behaviors, build trust, and tailor their care to local needs. Ensuring concordant language is the first step in this process. Without adequate communication, fear can arise from ignorance, and population health efforts that require full public participation will be undermined. As I grow as a future physician, I aim to place this commitment to improving health equity through effective communication at the center of my career.

COVID-19 Infographic Cards for Street Homeless

Project lead
Aditi Gore, Rutgers Robert Wood Johnson Medical School

Teammate
Sonia Bhala

Faculty mentor
Paul Weber, MD, Associate Dean of Continuing Medical Education, Rutgers Robert Wood Johnson Medical School

Abstract

In April 2020, amidst the unprecedented pandemic and rapid influx of contradictory information, vulnerable populations across the nation were severely affected. Among them, the homeless individuals of New Brunswick, NJ were particularly at risk due to the high local incidence rate of COVID-19 cases. While the scientific community continuously updated its guidelines, those without easy access to technological devices were left in the dark. The low health literacy of the homeless, compounded with their limited access to clean, isolated shelters and running water, put them in a precarious position. This population desperately needed a source of clear, consistent, and simple information about preventive measures and resources, customized to their needs, and delivered straight to their hands. Thus, we designed user-friendly, bilingual, pocket cards with specialized visual aids at a 4th-grade reading level that outlined steps for self-hygiene, social distancing, recognizing COVID-19 symptoms, and contacting local medical/mental health resources.

Project addressed/problem discovered

The street homeless are particularly vulnerable in the face of a public health crisis. They generally lack stable access to health care and usually do not have their own primary care provider, insurance or transportation to see a physician. Furthermore, they have limited access to TV, computers, media and phones. Due to this multitude of factors, they are a challenging population to reach in the distribution of health information. When we have gaps in our health system infrastructure that extend to basic health needs and information, the consequences are typically first seen among the homeless population.

COVID-19 has amplified the health communications challenges we see in the homeless. There is increasing concern about COVID-19 in the street homeless because until access to social distancing and health information is met for everyone, stopping community spread of this virus will not be possible.

Due to the homeless population's low level of health literacy, there is a need for visual infographics that are catered specifically to them. Most health information typically provided to the general population, such as guidelines for handwashing and staying at home, are not applicable to the homeless due to the lack of running water and walls around their sleeping quarters. Based on our discussion with New Brunswick community partners, the street homeless care about their health and would like to be active in preventing COVID-19. Yet, experts are unable to easily reach them with recommendations for actionable, preventive steps. As medical students, we aimed to bridge this divide.

Approach

During the initial months of uncertainty in response to COVID-19, it was clear that our health system was overwhelmed. While New Jersey Governor, Phil Murphy, took a cautious and informed approach in statewide decisions, several citizens continued to struggle with managing their health, finances and personal lives. According to the U.S. Census Bureau's 2019 report, 50.1% of New Brunswick residents identified as Hispanic or Latino, and 14.6% identified as African American or Black alone. Additionally, 20.7% of residents, under age 65 years, did not have health insurance, and 34.2% of residents were determined to be living below the poverty level. In such a

diverse, urban, yet often under-resourced community, the street homeless were especially disadvantaged.

For this population, navigating our intricate health care system and public health guidelines was already challenging, even prior to the global pandemic. The various health systems science domains were not being addressed in their overall access to and quality of health care. After quarantine began, these residents had even more restricted access to virtually distributed and rapidly evolving health information. To address their varying socioeconomic determinants of health, we began thinking innovatively and sought guidance from our faculty and community partners on how to meet these residents at their level. Based on our medical education thus far, we understood that the U.S. health system demands consistent improvement, and we saw this public health crisis as an opportunity to be proponents for a small change through advocacy and teamwork.

As students, we were unable to deliver acute health care measures ourselves. However, with guidance from our faculty, we determined that we could still provide valuable health care resources to this vulnerable population. We could share crucial information in a simple, easily accessible, visual, and portable format. Thus began our collaborative effort to bridge the communication gap between the health care community and the local street homeless.

Outcomes

During this project, our student pair collaborated with Elijah's Promise, Eric B. Chandler Health Center, RWJMS Promise Clinic, United Methodist Church, Archangel Raphael's Mission (ARM), Middlesex Coming Home, and other community organizations in the greater New Brunswick area. In consultation with local academic health center physicians and community leaders, we carefully curated the bilingual pocket cards to adequately present simple, appealing, and concise information. As such, they were widely received among the homeless members of the community who sought refuge from the pandemic. While the cards were distributed in print, our team verified that all information was in accordance with the national Centers for Disease Control and Prevention and local New Jersey guidelines. Additionally, we provided phone numbers for continuously monitored mental health, shelter list, and COVID-19 testing hotlines. We also provided details on how residents could contact a local doctor and/or how they could access a working phone to seek help.

As residents arrived at designated soup kitchens, Eric B. Chandler Health Clinic, or mobile hygiene stations run by ARM in New Brunswick, they were greeted by socially distant volunteers who provided hot meals, our content cards, and other supplies. To date, our community partners have distributed English and Spanish cards to 100+ underserved residents. Those who were open to discussing health outcomes and healthy decision-making eagerly received the information. In fact, our partners at ARM relayed to us that the cards sparked conversation not only about COVID-19 precautions, but also questions about safe habits regarding drugs, rehabilitation and naloxone use. Therefore, the residents were able to receive valuable information regarding multiple aspects of their health and well-being amidst this crisis. As per feedback from ARM, the cards are still being distributed and will be evaluated for revision, if necessary, at a later date. Overall, our community partners and our faculty advisers at Robert Wood Johnson Medical School were immensely valuable in bringing our efforts to fruition. Together, we were successful in informing a low health literacy population to make safe health decisions and access vital resources during a critical public health emergency.

Personal impact

Through our process, we have learned to identify the salient features of the quintuple aim of health systems science and carry it out of the classroom to become advocates within our community.

During this project, we learned about and acquired several skills and intrinsic traits that we must have as valuable members of the health care workforce (whether volunteers, medical students or practicing physicians). We learned firsthand about the sense of duty, urgency and preparedness level needed to respond to emergencies and crises with our current skills, especially at such an early stage in our training. Although we had limited clinical knowledge, we possessed a high internal locus of control

and the confidence to use our privileged education to aid our community in any way possible. Since this is the first of many times that we will be called upon to act in public health emergencies, we feel this knowledge has transformed our development and given us vital experience that will translate to our careers as future physicians.

Through this project, we have expanded our capacity for design thinking as we learned how to innovate with creative ideation through the RWJMS Distinction in Medical Innovation and Entrepreneurship (DiMIE) program. Yet, above all, we have utilized this opportunity to become attuned to the ever-present and growing needs of the vulnerable members of our society. As pre-clerkship medical students, we have learned how to address this population's current challenges and think creatively to extrapolate actionable solutions to their future health care problems.

DC COVID Connect

Project lead
Harleen Marwah, George Washington University School of Medicine and Health Sciences

Teammate
Savita Potarazu

Faculty mentor
Hana Akselrod, MD, MPH, Assistant Professor of Medicine, George Washington University School of Medicine and Health Sciences

Abstract

DC COVID Connect is a comprehensive and dynamic online tool created and managed by 70 current medical students that empowers the community in the D.C. Metropolitan Area with accurate and reliable information to navigate the evolving COVID-19 pandemic.

In the midst of this global pandemic, it is critical that accurate information is communicated clearly. DC COVID Connect delivers information to D.C.- area families and communities that is clinician-reviewed, digestible and actionable. The guide not only addresses people's pressing concerns about the ongoing pandemic, but also helps people navigate their pre-existing concerns about social support, financial resources and access to care.

Our unique insight from serving in a clinical role with this population informs how we are able to meet their information needs. DC COVID Connect supports the broader health system by connecting patients with important and accurate information regarding the latest scientific evidence and community resources.

Project addressed/problem discovered

When medical students were taken off clinical rotations in March 2020, DC COVID Connect founder, Harleen Marwah, searched for a meaningful way to support the community. Inspired by similar efforts in New York City and with peers eager to help, she launched DC COVID Connect on March 30, 2020.

DC COVID Connect is informed by health systems science, particularly the social determinants of health. As the pandemic shines a light on existing health disparities in the D.C.-area, this resource addresses concerns with regards to COVID-19 and recognizes pre-existing concerns including how housing and documentation status influence access to health care. Content is available in twelve languages. There are specific sections for those who are undocumented, affected by incarceration, identify as LGBTQ, and who are experiencing disability, homelessness and/or domestic violence.

During the pandemic, there has been an abundance of misinformation. We support our community with this by determining the reliability of sources. Our student section authors diligently cite their sources and update their sections to maintain relevance. Faculty advisers, including infectious disease specialists and pediatricians, are available to review developing content and address questions.

At a time when learners were removed from a traditional clinical environment, DC COVID Connect has further allowed medical students to draw important connections between the clinical setting and social determinants of health. Student authors are challenged to critically review the latest scientific evidence and community resources and to communicate in an accessible way for all the patients we serve.

Approach

DC COVID Connect Guide: Social determinants of health

DC COVID Connect is a central platform for people to discover resources previously unknown to them. The easily navigable website delivers information through

lay language, clear indexing and intuitive organization. Further, the website has full translations available in the twelve most spoken languages in the D.C.-area. The digital format allows the tool to keep pace with the breath of information covered and its growing user base.

The website offers a variety of information, such as: where to get testing, resources for addressing food insecurity, and how to apply for small business loans, among others.

Distribution: Health care structure and processes

DC COVID Connect has been recognized as a trusted resource by the community and has been utilized by D.C. Medicaid, Children's National Medical Center, and the Black Coalition Against COVID, among others. The guide is also a key part of the workflow for social workers across the city.

Our lead Spanish translators hosted a Facebook live conversation with "El Tiempo Latino," the largest Spanish newspaper in Washington, D.C. that had 1,000 views in the first day. In collaboration with emergency medicine physicians at Children's National Hospital, D.C. COVID Connect is shared with families who present with COVID-19 concerns.

We frequently solicit feedback from users to continue to expand and tailor the resource to best support the community.

The Learning Environment: Health system improvement domain

DC COVID Connect has offered an immense learning opportunity to the over 70 medical student contributors from the second and fourth year medical classes. Faculty and fourth year students have been able to mentor second year medical students on how to read scientific papers, communicate complex information, and bring innovative ideas to fruition.

Students have helped expand the guide by responding to community feedback, watching the evolving environment, and offering innovative solutions, with developing sections including: how to vote safely, educational resources for online learning, and more.

At a time when the medical school environment has shifted to be largely virtual, especially for the pre-clinical learners, this team offers opportunity for camaraderie.

Outcomes

Community: Since July, new users have grown from 1,594 to 2,390. During times of rapidly evolving information, DC COVID Connect has seen up to an additional 400 users in a given week. Over 50% of our users are between 18 and 34 years old. Adults in these groups are known to obtain the bulk of their information online and are particularly vulnerable to misinformation; through DC COVID Connect, these users have access to vetted information. DC COVID Connect is translated into the twelve most common languages in the D.C.-area.

Innovation: A mobile application is being developed in partnership with Children's National Hospital. The app will highlight essential information for families and children to navigate the latest information regarding COVID-19. DC COVID Connect is developing new content areas, including virtual learning resources, adolescent health promotion and information for safe voting during the election.

Media: DC COVID Connect recently launched Instagram and Twitter accounts. Information has been shared by social media users including: GWSMHS, GWAlumni, and AAMC. DC COVID Connect has been featured by media outlets including: El Tiempo Latino, The GW Hatchet, GW Today, and GWSMHS.

Community Feedback: "We have been sharing this guide with community activists, the director of Mutual Aid in Ward 8, and school-based social workers who do home visits…this is all very exciting and super helpful right now " — community pediatrician

"Very thorough and thoughtful community resource guide and FAQ for patients and families in D.C." — infectious disease specialist

"What a great effort, not only the creation but also the translation of this to Spanish for the Latino community of the DMV area. To be culturally and linguistically appropriate is a key principle in all or health equity efforts." — physician at La Clinica Del Pueblo

"You and your fellow students have done a terrific job of compiling a lot of very valuable information. I will share with colleagues here as a helpful resource. " — senior deputy director, D.C. Department of Health

"Your efforts affirm that the way forward is a communal one — thanks for helping our community stay connected." — community pediatrician

Personal impact

When the COVID-19 pandemic emerged and our clinical training was briefly interrupted, my classmates and I felt uncomfortable. We had just finished our third year of medical school and even though we recognized our limitations after only one year of clinical training, we felt compelled to help.

Through our time as medical students in clinical environments, we had learned more about the questions, concerns, and barriers that influenced healthy choices. With these in mind, DC COVID Connect launched as a comprehensive guide for navigating the Washington, D.C. area in the context of the pandemic. Our work with DC COVID Connect has affirmed the importance of understanding our patients holistically and assessing community needs.

Further, we have learned more about the many barriers individuals have to navigate in order to access health information to improve the quality of their lives. We have learned first-hand how equipping communities with information can have a significant impact. From appropriate utilization of resources to effective dissemination of key information, DC COVID Connect has supported our community through an unprecedented time. As future physicians, we will carry these lessons forward, remembering how to respond in uncertain times, the importance of clear communication, and the unique impacts we can make across society.

Through leading a team of our classmates, we have been inspired by the ideas, diverse expertise, and perspectives represented. We have learned how to support and facilitate growth of a dynamic organization and cultivate meaningful experiences, even virtually.

Filling the Gaps During COVID-19: Health Systems Science at Work Through Proactive Outreach Calls

Project lead
Rebecca Goldstein, Emory University School of Medicine

Teammates
Alyssa Greenhouse (Emory), Ariel Jordan (Morehouse School of Medicine), Georges Bouobda Tsemo (Morehouse), Carson Ward (Emory) and Anjali Om (Emory)

Faculty mentor
Maura George, MD, Emory University School of Medicine

Abstract

In the wake of the COVID-19 pandemic, many patients are left without access to the regular health care they need. Health systems and patients continue to feel the effects of appointment cancellations, procedure delays and limited telemedicine availability. This student-led initiative between Grady Health System, Emory and Morehouse Schools of Medicine in Atlanta, Georgia utilizes health professional students to support those at highest risk of poor outcomes due to COVID-19. Through proactive outreach calls to patients identified as high risk using an innovative prescriptive analytics program, students have reached over 1,100 high-risk patients. Volunteer student callers screen for COVID-19 and counsel on prevention; elucidate medical concerns; identify medication refill needs and offer social assistance. Through this initiative, students learn about and meaningfully engage with nearly all health systems science principles to provide an immense benefit to patients and the health system overall.

Project addressed/problem discovered

During the COVID-19 pandemic, many patients lack customary access to the critical health care and needed social resources. Although necessary, measures such as physical distancing, stay-at-home orders and cancellations of in-person appointments have imposed unprecedented barriers to accessing care. These barriers are especially pressing for thousands of patients at Grady, Atlanta's safety-net hospital, who rely on regular health maintenance for their multiple complex medical conditions. While patients were forced to navigate a new and challenging health care landscape, health professional students were simultaneously removed from clinical rotations. Through a population and public health lens, we realized we could simultaneously aid high-risk patients in navigating the abrupt changes to the health care system and proactively address their health and social concerns at home. We took a value-based care approach and trained over 200 medical and physician assistant students from Emory and Morehouse to perform comprehensive telephonic outreach to thousands at highest risk of poor outcomes if they were to contract COVID-19. We aimed to screen for COVID-19 and educate patients on preventive strategies to protect themselves and their communities; support patients in navigating the health care system during the pandemic; and identify patients' social needs and resources to address them. This low-cost, high-yield program organically encompassed health systems science; through our operations, we realized that 10 of the 12 health systems science domains were inherently woven into our program. We launched curricula at both schools, recognizing the value in designing health systems science curricula around high yield experiential learning.

Approach

Students and faculty recognized the health care system disruption caused by COVID-19 and partnered with Grady Health System to develop a population health initiative to address the care gaps facing patients (leadership and change agency). The initiative utilized Jvion, a prescriptive analytics company using machine learning, to prioritize the 15,000 patients within the Grady system at highest risk of complications from COVID-19 (clinical informatics and health information technology). With this list, student

leaders recruited, organized and trained over 200 health professional students to provide proactive medical and social outreach (health system improvement and value-based care). Volunteers included medical and physician assistant students from Emory and Morehouse Schools of Medicine (teamwork and interprofessional education).

Patient outreach via 15-minute phone calls utilized a standardized telephone script in REDCap, allowing for data collection and needs assessment. The REDCap script was developed through collaboration with medical students, the hospital's Department of Population Health, and clinical advisers (teamwork and interprofessional education). Skip and branching logic allows flexibility for the varied nature of each patient encounter. Prior to each call, students review the patient's chart in the electronic health record (EHR), including last hospital note, problem list, and medication list (clinical informatics and health information technology).

The script directs students through a screen for COVID-19 symptoms, health check-in for chronic medical conditions, assessment of medication refills, and evaluation of social needs for each patient (population and public health). The survey prompts specific next steps for patients needing medical, mental health or social assistance including a nurse advice line, crisis hotline, medication delivery, food pantries and other community assistance resources. Students provide phone numbers or initiate three-way calls with the patient. Volunteers are provided with a resource guide and novel pharmacy refill system for urgent medication delivery (health care structures and processes). Collaboration with social workers and pharmacists occurred throughout training and patient encounters (teamwork and interprofessional education). Following an outreach call, students document a patient outreach encounter in the EHR to be routed to the primary care provider or nurse pool if further action is needed (clinical informatics and health information technology).

Outcomes

Outcome 1: Benefits to patients. In the first five months, students called over 2,700 patients and had full conversations with over 1,100. Students elucidated patients' needs and connected them with necessary resources. For the one-third of patients who were running low on medications, we facilitated refills sent to their homes free of cost or provided them with instructions for how to obtain refills during the pandemic. Students also connected over half of the patients called with at least one health or social service to fill an identified need. The most common health referrals were for medication refills, telehealth appointments, Grady's nurse advice line, and mental health resources, including 20 three-way calls for acute mental health crisis care. The most common social connections were to food banks and United Way. Students helped patients apply for food stamps during calls and identified zip-code specific resources together through Aunt Bertha, a resource database. These proactive connections aimed to provide patients with the resources they need to stay healthy and safe at home.

Outcome 2: Benefits to students. Students gained applied experience understanding health systems science. Students learned from patients, recognized how social determinants affect health, and problem-solved complex issues at the root of population health. As we recognized the value that students gained, we formally integrated this initiative into curricula at both Schools of Medicine. We developed a for-credit elective course offered jointly at both schools, through which students formally studied health systems science and applied them through calls. Emory later incorporated the calls as a requirement in third-year primary care clerkships.

Outcome 3: Benefits to health system. Incorporating practical health systems science training in medical education is paramount in ensuring the next generation of physicians think beyond physical health alone. This program fosters a systems thinking mindset in future doctors. This program secondarily aimed to prevent avoidable emergency department visits and hospital readmissions during COVID-19, when hospitals were already overburdened. We hope our proactive approach helps to alleviate physician workload by identifying and addressing patient needs early, before they become costly to patients and health systems alike.

Personal impact

This initiative has taught us many lessons about becoming physicians engaged in systems change. We created an opportunity to care for patients during the pandemic. This was extremely rewarding, as students were pulled from clinical rotations and felt sidelined during one of the most vulnerable times for our health system and medical community. We realized that as students, we still can have a significant, even critical, role in patient care during times of crisis. This initiative was created by students, for students, and later integrated into the curriculum at both medical schools. We saw that we have the power to drive our own educations, and match curricula to our learning goals. Such empowerment and skills prepare us to be physician-leaders. This initiative also demonstrated how necessary interdisciplinary understanding and partnerships are for effective patient care. Learning from our social work and pharmacy collaborators, for example, has prepared us to better serve our patients, especially those with complex needs. Similarly, the breadth of need we identified showed us that we should ask patients routinely about their social needs to provide them with the comprehensive care that they need. We recognize how to incorporate the social determinants into our clinical care, when and how to connect to a social resource ourselves, and when to refer to our social workers. We are capable of addressing all aspects of a patient's health and have the potential to impact patient-physician relationships and patient outcomes beyond the clinical setting.

Homelessness and the COVID-19 Pandemic: A Telemedicine Monitoring Program

Project lead
Kyle Sellers, Florida International University Herbert Wertheim College of Medicine

Teammate
Alex Suarez

Faculty mentor
Gregory Schneider, Associate Professor in the Division of Family and Community Medicine in the Department of Humanities, Health, and Society, Florida International University Herbert Wertheim College of Medicine

Abstract

During the early days of the COVID-19 pandemic, students at the Florida International University Herbert Wertheim College of Medicine wanted to help one of our most vulnerable populations — the homeless. Through the combined efforts of students, clinical faculty and the Miami-Dade County Homeless Trust, a telemedicine program was developed to address the particular needs of and monitor the health status of homeless individuals with known or suspected COVID-19 exposure. Student teams established daily contact with homeless individuals to record symptoms, refer to appropriate outside services and direct care. Through this program, students learned how telemedicine can play a role in our public health systems, and they also discovered the specific challenges facing the homeless population during the pandemic. Following our efforts, a clinical fourth year elective was developed to continue helping our local homeless population.

Project addressed/problem discovered

On any given night, 1347 people are living unsheltered on the streets of Miami-Dade County (Camillus House). During the COVID-19 pandemic, public health measures such as social distancing and sheltering-in-place have become paramount to the well-being of our population. How can somebody adhere to these measures, however, if they do not have shelter? The Miami-Dade County Homeless Trust has been attempting to ameliorate this issue since the pandemic began. They have undertaken the responsibility of testing homeless individuals, as well as providing shelter for those with known or suspected COVID-19 exposure in hotels across the county. As medical students, we wanted to help these efforts in any way possible. We identified the need to monitor these homeless individuals as they experienced quarantine or isolation. In several of the hotels that had been repurposed as quarantine and isolation shelters, there was an absence of clinical caretakers to monitor the individuals for symptoms or other arising needs. A system was needed to remotely monitor the individuals' health. Because the homeless are a particularly vulnerable population, experiencing disproportionate rates of chronic diseases and mental health issues, we also needed students to refer these individuals to the appropriate parties for such services as medications, hygiene products, and behavioral health services.

Approach

Our project designed a remote-monitoring protocol through the combined efforts of our clinical mentors and the legal team of the Miami-Dade County Homeless Trust. This ensured our monitoring protocol incorporated clinical knowledge with the legal requirements for privacy and patient safety.

The protocol consisted of a survey of the individuals' symptoms, as well as potential risk factors such as age and comorbid conditions. Given the individuals' responses, a risk score could be calculated that would aid in determining appropriate next steps, which included continued monitoring, referral to primary care or emergency health services.

Once the protocol was developed, teams of two medical students, one upperclassman and one underclassman, were assembled to remotely monitor a total of 27 homeless individuals. Students participated in two training sessions to learn about the telehealth approach as well as how to document the encounters on the electronic health record. The teams called their assigned clients daily to calculate their risk scores. Following these encounters, students would present the cases to clinical mentors and consult them for appropriate next steps, if necessary. Student teams followed their clients through discharge and referred them to appropriate resources for needs such as medications and behavioral health services.

Overall, we approached this project with the goal of assisting a particularly vulnerable population with navigating the largest public health crisis of our time. Many of our clients lacked some of the basic resources that we take for granted every day. Our monitoring program assisted these individuals in obtaining some of these resources, as well as ensured their health and safety during these tumultuous times. Moreover, this project allowed for the continued quarantine and isolation of this population, preventing further community spread among the homeless population and decreasing the need for these individuals to enter homeless shelters, hospitals or clinics, where they could expose others or be further exposed to communicable diseases.

Outcomes

This project allowed students to gain clinical exposure and be direct participants in the care of a vulnerable population. It gave students first-hand experience in identifying the social determinants of health and highlighted the intersectionality of health and socioeconomic status. The experience has motivated several student volunteers to begin developing two separate scholarly pursuits: one examining the role of telemedicine within the COVID-19 pandemic and a case series examining the unique challenges faced by the homeless population during the pandemic. The ultimate goal of these pursuits is to quantify the specific outcomes of the project, such as the ratio of successful calls to incomplete ones, the number of referrals that were needed to meet the various health care needs of the population, and the specific priorities of the patients. Furthermore, the projects hope to outline the homeless experience during the pandemic and the special considerations that must be applied when engaging in telemedicine with this particular population.

In addition to these scholarly pursuits, the initiative spurred the creation of an elective for fourth year medical students at our host institution. In the elective, students partner with a clinical faculty member to care for several homeless individuals on a daily basis. The course is structured similarly to our project but includes assessments to evaluate the students as well as a final reflection paper to help the students examine their experience through a critical lens and consider the nuanced health care that must be provided to the homeless. The program itself, as well as the fourth-year elective that resulted from it, were instrumental in helping students continue their medical education in the midst of in-person classroom shutdowns due to COVID-19. They offered students a means of alternative learning and helped them refine specific clinical skills such as rapport-building, developing plans and presenting to clinical faculty. The project helped fill in the gaps in medical education that arose due to the uncertainty of COVID-19, like the lack of patient exposure, while adhering to social distancing guidelines and prioritizing the health of both students and patients.

Personal impact

Leading this program has given me many skills that will serve me well as I continue my development as a future physician. Because I needed to reach out to both clinical faculty and the Miami-Dade County Homeless Trust, I had to further develop my communication skills. I also believe that my organizational skills have improved as a result of this project, and I now feel more confident leading a group of people toward achieving a common goal. These will undoubtedly be necessary skills for my future career.

On a more personal note, this work affirmed my passion for public health and the structures through which we can aid our most vulnerable populations, and it further cemented my desire to pursue a career within the field of public health. This experience also opened my eyes to the ways in which technology can play a role in my future career.

As I am sure many physicians have learned during this COVID-19 era, telemedicine has the potential to reshape our health care delivery system and greatly impact patient care. Working on this project has motivated me to continue exploring the ways in which telemedicine can increase health care access to vulnerable communities. Telemedicine has become a passion of mine — one that will shape the way I approach medicine and the public health systems I hope to one day support, lead and advance.

Implementation of the H&P360 Within a Novel COVID-19 Telehealth Service

Project lead
Ramya Parameswaran, University of Chicago Pritzker School of Medicine

Teammates
Irsk Anderson, MD, Valerie Press MD, MPH, Jonathan Lio, MD, Nicole Gier, LCSW, Lisa Mordell and Vineet Arora, MD, MAPP

Faculty mentor
Joyce Tang, MD, University of Chicago Pritzker School of Medicine

Abstract

Social determinants of health, including poverty, social support and safe housing, have a strong impact on COVID-19 outcomes. Patient self-care and isolation practices can further impact spread of the disease among families and communities. The traditional history and physical (H&P) often fails to elicit information about important determinants of health or adequately assess patient understanding and self-care practices. We integrated the H&P360 framework, developed by Dr. Brent Williams at the University of Michigan, into an ongoing COVID-19 telehealth pilot project. Eight third-year medical students obtained telemedicine histories from patients with COVID-19. The framework sought to engage patients in co-managing their health and routinize the assessment of psychosocial factors impacting their ability to do so. Students found the H&P360 framework deepened understanding of patient goals and needs while improving patient care. Most domains in the H&P360 template were addressed during calls. Students assessed patient understanding of red flag symptoms and isolation practices and counseled when appropriate. Students elicited needs and provided resources for primary care, COVID-related triage phone lines, employment concerns and food security when indicated.

Project addressed/problem discovered

Social determinants of health, such as socioeconomic status, racism, food and housing security, and lack of community resources can account for up to 55% of health outcomes. These psychosocial factors have been shown to be especially impactful in the context of the COVID-19 pandemic, leading to differences in transmission rates, ICU admission rates and mortality. The traditional history and physical (H&P) does not adequately assess social determinants of health and patient perceptions or understanding of health. As a result, these important domains are often not addressed in the context of routine clinical care, and students are not trained to systematically inquire about these topics. To address these gaps in care and educational training, we implemented the H&P360, a six-domain biopsychosocial framework originally created by Dr. Brent Williams at the University of Michigan and further refined by the American Medical Association, in a telehealth setting for patients with COVID-19. The six domains include biomedical conditions, psychiatric conditions, behavioral health, social support systems, resources and living environment, and daily functioning. While the H&P360 framework is promising, it has not previously been applied to telehealth settings, and there is minimal data on patient outcomes and best practices for implementation. Thus, the main objectives of our project were to understand 1) student self-perceived feasibility, efficacy and educational value of the H&P360 framework, 2) describe the H&P360 domains assessed and types of information obtained within these domains, and 3) explore the impact of information gathered on care plans.

Approach

A multidisciplinary team with representation across general internal medicine, hospital medicine, infectious diseases and social work disciplines, developed a COVID-H&P360 template that was adapted from Dr. Brent Williams' six domain framework, implemented the template within our EPIC electronic health record system (clinical informatics and health technology), and

trained student volunteers to use the framework to guide patient conversations. The template consisted of six main sections that address biomedical conditions, patient perception of health, an expanded social history, needs identified, resources provided and patient education. The biomedical section included an assessment of ongoing symptoms and risk factors for severe COVID-19 disease. Within patient perception of health, three categories were specified, namely patient understanding of health, patient self-assessed control and patient-identified barriers, with sample verbiage that students could use with patients. Within social history, categories related to social determinants of health such as behavioral health, relationships including support system, and resources like transport and food security were delineated. Verbiage related to COVID-specific resources and education on red flag symptoms was also provided in the template. The participants were eight M3 volunteers already conducting longitudinal telehealth sessions with patients diagnosed with COVID-19 during April and May 2020. The COVID-H&P360 template was utilized to guide conversations and documentation during the first telehealth session with each patient conducted within 1-2 days after the patient tested positive. Follow-up phone conversations with each patient would occur at 1-2 day intervals until the patient was steadily improving or asymptomatic for two phone calls. At the completion of the study, students completed a survey consisting of thirteen 5-point Likert scale questions (1=strongly agree; 5=strongly disagree) and three short answer questions addressing feasibility, clinical utility and educational value. Surveys were developed via a collaboration between several internal medicine physicians at the University of Chicago and three other AMA H&P360 Implementation Grant grantee medical schools. Surveys were analyzed by calculating percentages of participants who strongly agreed or somewhat agreed with each question. Qualitative analysis of the 37 notes from 37 longitudinal patient encounters was performed. A multidisciplinary team participated in development and refinement of the coding guide, coding of the notes and identification of emerging themes. Preliminary data was presented at the Chronic Disease Prevention and Management meeting in September 2020. IRB exemption was granted for the participant survey, and IRB approval was granted for the qualitative analysis of the notes. In summary, this project focused on several domains of health systems science including social determinants of health through routinized assessment of these factors in the H&P, clinical informatics and health technology in the development of a new H&P360 note template in EPIC, and teamwork via multidisciplinary collaboration between physicians in a multitude of fields and social work.

Outcomes

Outcomes of the project were assessed through student surveys and qualitative analysis of student notes. The student survey data assessed feasibility, efficacy and educational value of the H&P360 framework. Regarding feasibility, all students strongly or somewhat agreed that the H&P360 template was easy to use and few thought that it took too long to complete. In terms of efficacy, all students strongly or somewhat agreed that the H&P360 framework added valuable information to the histories and improved patient care while virtually all found the H&P360 framework helped them better understand patient goals, facilitated deeper relationships with their patients and informed their care plans. Of note, only some students felt that it facilitated interprofessional care planning. In terms of the educational value, all felt that using the H&P360 framework would make them better clinicians and would incorporate the framework in future patient interactions. Open-ended feedback reinforced survey data highlighting the efficacy of the framework in terms of patient care, but also raised concerns about time constraints in other clinical settings. Some responses indicated that the personal nature of the H&P360 domains felt intrusive in the setting of telehealth especially with less talkative patients.

Qualitative analysis is in progress. Goals of this analysis are to understand which domains were assessed by students and how the H&P360 affected care planning. Preliminary data suggests that virtually all students assessed patient understanding of health and assessed resource needs. Many students assessed patients' social support systems and barriers to improvement, such as COVID-19 symptoms and progression and unemployment. Some students asked patients about self-assessed control of their condition or behavioral aspects of the social history. For instance, one student reported that the patient had "…a good handle

on this due to good support from family, who live closeby and are bringing her groceries/calling her daily" in a note with regard to self-assessed control. In terms of impact of the framework on care planning, virtually all students provided patient education to patients (primarily COVID-related red flag symptoms and self-isolation procedures). COVID-related resources such as tele-triage line phone numbers and health care referrals to primary care, were the resources most commonly provided. Some students provided resources for other identified needs related to employment/financial needs and food security. Study limitations include small sample size, no comparison group, and telehealth sessions that were conducted in a setting with little to no time constraints. We hope to address these limitations through future studies of this H&P360 framework.

Importantly, this project and the use of the H&P360 framework can have an incredible impact on not only patients but also medical student learners by enabling students to take on value-added roles such as facilitating advanced history taking incorporating assessment of social determinants of health and patient perspectives related to their health, promoting tailored patient education and counseling, and advocating and assisting patients with identified needs. In summary, this project suggests the H&P360 framework can be implemented in telehealth settings, facilitate improved patient care and care planning, and provide educational value to students.

Personal impact

As a participant in the study, this work provided me with an incredible framework for addressing psychosocial issues with my patients. Prior to having access to the H&P360 template, I noticed that many of these topics would naturally come up in conversations with patients; however, the template allowed me to ask about all of the domains in a systematic manner. It also facilitated these conversations well in the telehealth setting, which as a result of the COVID-19 pandemic has become a prevalent mode of physician-patient interaction; it allowed for me to delve into these personal topics that can be difficult to bring up in a first phone conversation with a new patient. Additionally, I have on a very practical level, learned about various resources I can offer to any patients I encounter in the future regarding food security, housing security, mental health phone lines, primary care services, as well as COVID-19 specific resources.

I also have appreciated this project as a formal acknowledgment to both patients and the medical community that these domains are important determinants of health. I found that several patients expressed feeling empowered to bring up these topics in conversations with other health care workers in their lives, like their primary care physician, and feeling thankful that it was seen and recognized as a part of their overall health. In the context of the COVID-19 pandemic, these determinants of health are particularly relevant to recovery and tied to outcomes. From conversations with patients as well as discussions with colleagues during the Chronic Disease Prevention and Management meeting, I have learned that empathy itself is action and that facilitating deeper connections and conversations with our patients alone can be healing. Furthermore, with the social and physical isolation that accompanies a COVID-19 diagnosis, these conversations with patients were particularly meaningful. Lastly, my perspectives on the vast ways in which a pandemic can affect people was broadened and the experience of using the H&P360 to take histories from my patients and analyze the notes written by my colleagues allowed me to continue to learn about this. These experiences have impacted my interactions not only with other patients, but also with anyone I encounter in my life.

Leveraging Student Volunteerism To Serve Health Systems and Communities Under Stress: The UNMC COVID Relief (CoRe) Initiative

Project lead
Rohan Khazanchi, University of Nebraska Medical Center and University of Minnesota School of Public Health, project implemented at the University of Nebraska Medical Center, Omaha, NE

Teammates
Taylor Kratochvil, MS, Hannah Tandon, RemyGrace Sass, Keely Reidelberger, MS and Lauren Hoody

Faculty mentor
Kelly Caverzagie, MD, Associate Dean for Educational Strategy, University of Nebraska Medical Center and Vice President for Medical Education, Nebraska Medicine

Abstract

The COVID-19 pandemic placed unprecedented stress on health care systems across the country. Removed from clinics and classrooms, students at the University of Nebraska Medical Center (UNMC) sought to support the evolving needs of front-line staff and vulnerable communities. This galvanized the creation of UNMC COVID Relief (CoRe; https://www.unmccore.org/), a multidisciplinary, grassroots, student-run initiative linking students and community members with service opportunities. Leveraging a systems thinking praxis, our organization coalesced key stakeholders to achieve three primary outcomes: 1) providing 1,100+ hours of child and pet care for health care workers, 2) acquiring and allocating 50,000+ units of personal protective equipment (PPE) donations to under-resourced areas across Nebraska and 3) producing and distributing ~100,000 cloth masks for community organizations and health centers. By building coalitions with national and local collaborators, these initiatives established connections between community partners, students and health care workers to improve health care safety, quality and literacy throughout the COVID-19 pandemic.

Project addressed/problem discovered

The rapid spread of COVID-19 significantly impacted day-to-day health care delivery. Furthermore, and perhaps more importantly, longstanding structural vulnerabilities beyond clinic and hospital walls compounded the pandemic's impact on marginalized communities. With a background in systems thinking, leadership and change agency fostered by UNMC's health systems sciences (HSS) curriculum, our UNMC CoRe leadership team reached out to health system and community partners to identify urgent challenges across each of the four levels of patient-centered health care delivery:

- At the community level, we identified significant and urgent needs for cloth masks and evidence-based, multi-language health information within high-risk communities in Omaha.
- At the microsystem level, clinicians faced increasing workplace demands as hospitals overflowed with COVID-19 patients. Concurrently, childcare/pet care centers were closing across the state to limit viral spread, leaving clinicians struggling to care for both their patients and their families.
- At the mesosystem level, UNMC's clinical partner (Nebraska Medicine) expressed concerns regarding the availability of masks for patients, visitors and hospital staff.
- At the macrosystem level, UNMC CoRe identified striking PPE shortages at federally qualified health centers (FQHCs) and regional health care systems throughout the state, in spite of growing COVID-19 "hotspots" and massive outbreaks at meatpacking plants.

Responses to each of these problems had been attempted but were inadequate to meet rapidly growing needs. In

conversations with our partners, it became increasingly clear that a mission-driven group needed to coalesce stakeholders, establish clear priorities across community, microsystem, mesosystem, and macrosystem levels, and execute rapidly scaled, grassroots interventions.

Approach

We addressed gaps at each of the aforementioned levels by mobilizing our 300+ medical and allied health professions student volunteers.

At the patient and community level, we addressed population, public and social determinants of health by providing cloth masks and evidence-based health information to Omaha communities disproportionately affected by COVID-19. Through collaborations with critical trusted partners including Omaha Public Schools (Nebraska's largest public school district), the Omaha Housing Authority (Nebraska's largest purveyor of public housing), elected representatives, and community organizers, we targeted structurally vulnerable populations including families receiving meal assistance, individuals with limited English proficiency, refugees and recent migrants, and Native American reservations. Adult and pediatric masks were distributed alongside multi-language pamphlets about COVID-19 safety.

At the microsystem level, talking with clinicians about how they independently source in-home child and pet care helped guide our system of pairing student volunteers with clinicians. We saw an opportunity to support the front-line care delivery team under the domain of health system improvement by meeting clinicians' extra-clinical needs, thereby helping them conserve limited time and emotional energy to manage high-volume patient care.

At the mesosystem level, we blended health care structure and process with clinical informatics and health technology by designing and managing a community mask sewing program in partnership with Nebraska Medicine. We navigated processes for fabric supply and sterilization, used technology to organize mask material distribution networks, and built nimble management structures to efficiently and sustainably grow the program's impact.

As PPE shortages became pressing at a macrosystem level, we developed close connections with national suppliers to directly source PPE for local and regional clinics in need, prioritizing under-resourced rural clinics and FQHCs. Partnerships with community organizations, medical societies including the Nebraska Medical Association (NMA) and Metro Omaha Medical Society (MOMS), and regional health systems including the Health Center Association of Nebraska (HCAN) FQHC network allowed us to efficiently identify needs, while the cross-applicability of our existing mask-distribution network empowered effective material support mobilization. In this, we employed existing health care structures and processes within UNMC CoRe and our institution to meet needs outside of our proximate community.

Outcomes

After demonstrating early success and capacity for expansion, our organization was formally integrated into UNMC's Incident Command System, which systematized our direct engagement with institutional pandemic response leaders. The novelty and breadth of our initiative led to two journal publications and inclusion within the AAMC's iCollaborative database of student service projects (Kratochvil et al. 2020, Med Educ; Tandon et al. in press, Acad Med; Kratochvil et al. 2020, AAMC iCollaborative). Specific outcomes include the following:

- In total, 56 student volunteers were matched to 21 health care workers to provide 1135 hours of child and pet care.
- Our two community mask sewing programs involved 500+ community sewing volunteers and 100+ students distributing materials and collecting masks. Over 50,000 cloth masks were produced by the Nebraska Medicine program, and as of August 2020, these masks were still being given to patients, visitors and non-clinical essential staff at all points of entry. Over 45000 adult and child masks were sewn by the second program and paired with multi-language, evidence-based COVID-19 guidance. About 28,000 were distributed to families receiving meal assistance through the Omaha Public Schools; 5,600 to the

Omaha South Packer Pantry; 5400 to State Senator Tony Vargas's district in South Omaha; 5,000 to the Omaha Housing Authority; and 700 to a nearby Native American reservation.

- The PPE donation and distribution program reached a broad spectrum of health care facilities and community partners across the region. We collected donations from local businesses and connected with national coalitions including GetUsPPE, GetMePPE Chicago, Project N95 and MedSupplyDrive. In collaboration with the NMA, MOMS and HCAN, we identified local needs and provided the following supplies directly to requesting organizations:
    - Various regional hospitals and clinics: 90 N95 masks, 400 KN95 masks, 36,300 face shields, 7,000 procedural masks, 7800 gloves, 350 miscellaneous protective apparel items, 20 sanitizing items
    - FQHCs: 2000 N95 masks, 500 KN95 masks, 1300 face shields, 3600 gloves
    - Long-term Care Facilities: 3,990 KN95 masks, 1,000 gloves, 8 liters of sanitizer, 260 items of protective apparel
    - Omaha Public Schools: 500 face shields, 8,500 gloves
    - Methodist College of Nursing: 1000 face shields
    - Siena Francis House (shelter and service provider for people experiencing homelessness): 100 cloth masks
    - Moriah Heritage Center (representing 55 churches in North Omaha): 5,500 gloves

Personal impact

The creation and development of UNMC CoRe offered our leadership team and volunteers an opportunity for experiential learning in its truest form. In the wake of an unprecedented pandemic, we were humbled and proud to meaningfully serve our community in ways congruent with our knowledge and experience.

Service on the leadership team developed our ability to recruit, manage and mobilize team members to rapidly address shifting goals. Organizing hundreds of volunteers based on interests and availability, designing processes to operationalize and sustain complex distribution systems, promoting talented team members, and leveraging technology to maximize impact are skills that will serve us well as we grow into physician-leaders. Perhaps more importantly, it was inspiring to recognize that our peer physicians-in-training shared a deep investment in supporting our health systems and communities amidst a time of crisis, frustration and fear.

Our initiative was heavily driven by friendships, partnerships and collaborations with similarly mission-driven individuals and organizations. Joining forces with the NMA, MOMS and HCAN demonstrated the importance of clearly identifying and understanding "boots-on-the-ground" needs before deploying an intervention. In engaging with the Omaha Public Schools district, Omaha Housing Authority, Nebraska Masks for Medicine, Omaha South Packer Pantry and State Senator Tony Vargas (District 7), we leveraged new and longstanding relationships to address the needs of our broader Omaha community. In short, our work leading UNMC CoRe has humbled us with critical reminders that our personal missions in medicine are inextricably linked to our neighbors and local communities, especially those in greatest need.

Lost Connection: Disparities in the Adoption of Musculoskeletal Telehealth by Race and Gender

Project lead
Anna Farrell, Ohio State University (OSU) College of Medicine, project implement at Ohio State University Wexner Medical Center, Columbus, OH

Teammates
Anna Farrell (OSU), Althea Anne D. Perez (OSU), Janice M. Bonsu, MPH (OSU), Lisa R. Coleman, MS (OSU), Irfan A. Khan ATC (Florida International University Herbert Wertheim College of Medicine), Ryan K. Harrison, MD (Wexner Medical Center), Carmen Quatman MD, PhD (Wexner Medical Center)

Faculty mentor
Dr. Carmen Quatman, Principal Investigator, Ohio State University College of Medicine

Abstract

Summary: Gender and race significantly predict video and telephone telehealth utilization. Gender's predictive capacity irrespective of patient status increases with age.

Objectives: We investigate the relationship between patient gender, age, race and musculoskeletal telehealth utilization.

Methods: This cross-sectional study evaluated telehealth engagement by orthopaedic surgery, sports medicine and podiatry patients at an academic level-1 trauma center from March 2020 to July 2020. Patients were grouped by gender, age sub-groups and race.

Results: Among 5541 patients, more white than Black patients were seen across age groups ($p<0.05$). The proportions were similar to the region's demographics, although white patient representation was slightly higher. Proportionally, significantly more telehealth patients were female (31+ years old) interacting over video or phone (18+, 31+ years old respectively) ($p<0.05$).

Conclusion: Female and white patient populations use telehealth significantly more than their male and other race counterparts. Further studies should investigate underlying factors for musculoskeletal telehealth utilization demographic trends.

Project addressed/problem discovered

Telehealth, the provision of health care through the utilization of technology, has provided access to care to people and places that were previously limited by distance. However, the adoption, acceptance and utilization of telehealth interventions by patient demographics has not been well studied. Although researchers have long observed disparities in health care access and utilization by race and ethnicity, these associations continue to be observed. Documenting disparities that may present in telehealth is critical to leveraging its promising advantages to expand care to traditionally underserved populations. Although previous research reports that women utilize medical services more than men, no literature to the best of our knowledge addresses how gender and race may each predict telehealth usage. This project is important in discovering the sociodemographic factors associated with telehealth utilization and furthering our understanding of the factors that may play a role in gender or race-based differences in musculoskeletal telehealth utilization. Literature covering telehealth usage in orthopaedics is sparse and does not focus on the differences in the use of telehealth across demographics.

Musculoskeletal telehealth is known to improve health care access, increase clinical efficiency and reduce health care costs without compromising patient satisfaction or clinical outcomes. When considering the physician shortage nationwide, especially in rural areas, as well as the clinical constraints due to the coronavirus pandemic, it becomes increasingly important to ensure that health care access remains reliably available. This project provides information that will allow providers to identify more effective telehealth avenues that improve accessibility and health care delivery and maximize health outcomes.

Approach

When hit with the coronavirus pandemic, health care technology became imperative for preserving access to health care services. This observational cross-sectional study sought to determine how gender and race influenced patient engagement with telehealth services employed at Ohio State across various departments. From the months of March to July 2020, data was collected regarding orthopaedic surgery, sports medicine and podiatry patients' use of phone and synchronous video telehealth services conducted at a level one trauma academic center. The escalation of telehealth represented through this collected data required a grassroots interprofessional team to track the effectiveness of virtual health care delivery and patient retention across a variety of medicinal specialties.

Between March and June 2020, 409 patients were treated at Ohio State via telehealth who otherwise would not have received care during the coronavirus crisis. 1395 patients completed a survey, 90% of whom stated that they would recommend a telehealth appointment at OSU and 87% stated they would likely choose telehealth care again. Conducting these surveys and gathering information on patient satisfaction with their services assisted improvement of virtual health care systems and the provision of high quality patient telehealth care.

This projects' line of inquiry into whether sociodemographics significantly influence telehealth is an approach fundamental to population health and health care delivery. The information collected indicated trends in telehealth usage, demonstrating that females, white individuals, and those 51-65 years of age were the most likely to use musculoskeletal telehealth services. In order to develop a better understanding of Ohio State's musculoskeletal population telehealth, a heat map was constructed from the orthopaedic and podiatry telehealth patient locations.

Our project investigated how social determinants of health predict population musculoskeletal health during a time when medical care providers became more reliant on emerging telehealth applications. Evaluating quality of care through the engagement and retention of new and established patient visits through video and telephone visits allowed for a deeper understanding by longitudinal overview including a variety of telehealth mediums. Finally, the collaboration across professional teams in different fields of musculoskeletal care emphasized effectiveness across the diverse clinical practice settings and quality improvement.

Outcomes

As in-person physician-patient interactions have become constrained by the COVID-19 pandemic, telehealth utilization has rapidly increased to help secure optimum musculoskeletal care management. Prior to March 2020, no telehealth had been used at Ohio State University for orthopaedics, podiatry, physical therapy or sports medicine. An analysis of telehealth patient demographics informs effective employment of musculoskeletal telehealth and maintenance of excellent patient-centered care.

This project provided information regarding the telehealth's capability to engage and maintain musculoskeletal patients. Collecting data on both new and established patient visits through synchronous video or telephone calls became an important benchmark for the utility of Ohio State University's telehealth system and ability to care for patients without compromising their satisfaction. Optimal clinical outcomes rely heavily on access to pre-operative and post-operative care. Therefore, the monitoring of the rapid implementation of musculoskeletal telehealth is important.

There have been no other publications that address race or gender's ability to predict musculoskeletal telehealth usage to the best of our knowledge. It has been argued that race, a social construct, is utilized in research as a proxy for systemic health injustices. Those injustices include systemic barriers to insurance coverage, income, education, neighborhood safety, access to fresh foods and access to health care. A more expansive understanding of the patterns of telehealth utilization will require efforts to quantify some of these systemic health injustices that are differentially distributed by race. This data provides critical information to identify and target patients who are underutilizing this service and may have unrealized the benefits.

Personal impact

This research has given me optimism about my ability to help improve health equity and accessibility as a physician in the face of health care disparities I became exposed to in college. As an Emory undergraduate, I learned while working with Georgia community public officials to host a rural clinic that some Georgians live hours away from any hospital or clinic. Researching how telehealth can provide opportunities for patients like those I met, who had not seen a doctor for over ten years, has fortified my belief in creative solutions to overcoming obstacles to health care provision. It has strengthened my desire to become involved in translational research that leads institutions to excel in telehealth care. My involvement with this work has introduced me to various factors that may influence partaking in medicine, while honing an analytical mind to creatively expand access to care.

The fast rollout of telehealth options into Ohio State's musculoskeletal care in response to the pandemic has shown me the power of interprofessional teams working together to adapt to challenges. This implementation was carefully planned, scaled, and occurred very quickly acting as testament to the power and creativity in diverse teams. As I continue my journey to becoming a physician who works with medically underserved populations, I will continue to try pushing health systems to make considerations of social determinants of health integral to their application of health care technology in clinical care.

Medical Student Support for Homeless Populations: A Community-Oriented Blueprint during the COVID-19 Pandemic

Project lead
Daniel Yang, University of Michigan Medical School

Teammates
Claire Garpestad, Ruth Bishop, Molly Fessler, Sarah Jabour, Shannon Cahalan and C. Kenzie Corbin

Faculty mentor
Brent Williams, MD, MPH, Director, Global Health and Disparities Path of Excellence, University of Michigan

Abstract

Wolverine Street Medicine (WSM) is a medical student-led organization at the University of Michigan Medical School aimed at providing health care to those experiencing homelessness in Detroit and surrounding areas. WSM has developed independent relationships with community organizations in order to create a community-facing network. This network addresses gaps in care, protects and advocates for community members, and works toward ameliorating the health risks of homelessness. Since most support systems for this population cannot operate at full capacity due to COVID-19, higher levels of collaboration between all stakeholders became necessary. WSM's response during the pandemic demonstrates how student-run initiatives can act as a bridge between stakeholders and communities served, facilitating throughways for communication and resources between our academic institution, local community partners, student volunteers and underserved communities. We hope that this initiative can be used as a blueprint for efforts beyond the context of the pandemic and the scope of one organization.

Project addressed/problem discovered

On March 17, 2020, the Association of American Medical Colleges issued guidelines for medical schools to pause student clinical rotations at the start of the Coronavirus (COVID-19) outbreak to maintain patient and learner safety. This recommendation placed medical student education on a temporary hold. In response, medical students across the country mobilized to support their institutions. Many of these initiatives served patients well-connected to academic medical centers (AMCs). During the pandemic, organizations such as WSM, which operated within an AMC but engaged with a population not usually seen at said AMC, had the unique opportunity to leverage existing relationships with both their academic institution and their community partners to advocate for and support otherwise underserved patients. Homelessness is a well-established social determinant of health. People experiencing homelessness endure a disproportionate burden of disease as a consequence of increased exposure to the elements, inadequate nutrition, congregate living, reduced access to hygiene and decreased access to health care, particularly primary care. Even early in the course of the pandemic, the Centers for Disease Control and Prevention reported an average of 25% of shelter residents testing positive for COVID-19 in four shelters across the country, with incidence in one shelter as high as 65%. Moreover, many of the community programs in the areas that WSM serves were either restricted or shut down due to the pandemic, leaving clients without access to food, hygiene products and other essentials. These challenges were magnified by a lack of crisis contingency planning at the student organization, community partner and institutional levels.

Approach

WSM's COVID-19 efforts relied heavily on ongoing conversations with our community partners. Our team proactively opened lines of communication with our partners to detail specific needs, while simultaneously launching a medical school supply drive for redistribution. Our supply collection included materials to create our own hand sanitizer, which at the time was hard to come by in stores, as well as cleaning and first-aid supplies based on

community need. As community needs outstripped our initial drive capacity, we sought to form new partnerships with interdisciplinary initiatives to share volunteer pools, ideas and materials. The institution-wide partnerships we created were crucial in continuing to support our partners. Our partnership with the Michigan Medicine PPE drive was especially fruitful, as we were able to use our standing as an organization within the academic institution to advocate for a fraction of donations to be directed toward providers caring for people experiencing homelessness — individuals who may have otherwise been precluded from the benefits of this supply drive. Our partnership with the University of Michigan College of Pharmacy provided 50 gallons of hand sanitizer to redistribute to our community partners. These examples emphasize the unique ability of student-run organizations to leverage their position within a large academic institution to develop meaningful relationships and advocate for community organizations and their clients.

Open lines of communication with our community partners allowed for continued reassessment amidst the changing COVID-19 landscape, ensuring that our work remained community-guided and sustainable. For example, we learned that meal distribution programs in Detroit had closed, prompting members to begin a sack lunch program for distribution by our clinical team as they provide street-based medical care. When we found out that the shelter in our own community was operating with very limited staffing, we launched an initiative to supply volunteer staff at shelter extension programs. This program required careful collaboration between shelter staff and our medical school advisers, given we would be directly interfacing with clients. We developed a position description and training protocol, and in our new role, shifted from medical student to non-clinical, community volunteers in order to continue to support our community.

Outcomes

We relied on our previously established partnerships with community stakeholders to help us identify gaps we could work to fill (i.e. PPE, hand sanitizer, food, etc.), and we advocated for the resources of our large academic medical center to be distributed equitably across our community. In doing so, we were able to strengthen relationships between our student organization, our hospital system and our community partners, while helping support our partners as they worked to reduce the spread of COVID-19 among homeless populations. One community organization we partnered with, Delonis Center, a homeless shelter in downtown Ann Arbor, was able to stay operational in a time with significant decrease in both staff and client capacity, and, during the peak of the pandemic, had zero positive screens, due to their incredible efforts supplemented in small part by the extra support from WSM volunteers. Our members gathered and distributed over a thousand face masks, over a hundred n95 masks, a hundred boxes of gloves, and critical personal protective supplies among our community partners. We distributed over 50 gallons of hand sanitizer in over 1,000 individual containers to our community partners and clients. Because many meal programs closed in Detroit during the pandemic, we also assembled and distributed over 800 bagged lunches, which we continue to do today. Our experiences are also being parlayed into a resource for future outreach and incorporated into a central fixture of our more routine practices in our street medicine program at our AMC. Our long-term plan is to continue to grow our partnerships to create a stronger safety net for those experiencing homelessness, by leveraging our position inside a large academic health care delivery system with close ties to the community in order to increase access to health care for this vulnerable population. Our hope is to have a positive impact on the health system by creating a sustainable, integrated program which combats homelessness as a social determinant of health through advocacy, de-stigmatization, social support and direct health care delivery.

Personal impact

Health care is a right, and it is our mission as future health care providers to make sure that our unhoused neighbors have their health care needs met and to create a sustainable solution to ameliorate the health risks that homelessness poses — risks which have been exacerbated by the pandemic. It is also our mission to supplement education for medical students on the disparities and disproportionate risk that patients experiencing homelessness face and develop a consciousness within future health care providers that destigmatizes

homelessness and breaks down barriers between the health care system and the individuals it serves. To this end, WSM has created an elective program within the University of Michigan Medical School for advanced learners, which includes content regarding the pandemic and its disproportionate impact on the homeless population. Personally, the recent work within WSM has taught me about the value of intra- and inter-organizational relationships, and about how we can weave these relationships into something special, a net to catch those who have fallen through the cracks of a struggling system in an unprecedented time. I hope the work we've done has inspired others to do their part in their own way, because there is much work to be done. I hope this generation of learners can take with them these experiences into future practice, so that we may implement the system level change that will heal the cracks in this struggling system.

Providing Emergency Food Assistance to Underserved Households during COVID-19: A Community Initiative to Mitigate Food Insecurity

Project lead
Matison Alderman, Florida International University Herbert Wertheim College of Medicine

Teammate
Chase Mallory

Faculty mentor
Greg Schneider, MD, Department of Humanities, Health and Society, Florida International University Herbert Wertheim College of Medicine

Abstract

As the COVID-19 pandemic suddenly removed students from classrooms and clinics, we felt helpless. We also knew that the social determinants of health were likely to have profound effects on the underserved communities where our medical school runs a longitudinal service-learning program called NeighborhoodHELP. We decided to focus there. Food insecurity had been an issue among our communities and given the climate of employment layoffs and difficulties with shopping in person, it was clear the pandemic would exacerbate these challenges. We also wanted to support local businesses and health care workers in the process. We began a fundraiser with a goal of $5,000, of which 90% of the donations would be used to support households within the NeighborhoodHELP communities. If the goal was reached, we would use 10% to buy meals for health care workers from local small businesses. We happily report that we achieved this goal and more.

Project addressed/problem discovered

The COVID-19 pandemic has brought with it a host of challenges ranging from medical and psychological illnesses to social and economic hardship and everything in between. The Florida International University (FIU) Herbert Wertheim College of Medicine (HWCOM) has a special privilege of working closely with over 800 low-income and uninsured families through the Green Family Foundation Neighborhood Health Education Learning Program (NeighborhoodHELP).

Our primary aim was to identify households expressing signs of food insecurity and to provide food assistance. Secondary aims included providing personal protective equipment (PPE) and educational materials to the households as well as funding meals for health care workers at a local hospital.

Our health care delivery model consisted of the NeighborhoodHELP Outreach team, student and faculty volunteers, and local businesses. As part of regular check-ins, households were evaluated for a range of social factors, including access to transportation, access to the internet, financial insecurity, and notably food insecurity, along with any other medical conditions that might limit them from being able to obtain food.

One hundred households were identified to have a current or previous need for food assistance. With many families losing work, having limited financial support, and expressing fear of venturing outside of their homes due to the coronavirus, food insecurity was identified as a top priority within many of our households. Their situations mirrored that of many at-risk populations in Miami-Dade County.

Approach

In addressing food insecurity as a component of social determinants of health, our first goal was to identify households that demonstrated an urgent need for food assistance. The first priority involved those who were unemployed prior to the pandemic, and then those who became recently unemployed as a result of the pandemic. The NeighborhoodHELP Outreach team further identified those at the most risk (i.e., limited funds or transportation, medical comorbidities). To fund the project we hosted a

Food Insecurity Fundraiser as part of a collaborative effort between the non-profit organization Project Treehouse and the FIU Rotaract Club.

Our intervention consisted of two mechanisms: prepared meal delivery or a monetary donation in the form of a gift card. Those who expressed lack of transportation or concern leaving their home received the meal delivery. Others who were able to commute to a local market received a gift card to purchase groceries.

We worked alongside a local small business, Healthy Xpress, to provide 10 prepared meals for a week and an assortment of fresh fruit, in which they delivered directly to the households. Prior to meal delivery, households were provided a menu of Healthy Xpress' options from that week to select meals based on their preferences. After meals were delivered, households were surveyed over the phone to assess their satisfaction with the meals.

According to a survey of all the neighborhoods, it was very apparent that Walmart was the most accessible food market for all of our communities. For those households that were designated as requiring direct monetary assistance, we purchased $50 Walmart gift cards to provide to families for food purchases. This method gave the households the freedom to purchase items they needed.

Each household which received support from our project was also mailed a letter explaining what they received and why, a list of local community resources, and two face masks. The face masks were a manifestation of the secondary aims of the initiative to donate personal protective equipment to all households for whom we provided food assistance. We worked with a student-led mask creation effort that created and donated hundreds of masks.

Outcomes

Our fundraiser was very successful, in that we raised $7,750 to use in supporting our NeighborhoodHELP neighborhoods, local businesses, and health care workers, including a $500 grant from the Wawa Foundation. Our initial goal was to raise $5,000, to be able to provide short term relief for households in need over 4 weeks. However, we were able to extend the program to 7 weeks given the successful fundraising efforts. During the 7 weeks, we provided Walmart gift cards to 94 households and meal delivery to 23 families. A goal of healthy meal delivery was to expose families to new food times that they could continue using in the future.

With the excess funding, we were able to purchase toiletries and medical supplies, such as blood pressure cuffs and glucose monitoring equipment, to be available to NeighborhoodHELP households at a local pantry.

Since we met our $5,000 goal, we were able to use 10% of the funds in an attempt to support our local heroes and contribute to our local economy. We donated breakfast consisting of coffee, donuts and muffins to a local hospital emergency department, South Miami Hospital, to support our health care workers. Our hopes were to promote wellness among the health care workers by sharing our gratitude and appreciation for their hard work and dedication. We were able to place orders from two local businesses and had the goods directly delivered to the emergency department staff according to hospital procedures.

We are very proud of the fact that our program also laid the groundwork for the Green Family Foundation to continue in providing relief for families experiencing food insecurity. This program has continued to work with the NeighborhoodHELP Outreach team in identifying households in need and providing them with healthy meals. As a continuation of our program, the Green Family Foundation has continued into its 15th week and has been able to assist over 230 households. Through our program we were able to identify the best practices for achieving our goals and the Green Family Foundation was able to use these to continue helping the NeighborhoodHELP communities.

Personal impact

This project began as COVID-19 interrupted my medical education. I was very invested in its success and subsequently refined a few skills of mine. We had to adapt our project early on, as one of the goals was to support the local economy by purchasing meals and gift cards from local markets. I learned to compromise on this facet,

as the main priority was to benefit the households. Given the food deserts in many of the communities, it was not feasible to purchase from local markets. From this experience, I learned that it is important to keep your goals in mind and not get lost in the weeds, so to say. There were many working parts in the project and not everything went smoothly, but what was important was getting food to these households. I think this is important to remember as a physician. Humans are complex and have a lot of working parts, but it is key to focus on their well-being. Focusing on the priorities helps to not let the little things become overwhelming.

This project did not come without its challenges, trying to coordinate in the midst of a pandemic did complicate the execution. We had initially hoped for student deliveries, but this was not possible. We had to find many solutions throughout the project. I learned to be flexible and creative in finding solutions. I also think this is an important skill for physicians, the ability to think outside the box to solve patients' problems.

Repurposing Student-led Community Clinics in the Time of COVID-19

Project lead
John Connolly, Perelman School of Medicine at the University of Pennsylvania

Teammates
Amanda Gottschalk, David Hsu, Christian Wood and Gabriel Arguelles

Faculty mentor
Dr. Michael Beers, Robert L. Mayock and David A. Cooper Professor in Pulmonary Medicine, Perelman School of Medicine at the University of Pennsylvania

Abstract

United Community Clinic is a University of Pennsylvania student-run clinic that serves the Parkside neighborhood of West Philadelphia. The clinic provides patients with free physicals, dental care, referrals to Penn specialists and connections to social work resources. Additionally, our partner clinic, Heart Health Bridge to Care (HHBC), provides longitudinal care for patients with hypertension or diabetes. In March 2020, in-person clinic operations were postponed due to the COVID-19 pandemic. In response, we worked with the community and our patients to redefine our clinic during this challenging time. First, clinic leaders have ordered and distributed masks, hand sanitizer, and informational materials in the Parkside community. Second, HHBC has fully transitioned to telemedicine and maintains care continuity by mailing patient medications. Finally, clinic leaders are planning a series of outdoor flu shot clinics in Parkside scheduled for November 2020.

Project addressed/problem discovered

Our project seeks to address the economic and racial disparities laid bare by COVID-19. The COVID-19 pandemic has disproportionately affected poor communities and communities of color. Our clinic primarily serves the Parkside neighborhood of Philadelphia. The Parkside neighborhood is 88.5% Black, and the zip codes comprising the Parkside neighborhood have among the highest positive COVID-19 test rates in the city. One zip code in the neighborhood had a test positivity rate of over 22% in mid-July. Moreover, Parkside residents also suffer from high rates of medical comorbidities that put residents at greater risk from COVID-19. 14.7% of adults have asthma, 44.7% have hypertension, and 19.5% have diabetes. In a 2019 study from the City of Philadelphia, Parkside ranked 43rd out of 46 neighborhoods in Philadelphia for health outcomes.

Further, access to health care was a significant issue in the Parkside neighborhood even before the COVID-19 pandemic. The vast majority of patients we see at UCC are uninsured or underinsured residents of the neighborhood. The Parkside neighborhood also has approximately 50% fewer primary care physicians practicing in its borders than the city average.

The closure of United Community Clinic due to the COVID-19 pandemic has further exacerbated the difficulties many Parkside residents face in accessing medical care. Our clinic leaders sought to identify creative ways to continue to serve the Parkside community in an environment where, due to University regulations, we were unable to see patients in person.

Approach

Our team began with a grassroots approach focused on identifying community needs. Our initial conversations with community partners consisted of exploratory discussions about health system improvement and how our clinic could add value to the current state of health and well-being in Parkside during this tumultuous time. From these conversations, we established three main initiatives: COVID-19 kits, continuity of care for patients with hypertension and diabetes, and the establishment of flu shot clinics in the fall.

Over the summer, we created COVID-19 "survival kits" for distribution in West Philadelphia. First, we repurposed our

clinic budget to purchase cloth masks, surgical masks, hand sanitizer and bars of soap. We also obtained informational flyers on COVID-19 and proper mask wearing. Finally, our kits included palm cards detailing the importance of completing the census and wearing a mask. We partnered with an existing food distribution network to deliver the kits to the Parkside neighborhood. We have two additional mask distribution projects scheduled for the fall.

Second, our partner clinic, HHBC, worked to maintain continuity of care for its patients with diabetes and hypertension, even without the benefit of in-person visits. HHBC sought to leverage health system technology to generate an efficient telemedicine program to maintain high quality care for our underserved patients while keeping them safe. With this in mind, we first coordinated with our pharmacy team to mail out automated blood pressure cuffs for remote blood pressure monitoring. Next, we implemented a biweekly telemedicine visit with a medical or nursing student, who would then meet with the physician and pharmacy preceptors to ensure an appropriate medication regimen delivered by mail.

Finally, we heard concerns from Parkside community members about flu season, and we realized the utility of a flu shot clinic for the fall, especially for a community at increased risk for both COVID-19 and influenza. We have planned an outdoor flu shot clinic that will be open on Saturday mornings in November 2020. We are recruiting volunteer nurses and pharmacists to administer shots and are working with community leaders to publicize the clinic.

Outcomes

Our 1,000 COVID-19 distribution kits consist of one cloth mask, four surgical masks, one 2oz bottle of hand sanitizer, one bar of soap, one informational flyer on COVID-19 and proper mask wearing, and two palm cards — one on the importance of completing the census and one on the importance of wearing a mask. We have two more kit distribution projects scheduled for the fall, each equal in scope to this prior round of distribution. The masks, hand sanitizer and soap help the community stay healthy and fight a COVID-19 surge. Residents feel safer knowing they minimize COVID-19 exposure. Our informational flyers on COVID-19 help increase community awareness and knowledge while our instructions on proper mask wearing will increase both overall rates of mask wearing and rates of proper mask wearing. We hope our cards detailing the importance of completing the census will increase census completion, thus helping accurately depict the neighborhood so that resources, including health care resources, can be optimally directed. We have two additional kit distributions planned for the fall, in which we will deliver 2,000 additional kits in West Philadelphia.

For HHBC, our rapid telemedicine transition has ensured that our 25 patients still maintain healthy blood pressures and receive quality care in the safety of their own home. With some of our patients previously presenting with extreme hypertension, we believe that our impact is multifactorial, including the reduction of potential hospitalizations related to hypertension and diabetes complications. This is particularly important because it is clear that COVID-19 patients with pre-existing hypertension and diabetes are at greater risk of morbidity.

Our planned flu shot clinics in the fall will help prevent a simultaneous surge of COVID-19 and influenza. We are scheduling two Saturdays in November 2020 where we will administer the flu shot vaccine. We are recruiting 20 on-site volunteers to administer vaccines and coordinate patient flow, and we hope to administer 500 total shots — all at no charge — over the course of the two days.

Personal impact

As medical students who have not yet entered the clinical phase of our training, it was initially demoralizing to feel that we could not help the patients in West Philadelphia that we wanted to serve. However, as we came to realize through conversations with faculty members and community leaders, there was much that we could do from a public health standpoint to serve Parkside, even if we could no longer directly see patients. We have heard from excited community leaders that the thousands of masks we have distributed in Parkside have made residents feel safer and more comfortable. The success of our mask distribution campaign reminds us that as physicians, we have both a responsibility and an opportunity to serve patients both inside and outside of our clinical practices. We feel confident that we will draw

on our clinical experiences in the future to spearhead more public health or social needs campaigns that can make a difference in the lives of our patients.

Additionally, our work has given us increased understanding of the disproportionate impact of the COVID-19 pandemic on certain communities like Parkside and how health system disparities perpetuate this inequity. While this inequity is extremely frustrating, all of us feel newly committed to addressing health care disparities at all levels whether it be through grassroots campaigns or higher-level health care reform. We plan to continue to work toward reforming health care systems to benefit the communities most at need throughout our medical careers.

Resident Led "Telehousehold Visits" Utilizing an In-house Guide and Workflow to Systematically Address Social Determinants of Health Related to COVID-19

Project lead
Wendy Bocaille, West Kendall Baptist Hospital affiliate of Florida International University Herbert Wertheim College of Medicine

Teammate
Daniel Gil de La Madrid, West Kendall Baptist Hospital affiliate of Florida International University Herbert Wertheim College of Medicine

Faculty mentor
Andres Rodriguez, MD, Assistant Professor, Florida International University Herbert Wertheim College of Medicine

Abstract

In the wake of the COVID-19 pandemic, social factors that disproportionately affect minority populations were exposed and warranted further action. The pandemic also served as a time to implement practices outside the traditional model of care and embrace clinical care supported by health systems science. With this in mind, The Green Family Foundation Neighborhood Health Education Learning Program (NeighborhoodHELP) at the Florida International University (FIU) Herbert Wertheim College of Medicine implemented an initiative designed to target these issues. A needs assessment workflow was formulated into an in-house guide called the "NHELP COVID19 Resource Guide." With this guide, interdisciplinary team members conducted thousands of calls and video encounters to assess and respond to household social, behavioral and clinical needs, including remote monitoring for COVID-19, crisis counseling, and distributing thousands of facemasks and hundreds of food boxes. As such, we have been able to make a lasting impact within our communities.

Project addressed/problem discovered

The Green Family Foundation Neighborhood Health Education Learning Program (NeighborhoodHELP) is a population health program integrated into the Florida International University (FIU) Herbert Wertheim College of Medicine's (HWCOM) curriculum and organizational structure. We identified that the COVID-19 pandemic disproportionately impacted vulnerable minority populations, and social determinants of health contributed to COVID-19 disparities. Uninsured populations commonly lack access to basic primary, preventive, and behavioral health care services along with other resources such as childcare, employment, sick leave, food, masks, etc. Unpredictable events, like the COVID-19 pandemic, further expose the vulnerabilities of these communities. We used health systems science to identify this problem by implementing a patient and population centered approach when evaluating household needs. By doing so, we were able to move away from the old model of care and address gaps in health care created by the pandemic.

Approach

The "NHELP COVID19 Resource Guide" is a collaborative in-house guide that addresses the major social determinants of health for NHELP families in the wake of COVID-19. The comprehensive resource guide contains a unique NHELP COVID-19 needs assessment workflow that assists the user to identify needs and navigate those needs to the most appropriate resource. The NHELP program is a perfect example of using health systems science as a synergist to integrate the concepts of basic and clinical sciences. By utilizing this approach we are ultimately able to improve population health, improve experience of care and lower per capita cost in the face of economic, political and societal pressures. The workflow was created with input from the primary interdisciplinary stakeholders who

service our NHELP families, medical students, the outreach team, social work and behavioral health. The workflow is embedded into the resource guide with hyperlinks that can provide education and/or referrals to address the needs identified by household members. Moreover, the guide was created to be used by all members of the NHELP team. The guide has links to local resources as well as resources unique to our college. Thus, it makes it easy for the user to find "in-house" student and faculty COVID-19 initiatives that would apply to NHELP households — such as crisis counseling, mask access, food insecurity, tutoring and other services provided by HWCOM. The resource guide is comprehensive and constantly updated by stakeholders as new resources become available. Therefore, it evolves with the ever-changing response to COVID-19.

Outcomes

Within 30 days of the county-wide stay at home order on March 26, 2020, we were able to contact all 851 of our enrolled households to complete a COVID-19 assessment and health education. In the ensuing months, despite social distancing, contact with households increased significantly. Interdisciplinary team members have conducted thousands of calls and video encounters to assess and respond to household social, behavioral and clinical needs, including remote monitoring for COVID-19, crisis counseling, distributing over 3,000 facemasks, and distributing 854 food boxes to 242 unique households.

Personal impact

The personal impact that this work has had on my development as a physician is one that will forever shape how I practice medicine. Through this NHELP Needs Assessment Initiative, I have come to understand how fundamental it is to identify social determinants of health and how doing so can positively impact a patient's life. I also gained an understanding of the impact cultural sensitivity can have in patient-care and a newfound appreciation for holistic clinical care. Moreover, working within an interdisciplinary team in a collaborative fashion taught me invaluable lessons. I was able to work alongside nursing students and social work students, which taught me to see issues from varying perspectives. Food insecurity, financial constraints, and legal concerns were among a few of the social determinants that were identified. However, without the help of each interdisciplinary professional, reducing these barriers would have been nearly impossible. Through this project, I was able to understand the limitations of the medical care that I can provide without a team. Furthermore, I learned how to work effectively in a team-based environment, which will mirror my work setting as a physician. I also became more culturally aware in addressing household members, understanding that one size does not fit all. Everyone has different views and reservations with regards to receiving care and assistance. Through this project, I was able to polish the tools needed to be a culturally sensitive physician while building rapport.

Service Learning Amid COVID-19

Project lead
Daniel VanZweden, Wayne State University School of Medicine

Teammate
John Sherwood

Faculty mentor
Jennifer Mendez, PhD, Wayne State University School of Medicine

Abstract

Due to Coronavirus, faculty and students worked together to transform the service-learning curriculum into a telemedicine experience in less than a month. Learning communities used telemedicine to contact families in the community and used a standardized questionnaire as a guide for assessing any needs. They then designed a resource guide to help their families and presented it to them. Finally, they completed a reflection on the assignment and what they learned about telemedicine in general. This research examines these experiences of learning communities as a framework for using service learning to respond to natural disasters in the future.

Project addressed/problem discovered

During COVID-19, many families throughout communities in Detroit underwent quarantine for the first time. For some, this presented unprecedented difficulties with regard to finding medications, getting to doctor's appointments, getting food, etc. Wayne State School of Medicine restructured its service learning program to set up tele-check-ins to make sure families in inner city communities were able to find resources to meet their needs.

This program was designed not only to identify and meet needs of the community, but also to educate second year medical students about health disparities and the social determinants of health as well as telemedicine. Students learned about many of the difficulties certain communities have with regard to health care access and completed a reflection assignment on several ways to mitigate some of the problems facing these communities.

Approach

This project used telemedicine to connect medical student learners with members of the local community. Using existing learning communities, teams of students contacted families recruited through a local non-profit. Students used a standardized questionnaire to assess the needs the family had. Students then compiled a list of resources to help the families with any needs and contacted them again to present the resource guide to them. After the teams finished the presentation, they completed an assessment survey and reflection assignment. Projects were peer graded. In their reflections, many students identified social determinants of health as major barriers to receiving adequate health care, especially during the pandemic. Students learned about many of the environmental, social and economic barriers which marginalized people often face.

Outcomes

This project achieved the goal of engaging students in service learning in the community during COVID-19 and teaching students about the social determinants of health. It successfully identified the most sought-after resources by community members (with food-related resources being top priority), and students helped members of the community navigate local programs to obtain resources. Students, many for the first time, also learned about many of the resources available to underserved populations.

Personal impact

This work makes me more thoughtful about the multitudinous difficulties facing our most vulnerable populations. Especially during a global pandemic, the lack of a safety net becomes especially apparent as many

families make the difficult decision to just "make do" and "go without" for the time being. While I am powerless to solve all of these problems, I am more cognizant of them and am determined to work with my peers toward health care solutions that do not leave segments of the population behind.

University of Colorado COVID-19 Pandemic Response Course: Beyond the Virtual Classroom

Project lead
Alexander Nguyen, University of Colorado School of Medicine

Teammates
Jaclyn Anderson, Melissa Laughter, Jamie Solis, Alejandro Itzam Marin, MD, Bryn Launer, Tai Lockspeiser, MD, Rachael Tan, PhD, Shanta Zimmer, MD, Chad Stickrath, MD

Faculty mentor
Aimee Bernard, PhD, University of Colorado School of Medicine, Anschutz Medical Campus

Abstract

The COVID-19 outbreak swiftly evolved into a pandemic with enormous societal impacts. In March 2020, a student-led course was developed at the University of Colorado School of Medicine to provide learners with current scientific knowledge regarding COVID-19 and a platform to support the community as the pandemic evolved. Students completed asynchronous online modules and applied their online knowledge through community service within focused pillars — service learning, education, bioethics and medical humanities, and research — to address multiple pandemic-related societal needs. Beyond the significant improvements in knowledge regarding the biology, epidemiology and clinical course of SARS-CoV-2, students overwhelmingly supported the evolving grassroot service opportunities and reported these non-clinical roles as fulfilling contributions to their communities. Our results suggest the importance of creating authentic roles, through integrated pillar-based curriculum, to significantly enhance students' knowledge and attitudes toward their roles within the community, especially during public health emergencies.

Project addressed/problem discovered

As Colorado declared a state of emergency on March 10, 2020, the University of Colorado School of Medicine (CU SOM) and Anschutz Medical Campus (AMC) worked to protect the students, faculty, health care professionals and patients frequenting its campus and hospitals from the risks of COVID-19. CU SOM transitioned to virtual learning by March 13 when Colorado's first COVID-19 related death was reported by Governor Polis. He correspondingly tasked CU SOM to mobilize professional students in Colorado, resulting in students and faculty creating the University of Colorado COVID-19 Student Response Task Force (CSR) to rapidly fulfill the needs of students at AMC and our Colorado community.

With this outbreak developing into one of the worst public health emergencies of our century, it became imperative for medical students to be informed with supported scientific data in order to better advise patients, family, friends and the community. CU SOM's COVID-19 Pandemic Response Elective Course was officially released March 18 with the following overarching goals: 1) to offer evidence-based knowledge about the biology, epidemiology and clinical course of SARS-CoV-2, and 2) to provide students opportunities to directly apply their learning through safely contributing to their communities during the COVID-19 pandemic. As one of the very first medical student-led responses in the nation tackling medical education's swift transition from clinical roles to virtual classrooms, we worked to incorporate new methods of explorative learning, define non-clinical roles supporting our communities, and create collaborative interprofessional opportunities to develop leaders for future public health emergencies.

Approach

A two-part curriculum was developed consisting of an asynchronous learning component (Part A) and an experiential component (Part B). Part A was composed of nine modules to provide fundamental knowledge

regarding SARS-CoV-2 centering around pathophysiology, diagnosis and treatment with inclusion of threads on social determinants of health, bioethics and medical humanities. Learning materials included select readings, primary journal articles, educational videos, relevant news and/or podcasts, professional physician organizations' websites, discussion threads, and other key resources. With rapidly evolving information on COVID-19, weekly lectures with three update modules were also provided focusing on epidemiology modeling, public health and societal impacts of COVID-19, the situation in Colorado and the United States at large, and a final update on scientific strides related to the evaluation and treatment of the disease.

Part B allowed students to apply their learning from Part A and actively engage students' educational and societal needs created by the COVID-19 pandemic. Students selected one of four designed pillars to complete pillar-unique assignments and activities. All pillars offered opportunities for remote completion of requirements. The bioethics and medical humanities pillar emphasized tackling discussions concerning current ethical dilemmas and social determinants of health related to the pandemic. The education pillar aimed to educate the community about COVID-19 and to fill K-12, higher education and undergraduate medical education curricular gaps created by the pandemic. The research pillar aimed to support the pandemic response through providing students opportunities to become experts on the topics surrounding SARS-CoV-2 and contribute to the research community. The service-learning pillar aimed to funnel students into the community pandemic response through a variety of service-learning roles that directly and indirectly support health care and public health operations through CU SOM's CSR. Opportunities ranged from creating narrative pieces for the community, developing educational materials for the general public, assisting faculty or formulating COVID-19 research projects, triaging COVID-19 calls, and distributing PPE to major hospitals around Denver and Colorado Springs. Overall, the four pillars tackled the domains of public health and value-based care to properly equip students during the pandemic when educational opportunities were limited.

Outcomes

336 students were enrolled — 72% were 3rd year medical students, 16% were 4th year medical students, and 12% were public health students. The bioethics and medical humanities pillar published a website and started weekly open-mic platforms for AMC members to share their thoughts, feelings and concerns through any expressive forms. The education pillar had 60% of its students complete community education projects while 40% developed online clerkship materials. The research pillar facilitated 70 connections covering both COVID and non-COVID projects. The service-learning pillar had a total of 5,000+ service-learning hours logged over the four weeks.

The expectation that a perfect course could be created in a matter of days is unrealistic. However, the pandemic's impacts on medical education have necessitated rapid adoption of technologies for learning to be "pandemic-ready." The challenge faced by student and faculty leadership was to create opportunities to reinforce "classroom" learning within the parameters of social distancing between students and faculty. Simply relegating students to learn from online modules would fall short of the benefits of in-person experiences. The medical student's common phrase of "see one, do one, teach one" can still hold true during this time by preparing students on how to contribute to future public health emergencies in non-clinical roles. Examples highlighting this include "read the module, make a module, teach the community" in the education pillar or "read the literature, make a hypothesis, share the literature" in the form of a review or research with the community in the research pillar.

The biggest gain from the course was allowing students to find meaningful roles. Reviewing feedback demonstrated strong support of the opportunities created and suggests the importance of creating authentic roles — through integrated, pillar-based curriculum — to significantly enhance students' knowledge and attitudes toward their roles. It will be important to further explore how to create those opportunities within the community during future public health emergencies. At CU SOM, the pillar-based experiential learning model will be incorporated into

the future medical school curriculum to expand service learning opportunities and public health teachings that have thus far been limited in traditional medical education.

Personal impact

I am proud and honored to be a part of the overwhelming student response to help our community overcome this historical public health crisis. The leadership shown by many of my classmates and colleagues throughout the COVID-19 pandemic and in the formation of the CSR representing a collective student response illustrated our willingness to respond to the call of action. Additionally, I was able to witness the impact we were able to make on our AMC campus and within the Denver community even outside of our clinical roles. The collective efforts of our student body have equipped these future health care providers, including myself, on how to better serve patients in future public health emergencies and better tackle disparities in public and community health settings. Beyond this preparedness and work to tackle health care disparities, I have been able to hone personal qualities including leadership, resiliency, ability to design and implement new programs, and engagement with faculty and community stakeholders. Lastly, my passion for medical education has been reinforced, and I have continued to work with other student leaders to update the educational materials to reflect the latest developments related to COVID-19 as the medical school has continued to offer this course throughout the academic year. Beyond this time, I hope to continue contributing to the medical education community throughout my future career.

University of Connecticut Health Leaders — Promoting Health Equity During the COVID-19 Pandemic

Project lead
Jacqueline Steele, University of Connecticut School of Medicine

Teammate
Henry Siccardi

Faculty mentor
Christopher Steele, MD, MPH, MS, University of Connecticut School of Medicine

Abstract

The COVID-19 pandemic resulted in many patients developing social determinant of health (SDH) barriers with decreased access to multidisciplinary teams that are usually present during in person clinical encounters. In response, the University of Connecticut Health Leaders (UCHL) was developed to train the next generation of pre-professional health students to address these issues within the clinical setting but also provide COVID-19 contact tracing for Connecticut. Within 32 clinic sessions, our volunteers approached 541 patients and completed the screening questioner on 317 patients. Ultimately, 110 were identified to have SDH barriers, and 98 were connected to community resources. For Connecticut, our program has provided 36 contact tracers.. In conclusion, the UCHL program provides the solution to train the future generation of health professional students to address the SDH barriers within their community and offers a virtual option to create a multidisciplinary team to address these issues during a pandemic.

Project addressed/problem discovered

It is estimated that nearly 10-20% of someone's health is modifiable, while the other 80-90% is a product of their environment collectively termed as the social determinants of health (SDH). As one can imagine, access to resources such as a safe living environment, food, health literacy, insurance status and many other factors drive health care outcomes. Certain vulnerable populations such as immigrants, homeless patients, and HIV patients face additional barriers to receive adequate health care. The COVID-19 pandemic has led to numerous patients developing worsening SDH barriers with the added challenge of involving multidisciplinary teams that are available during in-person visits. Unfortunately, physicians feel inadequately trained to address these barriers alone in the clinic setting.

The mission of University of Connecticut Health Leaders (UCHL) is to train the next generation of health care providers to be equipped to address SDH barriers within a clinical setting. The program was inspired by the Bronx Community Health Leaders and provides both formal experience and education to pre-professional students on health equity and SDH. The volunteers' roles are to call each patient to screen for these inequities while also providing contact tracing for the Connecticut. Once patients are identified as having inequity barriers, these students contact local community partnerships that have expertise in bridging these inequities. Each volunteer receives a formal education on how to provide contact tracing in addition to one focused on health inequities and SDH.

Approach

The COVID-19 pandemic made it clear that a community-driven multidisciplinary effort was needed that could adopt a virtual-based approach when isolation was needed. Our solution is a medical student-driven pre-health pipeline program that gives students the opportunity to gain clinical, research, leadership development and educational experience in health care while actively improving the care received by patients. Through combining SDH formal education with clinical experience, pre-health students are trained in how to work with marginalized populations through direct patient care and advocacy. These volunteers

gain clinical experience necessary for professional school while also having a meaningful impact on their community. We hope to improve Connecticut's health system by adding pre-health students to the patient care team.

Each UCHL volunteer is assigned to one of four primary care clinics within the Hartford County region. In the clinic they screen all patients being seen using our SDH screening tool and when appropriate, connect patients to community partnerships to address these inequities. Currently, our screening is virtual during the pandemic. The screening tool first identifies all inequities for a patient, then directs the volunteer to the resources they should connect the patient to. The SDH inequities addressed in our screening tool include: English as a second language, citizenship status, employment, food insecurities, access to utilities, clothing, and telephones, housing insecurity, childcare access, veteran services, medication costs and adherence issues, incarceration services, transportation issues, tobacco use, and insurance status. In order to provide high value care, all inequities are shared with their physicians so they are both aware and can bring them up during their clinical encounter. As stated before, students also provide contact tracing for Connecticut for residents exposed to or tested positive for COVID.

The education component of the program consists of a 10-week curriculum of weekly syllabi on SDH topics, health care structure, and economics. Each syllabus contains an introduction video, scientific readings, and an activity for the volunteer. The curriculum includes instruction on counseling to limit modifiable risk factors such as smoking and alcohol use. Each student also completes Johns Hopkins curriculum for contact tracing.

Outcomes

Preliminary data for our program demonstrates that after completing 32 full clinic sessions at one clinical primary care site, our volunteers approached 541 people. 391 initially agreed to hear about the survey, and 317 agreed to take the survey. Mean age of participants is 51 years. Most common ethnicity and races screened were Caucasian (36%), Hispanic/Latino (28%), African American (20%) and Asian (7%). After screening was complete, 110 patients were identified to have SDH barriers (35%), and 98 eventually received a resource. Some patients had more than one barrier. We identified 39 patients who were unemployed, 7 were homeless, 23 expressed concerns of losing their housing, 15 had food insecurities, 20 worried about utilities, 8 had access to clothing issues, 4 had phone access issues, 25 had issues with medicine/access to health care, 14 could not afford their medications, 5 had issues with childcare, and 30 had issues with transportation. In addition, 73 patients identified as smoking in their lifetime, 32 were current smokers, 15 want to quit, and 8 were connected to the 1-800 Quit-Line. 44 of 48 volunteers (93%) returned for the fall semester.

The long-term goal of this program is to determine if health outcomes improve with addressing these inequity issues. Another goal is to identify if connecting patients to community resources and creating a clinic culture that embraces SDH as a part of health changes health outcomes and results in improved health. The health outcome measures being used to evaluate this are: initial number of visits and missed appointments, average blood pressure, HbA1c, cholesterol, BMI, and smoking status. On an individual level, we will use the patients' medical record to analyze an association of the specific SDH need and the number of SDH needs identified to the individual patient health outcome measures.

Personal impact

There is an overwhelmingly positive response from volunteers who are recharged knowing that they can impact someone's life, even at such an early stage in their career. We have noticed that health care currently teaches physicians to be more focused on the disease in front of them instead of the whole patient. Personally, the most rewarding aspect of this has been seeing the future generation of pre-professional students understanding how important it is to screen for social inequities but also feeling empowered to address them. Many of the volunteers have commented that this program is a great way to get involved in the community, gain a sense of being a physician but also enhance the delivery of patient care. We have also found a solution to provide a multidisciplinary approach without having patients physically in the clinic.

As a future physician, it is imperative I understand that my patients' health will extend beyond the walls of my office. Prescribing metformin may not help a patient with diabetes who lives in a food desert and my patient with uncontrolled hypertension may never come in for a blood pressure check if they cannot find childcare. Founding UCHL has helped me learn that physicians need to broaden their diagnostic skills and treatment plans to include the patient's life within the context of their own home and community. Furthermore, the solution to better health care for all is to include pre-professional students in the discussion.

Systems thinking

Values-driven Service and Value-added Roles: Vanderbilt Medical Student COVID-19 Response Program

Project lead
Catherine Havemann, Vanderbilt University School of Medicine

Teammate
Thao Le

Faculty mentor
Amy Fleming, MD MHPE, Associate Dean for Student Affairs, Vanderbilt University School of Medicine

Abstract

By the time The Liaison Committee on Medical Education and the American Association of Medical Colleges issued a joint statement recommending the suspension of medical students from clinical rotations, COVID-19 had laid bare the vulnerabilities in our social, political and health care systems. Attuned to the immense pressure that the pandemic placed on our communities, Vanderbilt medical students, together with our colleagues around the country, stepped up to lead and fill the gaps. Organized under the Vanderbilt Medical Student COVID-19 Response Program (VMSCRP), >330 Vanderbilt students have since completed more than 2,350 volunteer hours, contributing to local and national pandemic responses by providing childcare to front-line workers, answering hotlines, contact tracing and addressing food insecurity. Through our service, we define and shape our professional identity and responsibilities. Often missing from traditional curricula, this experiential learning empowers us to find our voice as leaders and agents of change in our communities.

Project addressed/problem discovered

When the U.S. health care system began to wrestle with COVID-19 and communities nationwide felt its impact, many medical students felt the call to serve despite removal from patient care environments. With unprecedented stresses to the health care system predicted, medical students represented an untapped resource for the pandemic response, and the needs were urgent. Driven by a sense of professional duty, we asked: How can we utilize the unique skillset of medical students to meet the needs of our communities during a pandemic?

At Vanderbilt University School of Medicine (VUSM), health systems science is embedded in our curriculum, which led to a systems-oriented definition of "community:" the interconnected network of our colleagues, our patients, and our neighbors, both in Nashville, TN and beyond. Systems thinking also brought us organically toward opportunities to fill systemic gaps. The public needed information, so we staffed the COVID-19 hotline. With schools closing and hospitals filling, health care workers needed babysitters. Next came grocery delivery for the elderly, immunocompromised and food insecure, followed by public health initiatives like contact-tracing and community outreach.

At the program's close, the framework of health systems science gave us the structure to process our new roles and responsibility. It is best stated by Drs Lucey & Johnston: "The pandemic provided an opportunity for learners to… appreciate how mastery of key concepts in human biology, sociology, psychology and systems science are essential for physicians to respond to a novel threat to human health." (JAMA. 2020;324(11):1033-1034. doi:10.1001/jama.2020.14136)

Approach

The VMSCRP was a student-led initiative consisting of the following core projects:

- Family Support Program: Babysitting and other assistance to front-line health care workers; all student volunteers
- Lentz Public Health Center (In partnership with the Metro Nashville Health Department (MNHD)): Contact

tracing interviews for the MNHD following appropriate training; medical students only.

- Immigrant and Refugee Outreach: Bi-/multilingual volunteers offering case management and educational outreach to address health disparities in immigrant communities; medical students only.
- Food Delivery: Emergency food box delivery, supplied by a local food bank (Second Harvest of Middle Tennessee), to community members facing food insecurity; all student volunteers.
- Tennessee Poison Center COVID-19 Hotline: Staffed shifts providing COVID-related information and connecting Tennesseans to local resources under the supervision of public health workers; all student volunteers.
- VUMC Occupational Health: Post-exposure symptom tracking for medical center employees; medical students only.

While VMSCRP was not formally affiliated with VUSM, VMSCRP directors worked closely with VUSM leadership, serving as a point of contact between school administration and students regarding students-led volunteer efforts. To streamline workflow and communication, we employed a centralized survey to recruit volunteers and leaders for all projects while utilizing a communication hub (Slack and a website) to coordinate tasks within and between teams. Given the rapidly evolving nature of the pandemic, this approach ensured timely and efficient communication within teams, as well as between students, VUSM faculty, and community partners who were intimately attuned to the needs of patients and the larger community at any given time. Through active engagement of experts in the fields of law, ethics and public health, our infrastructure enabled students to safely examine and expand their value-added roles in the health care system. Leveraging students' leadership and drive toward effective patient care allowed us to maximize collaboration between stakeholders while minimizing efforts that were duplicative or inadvertently harmful to the communities they were meant to serve. This organizational structure also created an opportunity for a subset of volunteer activities to be readily assessed and applied toward the clinical component of the innovative Pandemic Medicine course offered by VUSM.

Outcomes

The VMSCRP was supported by 337 volunteers: 300 medical students and 37 students representing six additional graduate and professional programs at Vanderbilt University. This cohort completed >2350 hours of direct service on projects with local, regional and national impact between March and May 2020.

Family Support Program: 14 program coordinators and 65 volunteers delivered >1,000 hours of hands-on care, including babysitting and general household support, to the families of >60 VUMC health care professionals.

Lentz Public Health Center: Contact Tracing: Following specialized training, 14 medical student volunteers logged approximately 220 hours of contact-tracing interviews for MNDH

Immigrant & Refugee Outreach: Two medical students with native language skills in Spanish and Egyptian Arabic partnered with MNHD to reduce COVID-19 related health disparities in immigrant & refugee communities through case management and educational outreach.

Food Delivery: 35 volunteers served 186 households representing 485 community members in Middle Tennessee by offering contactless food delivery.

Tennessee Poison Center COVID-19 Hotline: 107 volunteers gave 910 hours to this hotline with multi-state reach, offering information, guidance and connection to local resources to thousands of callers.

VUMC Occupational Health: Following dedicated training, three medical students took on roles conducting post-exposure symptom tracking for VUMC employees.

Freestanding and pilot initiatives: Using the VMSCRP's infrastructure and volunteer contacts, we served in a supporting role for freestanding and pilot initiatives including a virtual social support program for ICU patients, outreach to COVID-19 patients, staffing for the MNHD's test result hotline and others.

In April 2020, the VMSCRP was privileged with a formal role in medical education as the main source of clinical credit hours for 200 students enrolled in VUSM's innovative Pandemic Medicine course. The VMSCRP has also helped shape the national conversation through participation in the AMA's Innovation in Medical Education webinar entitled "Deploying students in alternative roles during COVID-19: preserving clinical educational objectives and supporting competency development." Most importantly, student volunteers took on critical pandemic response roles, adding value to the health care system at the level of the community, hospital and medical center operations, multi-state information resources and government-supported public health organizations.

Personal impact

In a time of global crisis, the structure we lost in staying home gave way to shared humanity with our patients. Zip codes became neighborhoods that we wound through to place groceries on doorsteps. Social determinants of health became newly salient, even visceral, as we left our own homes to quite literally meet patients where they were.

Even on the phone, the lives of our patients intersected with our own in ways that demanded transformation. When faced with unanswerable questions on COVID-19 hotlines, connection with callers bridged the gap between those questions and the limits of evolving knowledge. Over a headset, we shared the vulnerability of not knowing. Our patients shared anxiety, pain and shame, and with little else to rely on, we simply bore witness.

Outside the clinical environment where our roles lacked definition, we found ourselves reflecting on purpose and the values that drove us to medicine. In a role of responsibility where our decisions and actions had genuine impact, our experiences felt formative. Beyond the pandemic, we hope medical educators will see the eruption of student-driven volunteer initiatives as a catalyst to reimagine the role of students in the health care system. We envision a transformative model of medical education that harnesses students' sense of purpose and makes room for creativity in designing impactful learning opportunities that connect our values to the needs of the communities we serve.

COVID-19 Virtual Innovation Bootcamp

Project lead
Mario Russo, Harvard Medical School

Teammates
Abhinav Appukutty (University of Michigan Medical School) and Andrew Pack (Texas A&M College of Medicine)

Faculty mentor
Dr. Jennifer Potter, Advisory Dean and Director of William Bosworth Castle Society, Harvard Medical School

Abstract

During the COVID-19 pandemic, health care problems proliferated while students were relegated to remote learning environments. There was a need to virtually supplement student education and collaboration while narrowing the disconnect between rising health care needs and trainees with the technical expertise to tackle these challenges. This Virtual Innovation Bootcamp empowered students across various disciplines to remotely collaborate on COVID-19-related solutions. The Bootcamp focused on five core educational objectives key to innovation and entrepreneurship and was coupled with mentor support, resources and funding to enable experiential learning and solution design. 76 students from 23 institutions and 4 countries completed the program. In four weeks, 17 multidisciplinary teams developed 13 prototypes and submitted two provisional patent applications. Our overall approach emphasized health systems science domains including leadership, change agency and interprofessional education, while supporting projects that spanned clinical informatics/health information technology, population health, health care processes and health system improvement.

Project addressed/problem discovered

The COVID-19 pandemic has demonstrated how the health care system relies heavily on medical innovation for solutions to critical health care problems while also highlighting important barriers to innovation. The typical timeline of innovation can span years before benefiting patients and health care workers. Exacerbating this, training in innovation and entrepreneurship within health care is scarce. Despite university students being an abundant talent pool for innovation in ameliorating these barriers, opportunities for students to learn about and explore the medical innovation space are limited.

As a result of the pandemic, students were relegated to online classes with few opportunities to apply their skills or time to contributing to combatting the pandemic. Students were eager to use their skills and energy, but lack of structured opportunities, financial resources and educational and support structures presented hurdles. While some academic institutions have offered mini-grants and fellowships for faculty to develop COVID-related solutions, little has occurred to foster collaboration or experiential opportunities for students to address urgent pandemic issues.

In important efforts to address these problems, various design challenges and hackathons have mobilized thousands of students and professionals to create solutions. However, these programs were often limited by their short time-course and lack of financial support, mentor feedback and/or educational resources. Thus, there was a strong need for immersive, virtual opportunities for interdisciplinary teams of students to learn fundamentals of medical innovation and entrepreneurship, develop solutions, contribute to our collective response to the pandemic, and gain resources and tools to jumpstart and sustain technology development moving forward.

Approach

As gaps in health care delivery were exacerbated by COVID-19, our student-led team at Sling Health sought to empower students to rapidly develop needed solutions. We created an intensive 1-month program that enabled

students to enhance their entrepreneurial education while innovating solutions. From the onset of this project, our approach emphasized leadership and change agency, interprofessional teamwork and education, and scholarship and professionalism.

Recruitment was driven by the opportunity to connect with peers, access diverse mentors and actualize COVID-19 solutions. The program was preceded by an organic, team-formation process where students joined teams by discussing interests and skill sets. This voluntary process established a virtual gathering place for self-starter, driven students looking to lead and drive change. Additionally, by promoting interdisciplinary and multi-institution teams, our approach emphasized that students should reflect and acknowledge their strengths, build on their areas for improvement from their peers, and build the necessary teamwork skills to contribute to an end product focusing on improving patient care.

To support these students, we constructed a comprehensive program that walked students through the innovation process from problem identification to business analysis to prototyping. For our first-time entrepreneurs, we partnered with the National-Institutes-of-Health-funded Entrepreneurship for Biomedicine program to curate in-depth videos explaining the innovation and entrepreneurship process. This aspect of our approach focused on scholarship, enabling experiential team learning in a variety of projects including patient safety, health information technology, public health and basic science research. Following this, weekly check-ins led by executive members outlined developmental goals of focus and educational events to support their success. Weekly design reviews with entrepreneurs and clinical leaders provided feedback and guidance based on the weeks' milestones.

Ultimately, teams submitted their final video pitches and executive summaries to be evaluated by an expert panel, with the top teams competing for additional funding. Successful teams, by advancing and modifying their projects while proceeding through the Bootcamp, were able to grasp the linking domain of systems thinking. These teams were able to understand the array of interdependent relationships and pieces in the health care entrepreneurship field in their journey to innovate and address important COVID-19 problems.

Outcomes

The one-month Virtual Innovation Bootcamp proved to be impactful in its ability to connect motivated students and mentors, educate students, and generate solutions to the COVID-19 pandemic. In all, 76 students across 17 teams completed the program, with 52 completing an optional exit survey that evaluated respondents' perceptions of self-improvement and programmatic success. The Bootcamp brought together students from 15 states in the U.S. alongside Bangladesh, Canada, and Pakistan. Majority of the respondents (67%) were female, with students identifying as Asian (62%), White (21%), Black (14%) and American Indian (4%). Furthermore, participants contributed skill sets derived from diverse backgrounds (21% in medicine, 52% in engineering, and 25% in business, arts, or sciences) as well as diverse stages of their careers (62% undergraduate students, 31% graduate students, 7% professional). Notably, the Bootcamp was successful in engaging new entrepreneurs, as 67% indicated this was their first entrepreneurial experience. Joining these students, 26 mentors served as subject matter experts and provided feedback throughout the program.

Respondents held favorably the educational supplement this program provided them. 92% agreed that the Bootcamp was a valuable supplement to their education during the pandemic, and 83% believed it helped them contribute during the pandemic. This is further illustrated by the Bootcamp's success in meeting all five of its educational objectives key to entrepreneurship and innovation (performing market research, developing a solution/prototype, constructing a business plan, pitching/presenting an idea, and working on a multidisciplinary team), with statistically significant self-reported improvements in each of these competencies. These teams also achieved many milestones, completing together 62 design reviews, developing 13 prototypes, and submitting 2 provisional patents. Furthermore, 90% indicated that they would continue working on their projects after the Bootcamp's conclusion. Prototypes developed spanned a broad range of clinical areas, with example solutions including an on-demand service that connects nurses

with patients, a mask that captures aerosolized droplets to minimize disease transmission during extubations, and a social media campaign to fight disinformation online. This Bootcamp serves as a model to pragmatically inspire collaboration and elevate others to develop urgently needed solutions to the world's pressing issues.

Personal impact

The poignant context in which this program was developed and necessitated solutions continues to shape my perspective of my role as a physician. Having a foundation in engineering from my undergraduate studies, I've developed confidence in our ability to develop solutions to the problems impacting patients and health care. Bolstering this, the invaluable mentorship from physicians and health care professionals that enabled this program to foster solutions invigorates my desire to not only contribute to innovation throughout my career but empower students to do the same. The Bootcamp has shown that students can make an impact in health care, and my experience leading this program motivates me to make innovation accessible to all throughout my career as a physician. Furthermore, the rise of this Bootcamp added to my entrepreneurial agency a strong desire to impact health care systems. As we're taught through medical school and which has been exemplified by the pandemic, health care in America is inadequately prepared to support the well-being of many in our society. This program has shown me that individual patient care I provide alone cannot solve this. Change in systems is necessary to resolve the lacking value placed on preventive care, the barriers that make care inaccessible to disadvantaged populations, and more. Because of this program, I'm eager to seek a deeper understanding of health care systems and weave this with my engineering training. I will continue to promote others in interprofessional collaboration, enabling them and myself to thrive in championing positive change in health care.

Designing a Robust Case Interviewing, Contact Tracing and Cluster Investigation Program

Project lead
Andrea Szabo, Case Western Reserve University School of Medicine (CWRU), project implemented at Cuyahoga County Board of Health

Teammates
Dr. Johnie Rose (CWRU), Dr. Amina Egwiekhor (University Hospitals [UH]), Dr. Jill Miracle (UH), Dr. Kurt Stange (CWRU), Dr. Pauline Terebuh (UH), Dr. Prakash Ganesh (UH), Dr. Wail Yar (UH) and Dr. Adeola Fakolade (UH)

Faculty mentor
Heidi Gullett, MD, MPH, Associate Professor, Case Western Reserve University School of Medicine

Abstract

The COVID-19 pandemic quickly overwhelmed local health departments with needs for high volume case interviews, contact tracing, and outbreak investigation at the same time that medical students were looking for ways to help amidst cancellation of rotations. Students, residents and faculty at Case Western Reserve University School of Medicine (CWRU) partnered with the local health department, the Cuyahoga County Board of Health (CCBH), to create a case and contact tracing program and cluster investigation team comprised of first- through fourth-year medical and physician assistant students as well as preventive medicine residents (PMRs) from University Hospitals. Our program allowed medical students to continue their medical education in a unique, value-added way as well as give back to the community by supporting the local health department in preventing the spread of COVID-19.

Project addressed/problem discovered

The COVID-19 pandemic greatly impacted medical education by suspending in person learning for medical students with a delay in developing a remote learning curriculum while local health departments simultaneously experienced an urgent need for a skilled workforce to adequately address the emerging infection. Additionally, medical students were unable to perform volunteer activities which further affected the most vulnerable in our community. However, given our early exposure to health systems science (HSS) and systems thinking, we knew we could be of great value to the local public health response as the first COVID-19 cases within Ohio occurred in greater Cleveland and quickly spread.

Because CWRU and CCBH have a long-standing history of partnering, the Cuyahoga County medical director, also a CWRU faculty member, offered me the opportunity to join the COVID-19 response on week 1, assisting CCBH with case interviews and contact tracing. I quickly saw the value of employing my HSS training and recruited other students to join. When other contact tracing programs in New York and Boston were getting national attention, we had already implemented many process improvements in our student-led contact tracing program, which also served as a telehealth elective for medical students. We shared our process early on with other medical schools including Penn State University and Emory University, the Ohio Department of Health (ODH), and through a public webpage with training videos (http://www.ccbh.net/covid-19-responder-resources-and-toolkits/) that were shared nationally. We even helped design and conduct a contact tracing training program through ODH for individuals hired by the state.

Approach

With CWRU leadership, we created an elective where medical and physician assistant students received telehealth credit for partnering in the CCBH COVID-19 response. In the following program description, nearly all HSS domains are represented. CWRU faculty, CCBH staff, and the PMRs supervised the elective by guiding students

in case interviews, contact tracing, outbreak investigation, and policy development. Together, we designed an interview form that gathered all the required information to report to the state, was logically organized to create a flowing conversation, and included preferred written and oral language as well as a resource section to ensure individuals could appropriately isolate or quarantine with access to food, cleaning supplies, and a thermometer, among other items. We understood the importance of social determinants of health from our medical education and saw their impact on the spread of the virus. We were always working on process improvement for performing case interviews and outbreak investigation especially as we learned more about the virus.

This elective also built upon a pandemic influenza simulation all students experience as part of our first block of medical school which is our foundational HSS course. In this context, our application of systems thinking also helped us quickly realize that all the cases we had been interviewing separately had common exposures such as social clubs or events. Whenever two or more cases occurred from a particular setting, we called it a cluster. Soon we had clusters identified in employment settings and health care settings, especially residential care facilities which enabled us to create a sophisticated outbreak investigation response, including the formation of strike teams with COVID-19 testing in the field. Our training in HSS also enabled us to create numerous systems and process maps to increase efficiency in the response. We were a vital part of the health care structure during the beginning of the pandemic to be able to offer testing whenever outbreaks were occurring. Eventually we transitioned the contact tracing program to health department staff, and our role transitioned to be more of a consultant and offer guidance when needed.

Outcomes

We enrolled over 80 medical and physician assistant students into the program which afforded them practice interviewing patients through telehealth, while also gaining contact tracing and outbreak investigation experience. During case interviews, students gathered the history of present illness, past medical history, review of systems and social history from patients. They were able to assess resource needs and refer people for items, including food, cleaning supplies, and medications. They also had the opportunity to use interpreter services for the first time as well as employ cultural humility in responding to cultural differences like having a husband speak on behalf of the rest of the family or some families using water to clean rather than bleach or alcohol-based products. Students educated patients by explaining the difference between isolation and quarantine as well as reasons for testing recommendations. Students also practiced rapport building which is even more challenging in a telehealth situation. Many students helped at CCBH for more hours than required by the elective which filled up quickly every month, demonstrating the value to students.

Our student team provided over 5,000 work-hours helping CCBH with contact tracing and cluster management. We designed a public health response system that we were able to hand off to CCBH staff to continue to improve with return to our rotations and a contact tracing training we were able to handoff to ODH. We also helped build relationships between the health department, residential care facilities, hospitals, employers, schools and other entities involved with cluster management. These relationships will hopefully continue with other health and advocacy issues as well.

It is hard to measure the impact our contact tracing efforts had on the community, but the Cuyahoga County medical director believes our contact tracing efforts helped flatten the curve and reduced fatalities as opposed to other counties or states. As of September 1, our county has over 10,000 cases of which we have been able to identify and manage over 200 clusters. Finally, our work was highlighted by our state health director in a governor's press conference and in numerous news articles as a model program.

Personal impact

I had the incredible opportunity to make lifelong connections with other medical and physician assistant students, residents, attending physicians, local health department colleagues and members of the public. As I continue my medical career, I will often reflect on our critical role in this collaborative COVID-19 pandemic response.

I saw the struggle with communication and differing agendas from multiple stakeholders. At times I was frustrated that not everyone seemed to be focused on the overall health of our community. Other times, I was encouraged by partnerships like when CCBH and MetroHealth worked together to design a community testing plan. Overall, I have a better understanding of the difficulties of collaboration, but also, the power of those collaborations for the well-being of our community.

I have also gained an appreciation for the importance of public health and its integration with medicine. I have now seen how much policy can impact the community such as mask mandates which showed trends in decreasing cases and the stay-at-home order which made contact tracing more manageable. I also have a deeper appreciation for how essential training in HSS is for all physicians. It was also a rewarding experience to understand the benefits and consequences of making recommendations such as starting school virtually and how much thought must go into any policy decision. Through my experience, I know I will remember the special skills health departments can offer, and I hope to continue to work with my local health department throughout my career.

Innovative PPE Solutions for the COVID-19 Pandemic

Project lead
Nathaniel East, Brody School of Medicine at East Carolina University

Teammates
Andrew Ray and Carleigh Amyot

Faculty mentor
Dr. Michelle Brownstein, Associate Professor, Trauma and Surgical Critical Care, Brody School of Medicine at East Carolina University

Abstract

The goal of this project is to develop innovative solutions to personal protective equipment (PPE) shortages through the use of facial scanning, 3D printing technologies and an interdisciplinary approach to testing and validating new PPE products. We created three products that can be manufactured with 3D printing, including a face shield, a standardized N95 type respirator, and the "Pirate Mask," a customized N95 type respirator that uses a 3D face scan to create a personalized mask for ideal fit. These products went through multiple iterations of design, testing and refinement to improve fit, comfort, and usability. We currently have two studies under IRB review that will assess and compare these products to traditionally manufactured PPE products.

Project addressed/problem discovered

This project addresses two issues: the PPE supply chain issues revealed by the COVID-19 pandemic as well as the difficulties with creating effective face masks using traditional manufacturing. Hospitals around the United States and the world at large experienced PPE shortages in the early days of the pandemic. Although our hospital currently has an adequate supply of PPE products to deliver safe and effective care, the supply chain problems still exist and may worsen if pandemic infection rates rise. Therefore, it is vital to explore all options to ensure health care workers continue to have an adequate supply of PPE. Many 3D designers around the United States have attempted to address this issue by designing respirator masks and other PPE, however, few have been tested and refined with physician input. We used some of these freely available designs as starting points for our products, making modifications based on physician feedback.

The second issue addressed is that of creating effective PPE using traditional standardized manufacturing processes. Health care workers have long been aware of the difficulties many individuals have with passing "fit tests" using N95 respirators. Variations in facial dimensions from individual to individual make it impossible for a standardized mask shape to fit everybody. Many health care workers are required to wear powered air purifying respirators (PAPRs) or other heavy, uncomfortable PPE as a result.

Approach

This project aimed to address health care structure and process issues surrounding PPE shortages by creating a novel route for PPE supply. Our project took an interdisciplinary approach by involving team members from a number of different domains. Students from ECU's School of Design helped find, create and modify the designs as well as helping with the 3D printing process itself. Students from ECU's School of Engineering created an apparatus for particulate testing to evaluate different commercially available filtering materials as compared to N95 filter material. Physicians from ECU's Brody School of Medicine and Vidant Hospital tested the mask for fit, comfort and usability. ECU's Department of Occupational Health and Safety provided fit testing supplies and services. Our approach to the issue of ill-fitting PPE was to create a process for manufacturing personalized PPE products. Commercially available phone apps are now capable of conducting a 3D scan of a person's face. We then use that scan to create an N95 respirator-type shell that is perfectly

molded to the contours of that person's face. We then add padding, a strap and a disposable filter insert, and the product is ready to wear. This approach unlocks the true potential of 3D printing technology. Although 3D printing is not capable of matching traditional manufacturing processes for speed and volume, it has the advantage of being able to create personalized, reusable products without a vast retooling of the manufacturing line.

Outcomes

We created three products: a face shield, a standardized N95 type respirator mask and a customizable N95 type respirator mask that uses a face scan to create a personalized mask for optimal fit. This customized mask design makes use of the maximal potential of 3D printing and its main advantage over traditional manufacturing processes by creating a truly individualized mask. Our 3D printed products can be sanitized and reused multiple times and make use of disposable filter elements and plastic shields to maximize material efficiency and minimize waste. Our physician focus groups loved the fit and comfort of our custom masks, which we dubbed the "Pirate Mask" after ECU's mascot. We currently have two studies under IRB review that will evaluate our masks and face shields with a variety of health care workers in the clinical setting at Vidant Hospital in Greenville, NC.

Personal impact

I've always been a hands-on person. I like to build things and tinker — usually with my bicycles and motorcycles, and more recently with woodworking. This project was the first time I got to apply that love of tinkering to medicine — and it was a ton of fun. It's practical problem-solving at its best. One of the biggest advantages to 3D printing is the ability to rapidly create prototypes — you can go from an idea to a product in hours. We created dozens of iterations of each of our products in the span of just a few weeks. It made me think a lot about how much potential this technology really has for the field of medicine. Currently, 3D printing is underused in medicine. The most common application is creating 3D models for medical education. However, there are a few areas where 3D printing is being used to its real potential. One example is printing cheap, personalized prosthetic devices for amputees. 3D printing technology is still in its infancy — but commercially available printers are getting cheaper and more capable every year.

This project showed me that medical research doesn't have to be an onerous and tedious process. It can be a fun and creative exercise. Although there's still a lot of work to be done to test and validate my products in the clinical space, I have the satisfaction of knowing that I've created these products — and I can apply that know-how to future problems.

Jefferson COVID-19 Student Volunteerism Platform: A Practical Approach to Apply Health Systems Science Principles Amidst a Pandemic

Project lead
Alexandra Leto, Sidney Kimmel Medical College at Thomas Jefferson University (TJU)

Teammates
Eva Bernstein (TJU), Casey Moffitt (TJU) and Nathan L'Etoile, MD (Children's Hospital of Philadelphia)

Faculty mentors
Dimitri Papanagnou, MD, MPH, EdD, Associate Professor and Vice Chair for Education, Department of Emergency Medicine, Associate Dean for Faculty Development and Health Systems Science Thread Director (TJU)

Charles A. Pohl, MD, Vice Provost, Student Affairs, Vice Dean, Student Affairs and Career Counseling, Professor of Pediatrics (TJU)

Abigail Kay, MA, MD, Associate Dean, Academic Affairs & Undergraduate Medical Education, Associate Professor, Department of Psychiatry and Human Behavior (TJU)

Abstract

At Thomas Jefferson University Hospital (TJUH) in Philadelphia, clinical departments became quickly overwhelmed with new responsibilities in the face of the COVID-19 pandemic. Using a systems thinking approach, our team identified several opportunities to develop and integrate student volunteerism projects in the hospital to support the health system. Projects were designed to alleviate excess burden on clinical staff by connecting departments with student volunteers who were eager to serve the clinical community at large during Spring and Summer of 2020. To streamline efforts, we created a centralized online repository to aggregate institutionally-approved volunteer projects and recruit medical student participants to assist with running them. The creation of the Jefferson COVID-19 Student Volunteerism Platform led to the development of 12 projects with the participation of over 280 student volunteers. Implementation of student volunteers into the workflow exemplifies the goals of the Quadruple Aim by improving both the clinician and patient experience.

Project addressed/problem discovered

Delivering health care in the time of the COVID-19 pandemic proved to be an unprecedented challenge to health systems across the globe. At TJUH, clinical departments became quickly overwhelmed with unique responsibilities in the face of this crisis. In considering the Quadruple Aim, the COVID-19 pandemic worsened both the patient and clinician experience. Health care providers on the front lines experienced physical and emotional exhaustion due to overwhelming demands on the health care system. Visitation restrictions in the hospital stripped patients of their familiar support system and led to feelings of fear, anxiety and isolation. In the outpatient setting, the transition from in-person clinic visits to telemedicine proved difficult for many patients and hindered their ability to access health care. All of these circumstances contributed to a suboptimal experience for both clinicians and patients alike. During this difficult time, medical students were abruptly transitioned from learning in a clinical setting to an online forum due to concerns for student safety in the hospital. This quick transition left students with a natural desire to reconnect with patients, teachers and mentors, while also feeling a strong drive to serve their community. Using a systems thinking approach, we identified an opportunity to help faculty and staff across the health system, while also providing students with the means to safely connect with the medical community. In doing so, we developed an integrated system by creating projects supported by student volunteers that were constructed to alleviate the burden faced by hospital departments during the COVID-19 pandemic.

Approach

In response to the spread of the COVID-19 pandemic, medical practices faced a sudden need to adapt their workflow to protect patients and staff. Physicians at an outpatient primary care practice at TJUH quickly realized the need to reevaluate in-person patient care. The staff at this practice began calling patients to triage, screen and convert their visits to telehealth, while prioritizing those with active medical problems. These phone calls quickly overwhelmed the staff during a time of increased patient concerns. It became evident that health professional students could assist with these phone calls; thus, alleviating the burden on medical staff while providing the necessary time to both comfort and support patients. It quickly became clear that many hospital departments were in need of volunteers due to the increased clinical demands. This need was met with an overwhelming response by the TJU student body to offer support to the health system. In order to streamline the process of helping these departments, we created an online repository to aggregate institutionally approved projects and recruit student volunteers. This repository consisted of two interfaces. One interface, the department intake form, was for TJUH clinical departments to submit developed projects. The other interface, the student volunteer intake form, was for students to sign-up for volunteer projects needing participants. A student-led project development team worked to contact departments and assist with project refinement. The ultimate result was the creation of the Jefferson COVID-19 Student Volunteerism Platform. This platform also provided a place to display community-wide volunteer initiatives established independent of the university. The platform was then advertised to the student body through a variety of communication outlets as a centralized forum for students to access volunteer opportunities. The development of the Jefferson COVID-19 Student Volunteerism Platform exemplifies the domains of health care structure and process and health system improvement. The traditional model of departmental workflow no longer functioned in the setting of a global health crisis. This resulted in the need to reshape the paradigm of providing health care for the safety of both patients and health care providers. The implementation of student volunteer projects resulted in improvement of the health system in the time of crisis.

Jefferson COVID-19 Student Volunteerism Platform: https://jeffline.jefferson.edu/education/programs/volunteer/

Example Department Intake Form: https://jeffline.jefferson.edu/education/programs/volunteer/intake_dept_form_sample.cfm

Example Student Volunteer Intake Form: https://jeffline.jefferson.edu/education/programs/volunteer/intake_student_form_sample.cfm

Outcomes

Our project evolved into a concerted, enterprise-wide initiative spanning multiple medical fields, organizations and communities with hundreds of student volunteers participating across the university graduate and undergraduate colleges. In total, 12 projects were developed by students to directly support TJUH departments during the COVID-19 pandemic. In addition, we connected countless student volunteers to over 15 non-university affiliated community projects. Ultimately, our platform successfully linked hundreds of students across the university to a multitude of projects. Common tasks performed by students participating in volunteer projects included triaging patients over the phone, assisting patients in transitioning office visits to telemedicine visits, providing necessary Centers for Disease Control and Prevention (CDC) guideline information about COVID-19, and fostering a caring environment for patients scared in this global pandemic. Some unique projects involved remotely staffing hotlines to support the hospital faculty and staff and answering any questions they had about occupational exposures, leaves of absences, and CDC guidelines for providers. These initiatives were all developed to support the clinician and patient experience across the Jefferson Health System. Outcomes for the original project developed to support the outpatient primary care practice have been reviewed. Over 150 student volunteers attempted to contact over 4,800 patients. In addition, we have received reports that none of the faculty or staff within the primary care department contracted COVID-19 through an occupational exposure over the course of the student volunteer initiative. Another project was developed to collect iPads for donation to the emergency department (ED) at TJUH. These iPads facilitated triaging and patient care for high-risk patients, ensuring

provider and staff safety when in the clinical environment. This project donated a total of eight iPads to the ED. The aforementioned projects are examples of those developed as part of the Jefferson COVID-19 Student Volunteerism Platform. In total, over 280 students participated in these volunteer initiatives. Student volunteers spanned six colleges across the university. These colleges included the Sidney Kimmel Medical College as well as the Colleges of Health Professions, Nursing, Population Health, Pharmacy and Life Sciences, thus modeling inter-professional collaboration. Outcomes involving patient impact are still being evaluated for many of these projects.

Personal impact

This experience has greatly impacted my time in medical school and shaped my future career. It has been powerful to watch my classmates come together to support a health system in crisis. Additionally, it has been moving to watch both friends and colleagues donate their time to support the mentors, teachers and patients who have shaped us as future physicians. I was humbled by having teachers and mentors ask for help, thus bridging the gap between educator and colleague. I have found within myself a leader who can be relied upon in a time of crisis and facilitate formative action to support those in need. These experiences have allowed me to believe in myself as a future leader in the medical field. In addition, I hope to have the courage to ask for help as I have witnessed in order to protect my patients when I don't believe that I can do so alone. I have also learned how the power of systems-based thinking in the health care setting can harness the potential of the masses and create important change in the face of adversity. It has been difficult to learn the nuances of the health care system and how to join various institutional entities together. It has been a meaningful experience merging the overwhelming desire of students to volunteer during the COVID-19 pandemic with the needs of a struggling health system, all while ensuring the safety of those participating and, most importantly, facilitating patient care.

Leveraging Enterprise Text Messaging to Deliver Real-time Clinical Guidance to Hospital Employees During the COVID-19 Pandemic

Project lead
Cheyenne Williams, Perelman School of Medicine at the University of Pennsylvania, project implemented at the University of Pennsylvania Health System

Teammates
Aditi Rao PhD, Justin Ziemba MD and Jennifer Myers MD (all with the University of Pennsylvania Health System)

Faculty mentor
Neha Patel, MD, Associate Chief Informatics Officer, University of Pennsylvania Health System

Abstract

As the COVID-19 pandemic unfolds, hospitals face the challenge to reliably communicate evolving guidelines to employees across multiple departments and disciplines. Our team leveraged enterprise text messaging as a crisis communication intervention to deliver targeted updates directly to the smartphones of front-line employees. Content of messages focused on guidance for proper personal protective equipment (PPE) use and evolving PPE policies and included a current COVID-patient census. Recipients of the messages could also reply with feedback or questions. We found that read-rates were superior to those of blast emails, with 60% of enterprise texts read within 24-hours of delivery, and 18% read within 10 minutes. Surveys revealed employees found the messages useful and preferred the texts over emails. Furthermore, COVID-19 exposure and infection rates of hospital personnel decreased during the intervention period. We describe how leveraging enterprise text messaging can help to efficiently and effectively communicate to hospital employees during crises.

Project addressed/problem discovered

Responses to the COVID-19 pandemic introduced evolving policy and practice changes that were necessary for protecting the health and safety of patients and health care personnel. With more than 3,000 health care workers inadvertently infected in the early months of the pandemic in China, health care providers became a critical population for receiving timely communication about infection prevention strategies. Several recommendations were issued regarding the need for agile crisis communication strategies in the inpatient setting. Updates like PPE requirements and COVID-19 symptom screening policies spanned system-wide operations across every discipline and department. Furthermore, it remained valuable to provide multiple safe channels for hospital leadership to obtain employee feedback. In considering the health systems science concepts of leadership and safety, our team at the Hospital of the University of Pennsylvania (HUP) quickly recognized this need for communicating updates in a reliable platform that supplemented our traditional hospital communication strategies of mass emails, in-person huddles and phone conferences. We also recognized that hospital staff who were actively taking care of patients needed to receive important communication in a timely and effective manner.

Traditional communication methods each have limitations. Although email allows leadership to deliver consistent messages to large groups, readership is often poor among employees, and few are able to provide feedback. Conversely, engaging hospital employees with in-person huddles is not feasible with large groups and employees with variable shifts throughout the week. Given the uncertainty surrounding COVID-19, inconsistent messages may create dramatic unintended consequences including eroded trust in leadership and ineffective adherence to safety measures.

Approach

Over the last decade, smartphone-based text-messaging via HIPAA-compliant applications has been demonstrated

as an advantageous method for both two-way and group in-hospital communication. Leveraging this existing informatics infrastructure for secure messaging, our team developed an enterprise text messaging workflow in order to: (1) deliver COVID-related information directly to hospital employees in a consistent and timely way, (2) promote uptake of this safety information to minimize exposure events and (3) provide a mechanism for two-way text communication between hospital employees and leadership to facilitate front-line feedback about pandemic policies.

This enterprise text messaging intervention was a systems-thinking strategy that centralized and unified pandemic communication ultimately facilitating effective leadership, teamwork and health system improvement.

As COVID-19 surged in March 2020, a multidisciplinary team formed with experience in communication, informatics, and quality and safety. We leveraged an existing secure text-messaging tool, Cureatr, to deliver messaging from hospital leadership to front-line staff. All hospital employees, including physicians, nurses, social workers, environmental services, technicians and secretaries had access to Cureatr and previously utilized it routinely for horizontal communication within care teams. We modified this previous use of Cureatr in order to facilitate effective communication from leadership by delivering vertical messaging. We created a sender account titled, "Penn Infection Control" which mirrors a health system department widely recognized as expert on infection control policies. When an enterprise message was sent from this account, it was immediately distributed to all on-service clinical employees and appeared on their mobile devices as a push-notification. Advantageously, since Cureatr is a two-way communication tool, recipients also had the ability to reply back to "Penn Infection Control" with feedback or questions.

Ensuring messages sent to hospital employees were accurate and up to date was critical during the surge. Message quality-control was maintained through multiple tiers of review. To develop content, special consideration was given to policies being newly implemented, questions frequently raised across departments, observed deviations from existing guidance, and/or exposure events. Messages focused primarily on health system improvement through increased safety and infection control strategies, such as appropriate PPE use, locations for isolating COVID-19 patients, and a weekly COVID-patient census.

Outcomes

During the intervention, 34 enterprise text messages were sent, on average, to 1997 users. Our platform allowed us to obtain "read" receipts for each message sent. On average, 60% of enterprise messages were read within 24 hours, translating to approximately 1,200 readers per message, and 16% of messages were read within 10 minutes (approximately 325 readers). Peak readership (79%) occurred during the second week of the intervention period on April 1st, 2020. Interestingly, this message date coincided with the initial acceleration in surge activity. Readership fell slightly following the first week of the intervention but remained consistently at 60% in subsequent weeks. Notably, the readership rate for mass emails, which were sent daily to approximately 9,500 employees, was 42%.

Twice during the intervention period, we administered Likert-scale surveys to message recipients to assess the perceived utility of the enterprise text messages. The first survey, administered 15 days after the intervention began, achieved a 10.1% (207/2,049) response rate and showed that across specialties and roles, 79% (n = 163) of respondents found the messages "valuable." Seventy-three percent (n = 151) of respondents "would recommend" the messages to their colleagues, and 55% (n = 114) preferred the enterprise text messages to broadcast emails. The second survey, administered 63 days after the intervention began, achieved a 6.7% (137/2,049) response rate and showed that 80% (n =109) of respondents found the messages "valuable." When asked about how enterprise text messaging could be used in the future, 31% suggested continuing them for COVID-19 communications, and 28% suggested them for information about changes in hospital operations or patient flow.

We also measured COVID-19 exposure events among hospital employees. We defined employee exposure events as patient-to-staff exposure, staff-to-staff exposure, or other workplace exposure to COVID-19. Prior to implementing

our intervention, the median number of employee exposure events per day totaled 9.5 (IQR= 20.5). The maximum number of exposure events in one day reached 113. Following the implementation of our intervention on March 26, 2020, the number of exposure events per day significantly dropped ($p<.001$) to 1 (IQR = 4) with a maximum of 31 events in one day.

Personal impact

Although the COVID-19 pandemic has posed unprecedented challenges to medical student learners, I feel that my incorporation as a medical student team-member in this system-wide initiative has also provided unprecedented opportunities for education and growth. Working on this project has been invaluable for enhancing and crystalizing my practical knowledge of health systems science and implementation of the concepts of leadership, informatics, communication, and safety. Far beyond didactic learning, close teamwork with an interdisciplinary team of faculty leaders across a myriad of fields and disciplines has provided experiential learning of how systems thinking is applied toward enhancing occupational safety and in turn, patient safety. Furthermore, I was able to adapt these frameworks to new challenges like this innovation's small part in the COVID-19 pandemic response. My role as project manager also allowed me to develop new skills for coding, data representation and visualization, and presenting innovations to a health system leadership audience. These skills will be utilized heavily throughout the remainder of my training and hopefully in my ultimate career in academic medicine.

Abstract

As the number of COVID-19 patients in Boston increased during March 2020, there was a new need for physicians to care for patients admitted to Massachusetts General Hospital (MGH). The Department of Radiology was one of the first to volunteer based on a belief that radiologists can provide high-quality clinical care and that it was incumbent on us to support our medicine colleagues.

Radiologists on the Wards as Internists: Clinical Redeployment During the COVID-19 Pandemic

Project lead
Mari Tanaka, Massachusetts General Hospital

Teammate
Samantha Harrington MD, MSc

Faculty mentor
Michael Gee, MD, PhD, Chief of Pediatric Radiology, Vice Chair of Clinical Operations - Radiology; Massachusetts General Hospital

Through volunteers, the radiology department successfully and continuously staffed a COVID-19 surge team from March 2020 to May 2020. Initially staffed by radiology residents and fellows, faculty also volunteered for clinical duty. Radiologists provided high-quality care to COVID-19 patients admitted to MGH, helped develop and streamline onboarding training for additional providers to ensure a large effectively trained volunteer pool, and demonstrated the importance of inter and intra-departmental teamwork at a systems level to address an unprecedented challenge.

Project addressed/problem discovered

Leading up to March 2020, the world watched as COVID-19 patients surged around the world and in New York City. Due to the anticipated influx of patients, staffing of COVID-19 surge units became a priority leading to massive provider reassignments. A call was sent out to the various residency programs throughout the hospital for help staffing these floors.

Radiology residents volunteered, trained, and were the first residents re-deployed to clinical duty outside of their specialty. Many other radiologists were initially apprehensive about volunteering due to the potential length of re-deployment and lack of knowledge about the EHR in the clinical care setting. A commonly held perception among radiologists was that it would take many days to become facile with the EHR in the clinical setting especially among those who had been separated from their clinical intern year by greater than four years.

Systems science manifested itself in multiple ways throughout this process. Despite the misconception that radiology is separated from direct clinical care, our volunteers firmly believed that radiologists can deliver high-quality patient care with appropriate training and supervision. This required substantial teamwork between radiology residents and the department of medicine to create clinical care teams.

Given the unprecedented nature of clinical re-deployment of radiologists at MGH, it required substantial leadership at all levels and effective communication within a complex and large health care system to meet the needs of COVID-19 patients through novel training and voluntary redeployment of physicians outside of their specialty.

Approach

The primary goal of this initiative was for radiologists to deliver safe and high-quality medical care to COVID-19 floor-level patients admitted to MGH. To achieve this, systems thinking in leadership and team-building between radiology residents and members of the department of medicine were paramount in addressing issues the health care system structure presented.

First, as all radiologists complete a clinical internship, it was believed that residents had the appropriate clinical training and knowledge to provide effective patient care. To polish these skills and ensure safe practice, clinical informatics and health technology were employed for the quick dissemination of practice guides by the department of medicine. These guides were updated daily due to the growing knowledge surrounding COVID-19 treatment.

Radiologists were trained using virtual meeting platforms. Key areas of training included documentation and ordering in the electronic health record, which is not typically part of the radiologist's everyday workflow.

Through streamlined training, the creation of macros and templates, and modifying the EHR interface for ease of use, we were able to equip many radiologists quickly for the wards in a way that was accessible to new clinical EHR users. This resulted in increased numbers of volunteers, particularly attendings who previously held misconceptions about their inability to learn the EHR in a short timeframe. This pipeline of radiologists ensured the continuous staffing of the COVID-19 surge team with volunteers.

The final goal was to communicate the importance of a wide-scale team-based effort to the remainder of the department and the hospital. This relied strongly on leadership and the ability of radiology residents to be agents of change. Many were appropriately concerned about their ability to provide patient care outside their normal scope of practice as well as their personal safety. Radiologists who had already been redeployed described their experience to the department, including training and oversight by an attending with training in internal medicine.

Outcomes

We had 25 resident volunteers, 12 fellows, and eventually 33 faculty volunteers. A total of 22 radiology volunteers were redeployed between March 30 and May 6, 2020. The volunteers continuously staffed one surge team on an inpatient ward comprised of nearly all COVID-19 positive or COVID-19 risk patients. A team consisted of a pair of radiology volunteers, who worked four continuous day shifts under the supervision of an attending physician from the department of medicine.

Radiologists were able to offset some of the stress the large number of COVID-19 patients had on the health system. Our volunteers received positive feedback from both patients, the department of medicine and floor staff. Radiologists successfully cared for floor patients, including participating in multidisciplinary rounds, discharging patients, and communicating plans with patients and their families.

Since radiology residents were one of the first teams to redeploy as internal medicine providers, our residents were able to offer valuable feedback and help shape/streamline subsequent training as additional providers from various divisions were brought on board to help staff additional surge teams. Members of the radiology department who had volunteered as providers on the COVID-19 wards spoke at virtual meetings to different departments, both within our hospital and at other hospitals, to try and inform others of the experience and answer questions.

Personal impact

This work was very important to us on many levels. The most poignant aspect of this experience was that the increased time spent interacting with patients brought key elements of social determinants of health to the forefront of our minds. Most of our patients were primarily Spanish speaking as COVID-19 hit their community particularly hard during the first wave. These patients were isolated from any visitors and were understandably very scared given the uncertainty. We were both a part of teams that had a physician member who spoke Spanish and saw first-hand the benefit to patients and the comfort they found having a physician who spoke their preferred language. As a result, this has further instilled in us the importance of having a diverse workforce as a major driver of improved patient care.

As we continue further in our path of training, we often identify more as a member within our own specialty, radiology, than as a physician. Working on a COVID-19 unit reminded us we are first and foremost physicians and then radiologists.

Last and most important, the concept of teamwork within both a large radiology department and a complex health care system was the crucial factor that made this both possible and successful. Radiology residents were effective agents of change by demonstrating the ability to quickly become effective medicine providers and showed others how to do the same. This fostered teamwork and the development of a large volunteer pool that spread the

clinical workload.

This endeavor strengthened relationships between attendings, fellows and residents within our department, but also between our department and members of the department of medicine. Although the COVID-19 pandemic has changed our lives in many ways, we will always value that teamwork allowed us to persevere and take the lessons we learned forward to continue to take care of our patients and their communities.

UTCOM Cares: Applying a Health Systems Science Approach to meet the Quadruple Aim of Health Care During a Global Pandemic

Project lead
Angela Jacob, University of Toledo College of Medicine

Teammates
Christian Posadny, Jass Kaur, Shivam Shah, Medea Shanidze, Gabrielle Hymel, Aditi Singh, Kylie Rostad, Meghan Lark and Stephanie Cordonnier

Faculty mentors
Stephanie Mann, MD, Associate Dean for Clinical Undergraduate Medical Education, University of Toledo College of Medicine

Coral Matus, MD, FAAFP, Assistant Professor, Assistant Dean, Clinical Medical Education Foundational Sciences Thread Director, UTCOMLS

Abstract

The COVID-19 pandemic resulted in unprecedented resource gaps in our nation's health care system. Within our community, there were both patient populations and health care workers who needed support, as well as engaged, innovative medical students who sought opportunities to provide that support to these populations in need. A group of motivated medical students at the University of Toledo College of Medicine joined together to form UTCOM Cares and utilized a systems thinking approach grounded in the Quadruple Aim framework to provide critical resources for our community's at-risk populations. Quantitative outcomes (e.g. student hours, PPE distribution) and qualitative outcomes (e.g. health care worker burnout) have been and will continue to be measured. This collaborative effort emphasized the importance of using a health systems science-based approach in order to mitigate various obstacles that arise within health care, especially during a global pandemic.

Project addressed/problem discovered

The COVID-19 pandemic has widened infrastructure gaps within the health care system and the greater community, creating the need for immediate support and urgent action. The resulting disruption in undergraduate medical education created an opportunity to utilize the knowledge, skills and passion of our temporarily displaced medical students in an innovative manner to support the needs of our community and health care system. UTCOM Cares, a student driven collaborative, was formed in response to our overarching mission of identifying and providing crucial resources needed by our community.

Major gaps identified included:

1. Increasing demand for personal protective equipment (PPE).

2. Inaccurate measurement of the prevalence of COVID-19 and lack of critical risk mitigation strategies, such as contact tracing and community COVID-19 education.

3. New disparities in social and educational support for geriatric and pediatric populations, respectively. Specifically, restrictions on outside visitors to nursing homes increased the social isolation of residents who were unable to see family and did not have the technology to communicate with those outside of the facility. As school-aged children were being removed from their learning environments and required to follow social distancing protocols, there was a stark decrease in mental and physical stimulation available to them — something that could be detrimental to those in their formative years.

4. Health Care worker (HCW) burnout due to increased overwhelming responsibilities.

5. External factors impacting the ability of HCWs to perform both professional and personal tasks, e.g. childcare, pet sitting, errands and supplemental education for children of front line HCWs.

Approach

Our team rectognized the novel challenges arising from the COVID-19 pandemic. In order to address the needs of our community and health care workers, our team utilized a systems thinking approach grounded in the principles of the Quadruple Aim. This approach, along with a group of motivated medical students committed to service, provided an opportunity to address the infrastructure gaps created by the COVID-19 pandemic. Our collaborative effort aimed to improve the quality, experience and value of patient care by focusing on the well-being of our health care colleagues on the front lines. Upon reflection of our project, we used a retrospective design approach to identify our common goal and did so by assembling a high performing team using the input-process-output framework.

To engage and serve our communities, we focused on identifying and leveraging stakeholders in a concerted effort to improve our health system. A systems thinking perspective allowed us to, first, understand the "big picture" of the problem at hand and proactively consider ways to make meaningful connections between available resources and the needs of the community. Once we had a more complete understanding of how to connect resources with community and health care worker needs, we were then able to provide appropriate support to these populations. By providing numerous services for our health care workers, we aimed to reduce barriers to improving patient care and population health. Specifically, with services such as contact tracing and PPE drives, our project also focused on system cost reduction and improved health care worker wellness.

In an ongoing effort to serve both the community and our health care workers, we ensured that our projects were targeted toward the immediate, yet constantly evolving and ongoing areas of need. For example, with the health care worker assistance program, a weekly survey was sent out to assess both student volunteer availability as well as health care worker needs. Adjustments were made on a weekly basis according to the results of these surveys. A similar approach has been and will continue to be applied to the other initiatives within UTCOM Cares.

Outcomes

The following is a summary of our quantitative and qualitative outcomes to date:

1. PPE Initiative:
   - Quantitative: 600+ hours were spent in collection of thousands of face shields, ear savers, masks, respirators and more.
   - Qualitative: Although not directly measured, the availability of adequate PPE mitigated HCWs' concerns about safety, enabling them to focus on patient care.

2. Contact Tracing:
   - Quantitative: 27 student volunteers were recruited to join our local health department for participation in contact tracing. Volunteers reached out to contacts of confirmed cases to provide guidelines and education regarding ways to mitigate complications and spread.
   - Qualitative: Our team members felt that through contact tracing, they were able to mitigate the risk of COVID-19 spread and to prevent unnecessary hospital visits.

3. Pediatric Initiative:
   - Quantitative: 43 videos and learning modules for ages 5-11 were created, which have been viewed over 300 times as of September 2020.
   - Qualitative: Parents found the videos entertaining and stimulating for their children. Resources aimed toward parents coping with emotional stress, how to homeschool, and staying connected during social isolation were also provided and found to be helpful.

4. Geriatric Initiative:
   - Quantitative: 13 students involved with the geriatric program have engaged with residents of a local long term care facility via letter writing. 31 windows will be painted from the exterior during a "visiting day" on October 3, 2020.
   - Qualitative: Per the recreation director "these activities give the residents at the care facility something to look forward to."

5. HCW Assistance Program
   - Quantitative: 200+ volunteer hours have been offered in childcare, pet sitting, online tutoring and errands for HCWs.

- Qualitative: A physician who utilized childcare services commented: "When you're treating patients, you have to be totally focused on what you're doing. It's devastating to worry about what's happening at home, especially since the boys were homeschooling and our regular babysitter wasn't available. I never imagined the students' help would have been so valuable."

To further assess the outcomes of our efforts, we plan to send validated surveys that will address the impact of our HCW assistance program on provider burnout during the height of the COVID-19 pandemic.

Personal impact

UTCOM Cares has helped reinforce the importance of maintaining a team-based approach to health care. Although I did not intentionally start out thinking about how we could leverage the principles of health systems science (HSS) and the Quadruple Aim to solve an urgent need for our community, retrospective reflection has allowed me to take a deeper dive into HSS and has helped me to appreciate and understand the principles and competencies that are critical for me to become an HSS "native." Each and every community member and health care worker requires support to navigate the difficulties all have encountered during this pandemic. Although many in our graduating class have reiterated the desire to have been able to stay in the clinical setting, it has been a humbling experience recognizing the needs of our colleagues and asking how we can contribute to the solution during a time when we could not be on the forefront. The enormous toll this pandemic proved to create on the mental fortitude of health care workers cannot be ignored. UTCOM Cares has allowed us to be a stable source of assurance and aid when many health care workers were working harder than ever and dealing with far more death than usual. This movement has allowed us students to become more flexible, embrace change and deal with an unpredictable, rapidly changing health care environment. This effort has also highlighted the importance of ensuring our own personal well-being. Everyone is deserving of help. No one can do life in solitude.

Teaming

Improving Multi-Disciplinary Rounds in the era of COVID-19

Project lead
Anup Das, University of Chicago Pritzker School of Medicine

Teammates
Marie Dreyer, Kathleen Wiest, Chase Corvin, Anastasia Pozdnyakova, William Marsack, Stephenie Blossomgame and Anita Blanchard, MD for the IGNITE Teams

Faculty mentor
Dr. Vineet Arora, Professor of Medicine, University of Chicago Pritzker School of Medicine

Abstract

Multi-disciplinary rounds (MDRs) are traditionally an avenue for health care professionals with a variety of backgrounds to come together in a structured format and discuss individual hospitalized patient needs and barriers to a safe discharge. Realizing the full potential of interdisciplinary rounds within our current health care structure is only possible when principles of team-based care are applied across the board. Specifically, there must be a clear understanding of the different roles within the team, clear routes of communication must be established, and teams must work cohesively toward the same goals. Given the need for physical distancing, we transitioned to virtual MDRs. We identify current areas for improvement in our MDRs and developed best practices for MDR teams to their team-based functioning within MDRs during the pandemic.

Project addressed/problem discovered

Poor communication between residents on inpatient services and health professionals during multi-disciplinary rounds (MDRs) leads to lengthy, inefficient rounds and subsequent delays in discharges for hospitalized patient. At our hospital, MDRs consist of residents on inpatient services, case managers, social workers, pharmacists and nurse/ward managers.

In the era of the COVID-19 pandemic, MDR discussions at our hospital had to be moved to a virtual format, adding a potential additional barrier to succinct communication between health care providers. The team-based-care approach to patient care is an integral part of inpatient care, ensuring safe and high-quality care. Efficient means of communication with interdisciplinary providers with well-defined roles within a setting of cohesion and cooperation is a necessity for providing inpatient medical care.

Prior needs assessments have demonstrated that poor communication and misunderstanding of the roles of MDR-providers has caused lengthy, inefficient discussions at our hospital. Previous work at our institution has demonstrated that overall perceived effectiveness of MDRs by all staff was low (3.3 of 5 on Likert scale), and residents reported low confidence on roles of the MDR team members (3.48 of 5). With the changes to MDRs as necessitated by the pandemic, some MDRs have lasted over 120 minutes, resulting in frustration on part of the MDR team. Accordingly, the Improving GME-Nursing Interprofessional Team Experiences (IGNITE) program, a team comprised of residents, nurses, unit managers and quality improvement faculty, developed methods to address MDR issues to improve experiences for residents and other health care providers.

Approach

Our first goal was to develop the foundation for MDRs by introducing all internal medicine residents to each of the MDR attendees, so we distributed handouts to all internal medicine residents with pictures and job descriptions of each of the MDR health care professionals. Then, to address timeliness concerns, we sent out pages to services each week reminding them of MDRs. We distributed small badge-sized laminated cards that could be attached to each resident's ID card where we provided an MDR reporting checklist to remind residents what the pertinent information to present would be for each MDR attendee. This badge card detailed how to present information for each patient on their service, from the name, to their indication for admission, overall plan, any foreseeable

case management and social work needs, any potential barriers to discharge, and estimated discharge date. Finally, in the era of virtual MDR, a group of residents met with leaders from case management and nursing to develop a list of best practices for virtual MDR. These included a) using video when possible, and putting a headshot in your profile on the virtual MDR platform, b) adding roles/titles to your profile in the virtual platform, c) the shared screen on the virtual platform mimics a conference room with pictures and titles of the MDR attendees, and d) when new members join an MDR, spend 1-2 minutes getting to know them. We have been sending out email reminders to residents on a regular basis and have had short presentations during residency-wide conferences to reinforce adherence to the MDR best practice guidelines we developed.

Overall, our project is primarily focused on the structure and process of health care delivery in the inpatient setting in academic hospitals where residents rotate through services and interact with multiple health care providers. Developing an understanding of the clear roles of each of providers for residents can lead to a better sense of cohesion for the team and help improve communication while working toward maintaining high quality patient care.

Outcomes

The overall goal of our project is to improve resident and other health care provider perceived effectiveness of MDRs. Health care is becoming more interdisciplinary given the complexities inherent in our health care delivery model. Accordingly, using principles of high-performing teams and applying them to the structure and processes currently in place should result in more efficient and high-quality care. When MDR discussions are delayed by tardiness of residents, roles are not clearly delineated, or overly clinically detailed information is provided to case managers and social workers, there are direct effects on discharge preparation. With our systematic approach to addressing issues identified by prior needs assessments, we are hoping to utilize the full potential for MDRs in our inpatient care setting. Given that the COVID-19 pandemic continues to limit in-person interaction, our project continues to be active. All these measures were implemented at the beginning of the academic year, and we have been sending email reminders to inpatient teams throughout the year. We are planning on obtaining data regarding the perceived effectiveness of MDR from attendees in the next couple of months to assess if our intervention has resulted in its intended consequences. Additionally, we will be pursuing a qualitative assessment of MDR perceptions by surveying all providers. Thus far we have received positive feedback, with one participant saying, "the Zoom MDR practices have aided the team in continuing to identify and address discharge and care barriers early on and throughout the patient's admission." We hope to use this positive momentum to continue improving our multidisciplinary rounds.

Personal impact

As a physician you spend so much time learning the pathophysiology of disease processes in medical school, with little time devoted to the clinical practice of medicine within our complex health care system. Unfortunately, this translates into not every physician touching base with the other providers involved in a hospitalized patient's care on a regular basis. Multidisciplinary rounds provide a clear avenue to further patient care by addressing social determinants of health and discharge planning with other health care professionals. Without their assistance, physicians would not be able to discharge patients on a regular basis. By having a clear division of roles and working together toward high-quality patient care while hospitalized allows patients to get discharged in a safe and timely manner. I strongly believe that this interdisciplinary nature of medicine will only continue to progress in our future. Therefore, developing high-functioning team principles early on in training will provide a good foundation for delivering patient care in the future. I have genuinely enjoyed getting to know our unit managers, case managers, social workers and pharmacists and learn every day how much they are able to provide for our patients.

MD/APP-in-Room: Leveraging Technology to Promote a Socially Distanced Touch Base During the COVID-19 Pandemic.

Project lead
Chase Corvin, University of Chicago Pritzker School of Medicine

Teammates
Anastasia Pozdnyakova, Vanessa Buie, Hunter Witmer, Bill Marsack, Alesia Coe, Anita Blanchard, MD and Ajanta Patel for the IGNITE Teams

Faculty mentor
Vineet Arora, Associate Chief Medical Officer of Clinical Learning Environment, University of Chicago Pritzker School of Medicine

Abstract

Prior to the COVID-19 pandemic, our institution has aimed to improve interdisciplinary teaming in the care of our patients by increasing face-to-face communication between nursing and physicians/advanced practice providers. By engineering a standard communication console in patient rooms to display a novel MD/APP-in-Room button, physicians messaged nursing staff when they were at the bedside. After successful implementation on a pilot unit with improvements in length of stay and patient experience, we scaled up the implementation hospital-wide to address interprofessional communication challenges that occurred as a result of the COVID-19 pandemic. We present our findings that this innovation has had on our efficiency and collaboration in patient care as well as the challenges to interprofessional communication in a pandemic. Our work in hospital-wide implementation is ongoing, but we are seeing promising results similar to what we previously saw on our pilot-unit.

Project addressed/problem discovered

In preparation for the reopening of a new level 1 trauma center, our institution faced many challenges, one of which was improving bed capacity. Without adding additional beds, we needed to increase hospital throughput to gain capacity for the surge of patients that would inevitably come with the trauma center. Our interdisciplinary team of surgical residents and nurses worked to address this issue by improving the patient discharge process. Through this work, we realized several fundamental communication issues that existed between the surgical resident and nursing teams. As a result, we created the MD/APP-in-Room Button which leverages a technology platform to improve face-to-face communication among teams.

Surgeons and nursing staff often struggle to communicate effectively as a result of early rounding times that often occur during the end of night shift as well as difficulty reaching surgeons while in the operating room. Efficient patient care, however, requires early and effective communication to allow for timely execution of plans and patient discharges. This necessitates a method for nurses and surgeons to quickly share information and plans of care for patients. We learned of a tool utilized by our OBGYN colleagues at our institution to signal to nursing when patients had met requirements for conditional discharge. We therefore repurposed this tool to improve our team communication. During the COVID-19 pandemic, we then expanded it hospital-wide to address the many new challenges in effective communication, such as maintaining social distance and helping to preserve personal protective equipment.

Approach

Our hospital is equipped with touchscreen communication consoles in each room. When the buttons are pressed, it sends the nurse specific text messages such as "Food tray delivered." After hearing how our OBGYN colleagues were utilizing this, we created the MD/APP-in-Room button to improve teaming in patient care by signaling to nursing when the team was at the bedside. By increasing face-to-face communication, we aimed to more efficiently provide treatment, decrease discharge delays and demonstrate effective teamwork to patients.

We marketed this to teams as a means to arrange a touch-base each morning. When entering the room, physicians/advanced practice providers were instructed to press the button, alerting nursing staff of their presence. If available, the nurse would come to the bedside to share information and care plans. Recognizing the need to minimize workflow disruptions, we indicated to physicians that they should continue rounds at their usual pace. If the nurse was unable to meet them in the room, the nurse would at least know the team had been by to see the patient and could potentially still meet outside another room. We also did not expect nurses to pause from care of another patient or critical safety tasks such as sign-out or medication passing. Our initial goal was that a touch-base occurred at least 50 percent of the time and we successfully piloted this on a surgical unit.

When the COVID-19 pandemic began, we realized the opportunity to implement this button hospital-wide to assist teams with effective communication during necessary workflow changes and isolation in their respective workspaces. With support from the chief medical officer, chief nursing officer and designated institution official, all units began utilizing this button to promote a socially-distanced touch base in the hallway outside of patient rooms. This provided a structured, safe opportunity to discuss care plans. We also hoped this would minimize extra, unnecessary trips to the bedside, and therefore reduce utilization of personal protective equipment. We sent weekly data reminders to unit leaders and resident champions to review the data and explore how to improve touch bases using a rapid cycle improvement approach.

Outcomes

The communication console provides the ability to track utilization by patient room. As we implemented the button on our pilot unit, we were able to track how often providers pressed the button. On this unit, we persistently saw 60 to 120 pushes each month over the course of a year. We surveyed our surgery residents during this and 80% agreed that speaking with the nurse during morning rounds is beneficial to coordinating the patient's care, with 52% agreeing that the button helped facilitate this. Ultimately our goal was not simply to press the button, but that a touch base occurred between nursing and physicians/advanced practice providers. After implementation, we began to see a unique change in team practices. In anticipation of pushes, the nurses began to come to the bedside during rounds even before the button was pressed. During this pilot, resident paging volume decreased by 22%, average length of stay decreased from 6.32 to 5.26 days, and bed turnover rate increased from 4.10 to 4.99. Although other confounders and ongoing improvement work could have also contributed to these changes, hospital leaders and front-line staff believe that the increase in face-to-face communication as a result of the MD/APP-in-Room button played a critical role in realizing these improvements.

As we are currently implementing the button hospital-wide, we are seeing similar, but expected implementation and workflow challenges that we saw on our pilot surgical unit. Primarily, physicians/advanced practice providers often forget to press the button at the point of entry into the room. We addressed this using signage as well as scheduled reminder pages. We implemented a managing daily improvement (MDI) metric on our units to track whether a touch base occurred. Finally, one effective method for increasing usage has been a verbal reminder when the physicians/advanced practice providers arrive to the unit. We are therefore implementing a new MDI metric to track whether nurses have reminded teams to press the button. In the future we hope to track how this button impacts patient satisfaction, specifically whether patients feel that their team works together effectively.

Personal impact

This project has played a pivotal role in my understanding and practice of health care system innovation and quality improvement. In the design and implementation of this project, I had the opportunity to meet and work with a multidisciplinary group of colleagues and leadership. I learned more about different work flows and how new processes may increase or degrade the efficiency of work. With this interdisciplinary team, I learned how to design a new process that fits the needs of all parties with the ultimate goal of improving the care we provide to patients. Finally, I learned the challenges involved in implementing change on a broad scale and strategies to address these challenges including building a broad support base,

motivating team members, persistence in efforts, effective communication, and the flexibility to change plans as necessary. Moving forward I plan to continue working to increase face-to-face communication among teams through the use of this button as well as other projects and hope to build a career as a physician with significant involvement in hospital operations and quality improvement. I want to increase ease of practice and efficiency within the system so that providers can focus more on patient care in collaboration with their nursing colleagues.

PPE Donation Drive for UC Irvine Medical Center

Project lead
Catriona Lewis, University of California, Irvine, School of Medicine

Teammates
Abigail Archibald, Himakar Nagam, Jessica Sea and Jaspal Bassi

Faculty mentor
Megan Boysen Osborn, MD, MHPE, Associate Dean for Students, Vice Chair for Education, Emergency Medicine, Associate Professor of Clinical Emergency Medicine, University of California, Irvine, School of Medicine

Abstract

Being first year medical students when the news of COVID-19 hit, we felt unprepared to assist in a clinical setting. As we witnessed other medical students across the country establish personal protective equipment (PPE) drives to help fill the unprecedented PPE gap precipitated by the COVID-19 pandemic, we created our own initiative to support the University of California, Irvine, Medical Center (UCIMC). We coordinated with UCIMC Procurement and Contracting to establish the types of PPE needed most; introduced a pipeline for collected donations; recruited volunteers; and established donation drop off sites, storage and decontamination protocols. Our donation drive lasted four weeks and collected over 31,000 pieces of PPE for UCIMC. Donations originated from campus research labs, local businesses and individual community members. All items were distributed to health care workers faced with PPE shortages and exposed to SARS-COV2 every day. As a result, UCIMC was able to avoid complete depletion of PPE during the COVID-19 pandemic.

Project addressed/problem discovered

Due to the rapid onset and exacerbation of the COVID-19 pandemic in March 2020, hospitals around the nation and the world found themselves with a short supply of PPE. Manufacturers could not produce PPE quickly enough to meet the unexpected surge in need, so medical students around the country started mobilizing PPE drives to collect PPE from the community to aid their local hospitals and health care workers. At University of California, Irvine, School of Medicine (UCISOM), we learned of the hospital's dwindling supply of PPE through daily email updates from hospital administration. After talking with our medical school deans and hospital leadership, we realized how the hospital's supply chain was severely impacted and hospital employees were at real risk of not having sufficient protective equipment. After seeing our peers organize donation collection efforts at other institutions, we envisioned initiating similar efforts at UCI. Using Slack and Twitter as platforms to communicate with schools across the state, we gathered information and were able to launch a similar PPE Drive in Orange County. The encouragement and gratitude from the administration was plentiful. Although we understood we could not aid in direct patient care, we knew there were other ways we could be helpful. After understanding the logistics of other medical student-run PPE drives and extensive communications with the UCI public relations team and our own media contacts, we set up a public relations campaign to broaden our audience, increase awareness and motivate residents of local neighborhoods to donate equipment for health care workers.

Approach

At the start of the pandemic, we were worried for both the general public and our mentors and teachers working to save lives in the face of a dwindling supply of essential PPE. We witnessed medical student-run PPE drives spring up across the country and were inspired to start a similar initiative at UCISOM. We contacted the medical center's procurement & contracting and environmental health & safety departments to coordinate our efforts and ensure we were collecting equipment that could be utilized by the medical center. We were hoping to provide an essential service for the medical center by providing support in the realm of health care structure and process during

a time when normal supply chains and processes were severely interrupted. We kept in close contact with the medical center to align our list of acceptable donations with the medical center's needs. As the medical center was working on setting up a new system to protect health care providers, support staff and patients, we provided necessary supplies for a COVID-19 specific health systems improvement plan. Additionally, we provided important links between community members, businesses and the medical center. Many community members and local businesses were eager to help UCI Medical Center (UCIMC) but were unsure what equipment would be most helpful and how to make donations. As a result of the significant amount of media attention we received and a team monitoring our donation drive's email, we were able to quickly respond to many community inquiries and forward large donations to the medical center. Finally, we were also able to help the medical center set up new supply lines for PPE, as we received inquiries from various PPE producing companies. COVID-19 pandemic precipitated an unprecedented stress on our health care providers, medical systems and supply lines. While we hope donation drives are not the future for health care structure and systems improvement, unprecedented circumstances called for unprecedented and rapid solutions.

Outcomes

The most direct benefit of this initiative was that it provided over 31,000 masks, face shields, gloves, and other PPE to the UCIMC and its staff. All items were distributed to health care workers faced with PPE shortages and exposed to the potentially lethal SARS-COV2 virus every day. Not only did these materials help protect the health of our health care providers and hospital staff, but they also helped protect the thousands of patients, family members and loved ones who enter UCIMC on a daily basis. To our knowledge, due in part to our efforts, UCIMC has been able to maintain an adequate supply of PPE during the COVID-19 pandemic.

In addition to these benefits, we were also able to bridge a connection between the community, medical students and our health care workers at the medical center. As the COVID-19 pandemic grew to become a large part of everyday life, many people in the community looked for ways they could contribute and help. By establishing and running this PPE drive, we were able to connect those in the community who could help with health care workers who needed protective supplies. Community members who worked in fields unrelated to medicine helped donate what supplies they had or worked long hours to sew hundreds of handmade masks for hospital staff. We witnessed scientists across the UCI campus donate face shields, goggles, gloves and other protective equipment from their labs to help health care providers in the hospital. Additionally, we witnessed our fellow classmates step up to help run this drive throughout the entirety of its duration. This drive demonstrated the strong connection between health care providers and the community they serve. During the beginning of the COVID-19 pandemic, when local and national leadership was severely lacking, this drive enabled the Orange County community to support its health care workers at UCIMC.

Personal impact

Having completed less than a year of medical school when news of COVID-19 hit, we initially felt ill-equipped to assist in a meaningful way. Similar to most medical students, we were relegated to the sidelines where we could only watch as health care workers across the country fell ill and suffered from the devastating impacts of the lack of resources. Our community showed up in full support, donating over 31,000 masks, boxes of gloves, shields and other PPE items. The success of this drive was due to countless individuals contributing their skills and talents in community organization, mobilization and innovation. Having the privilege to lead this project and witness it inspire the innumerable acts of selflessness from individuals in our community has deepened our sense of responsibility to and ownership for our continued efforts to safeguard the health and welfare of others. We humbly acknowledge the power we had, even as mere first-year medical students, to unify our community toward a singular effort that resulted in wide-ranging implications for improving public health. An unexpected outcome is that we gained an enhanced understanding of the myriad of roles within different hospital departments and essential employees required to keep both our health care providers and communities healthy and safe. This facilitated opportunities for our own interprofessional development while working with medical and non-medical professionals.

We will carry the knowledge we've gained and the sense of responsibility for others throughout our personal and professional lives as we remember the sacrifices made by those in our community, many of whom will also one day be our patients and colleagues.

Using an Interprofessional Educational Approach to Improve Pre-clinical Student Knowledge and Skills in Quality Improvement Methodologies

Project lead
Nadine Makki, University of Michigan Medical School

Teammate
Jamie Lindsay

Faculty mentors
Rosalyn Maben-Feaster, MD, MPH, Assistant Professor of Obstetrics and Gynecology, Director of Health Systems Science Curricular Thread, Michigan Medicine

Jennifer Vredeveld, MD, Clinical Associate Professor Internal Medicine and Pediatrics, Michigan Medicine

Abstract

Interprofessional education in the setting of patient safety and quality improvement (PS/QI) has become a major part of improving health care. Toward this end, the medical school at this institution, in partnership with other health professional schools, had sought to incorporate interprofessional education into its curriculum. By exposing pre-clinical medical students to the importance of working together in interprofessional teams, they will have a better understanding of the importance of collaboration, roles and responsibilities of the various team members in a clinical setting, how to approach problems systematically and efficiently, and how to work with others to achieve common goals and objectives. The session created for this project was part of an overall PSQI/health systems science curriculum for medical students. The course aimed to give students the opportunity to learn the definition of quality improvement and basic tools they could apply to begin practicing quality improvement. Students were also exposed to three important concepts: understanding current state, using data to define a problem, and root cause analysis.

Project addressed/problem discovered

Interprofessional education (IPE) is a core competency in health care professional teaching. As a result of a collaborative environment that cultivates communication and teamwork, health care delivery, patient care, and outcomes improve. It has become increasingly critical to introduce IPE early on in medical student education, and continued throughout the different levels of medical education, in order to ensure learners have the necessary training in teams to carry with them as they go forward into their respective practices. By exposing preclinical medical students to interprofessional learning environments, they have the opportunity to gain a greater understanding of the roles and responsibilities of other team members in the clinical setting and how their perspectives contribute to the team's ability to achieve common goals and objectives in day-to-day health care delivery. Our desire for this curriculum is to allow students to learn how to systematically and efficiently address problems in the clinical environment while widening their perspective about the importance of each person's role in addressing that problem.

Approach

Based on feedback gathered from previous health systems science-based sessions administered to medical students at this institution, I worked on developing more creative and relevant ways to teach important concepts in an interprofessional session for 1st year medical students. I made informational videos to play throughout this session (four in total) to serve as the baseline information and also to standardize the delivery of this content across groups. Prior to the COVID-19 pandemic, we planned to have the first year (M1) medical students work with students from the School of Nursing and School of Social Work to identify problems within a previously developed emergency department case and then develop process maps as a team as an in-person small group session. However, in light of the need for social distancing, the course was adapted into

an asynchronous online module. This module still required the students to work through the case and planned educational content, but the interprofessional component was achieved via responses to discussion questions throughout the course. The specific domain of teaming was at the forefront of this session as it became important to learn and recognize each individual's roles in patient care. In addition, by having to walk through an emergency department clinical case and filling out a process map, health care structure and process was addressed. By addressing wait times and problems, as well as where each individual health care team member might play a role in patient care, students are exposed to health care structure and process early on. The session itself sought to define QI and help students from different disciplines relate QI methodology to their professional fields and understand how their roles intersect. In specific, students would be able to practice QI concepts including current state assessment, using data to define a problem, and root cause analysis. They would also learn how to distinguish between different types of measures used to monitor progress with QI projects and distinguish between various roles existing within the health care team. Finally, they would be able to recognize the value of multiple roles participating in the improvement process.

Outcomes

Through this project, we hoped that pre-clinical learners would have exposure to quality improvement and interprofessional education, work on relating how quality improvement can be applied to their respective professional fields, and practice quality improvement concepts like current state assessment and using data to define a problem. Furthermore, an important outcome included being able to distinguish between various roles existing within the health care team and recognize the value of each of these roles as part of the quality improvement process. In order to evaluate if key themes and concepts translated well to students, discussion questions were added within the module for students to not only reply to, but to reply to other students in the course on the same discussion questions. In addition to this, to assess the effectiveness of this session in achieving the stated educational objectives, a student evaluation was developed. These outcomes are still pending on result analysis of these data points. All this has been created and done to emphasize early-on exposure to the importance of key concepts that fall under the health systems science umbrella and to take these concepts forward into clinical practice.

Personal impact

I have had a longstanding interest in working on ways to improve the health care system, and I also have an interest in medical education. I thus sought out a project that would allow me to meld these two interests and gain skills I can use in my career. During the first year of medical school, all students participate in a session which seeks to reinforce the importance of interprofessional collaboration and expose the students to QI methodologies. Knowledge and skills in both of these areas is critical to improving the quality of health care delivery. Being responsible for developing the curriculum and session content for this project allowed me firsthand experience with important concepts as well as finding ways to make these concepts applicable to fellow medical students.

Value in health care

Impact of a Dean's Distinction in the Foundations of High-Value Care and Quality Improvement in Undergraduate Medical Education during the COVID-19 Pandemic

Project lead
Gillean Kelly, Baylor College of Medicine

Teammates
Anjay Batra, Anoosha Moturu, Jinna Chu, Nadia Ismail, Christine Roth, Joseph Kass, Edward Lee Poythress and Andrea Stolar

Faculty mentor
Dr. Christine Roth, Associate Professor, Baylor College of Medicine

Abstract

Current health care spending is unsustainable; high-value care (HVC) and quality improvement (QI) initiatives are vital for sustainability of health care ecosystems. However, traditional medical school curricula do not provide adequate education in these subjects. To address this need, we proposed a program that awarded a Dean's Distinction to students who completed educational requirements covering foundational HVC and QI concepts. A needs-assessment survey was launched to gauge interest in such a program at Baylor College of Medicine School of Medicine (BCM SOM) while clinical rotations were suspended due to COVID-19. Interest from 20% of students suggested this proposed program would address a curricular gap and be a productive use of time during the COVID-19 pandemic. The program was launched in July 2020; 103 students have enrolled as of September 2020. Pre-tests and post-tests will be compared to evaluate program effectiveness in teaching HVC and QI concepts; obtained feedback will inform future iterations.

Project addressed/problem discovered

The ability to deliver the highest possible quality care at the lowest cost — high-value care — is an increasingly important skill to develop, as the cost of health care continues to rise in the United States at unsustainable rates. Furthermore, as technology enables the ability to collect and analyze large amounts of data, it is becoming increasingly more feasible to study the effectiveness of our interventions in the clinical setting and correlate our actions to patient outcomes. This makes it possible, and sometimes even convenient, to continuously optimize our care to provide the best outcome possible for our patients. As interest in high-value care (HVC) and quality improvement (QI) continues to become increasingly widespread across health care institutions, it becomes necessary for medical students to enter the workface adequately trained to implement HVC and QI concepts upon graduation. Although there is a need to teach HVC across the continuum of medical education, we believe current medical school curricula are not adequately covering these topics in core requirements. In order to address this need in our own medical education at BCM SOM, we proposed a program called "COVID-Accelerated Dean's Distinction in the Foundations of High-Value Care and Quality Improvement" which awards a Dean's Distinction to students who complete a set of educational requirements in the topics of HVC and QI. This program was modeled after existing infrastructure at BCM SOM for a Dean's Distinction in Service Learning, which has been successful with high participation across several classes.

Approach

The aim of the Dean's Distinction in High-Value Care and Quality Improvement is to help future physicians develop the skills necessary to practice HVC and improve the quality of care delivered wherever they go. Through this project, we are specifically addressing the domains "value in health care" and "health systems improvement," both of which are the foundational elements of our proposed program. We believe these domains are not adequately covered in medical school curricula, and thus we hope to address

this gap. Our proposed program will award a Dean's Distinction to students who complete a set of educational requirements including podcasts, readings, virtual discussions, research design and case-based learning, all of which have been vetted by the STARS student team and faculty mentor. All requirements are self-paced and may be completed remotely online in order to abide by infection-control limitations in place during the COVID-19 pandemic. The requirements have been categorized into two components: foundations and investigative thinking. The foundational components include podcasts, Institute for Healthcare Improvement (IHI) QI modules, and Dell Medical School at the University of Texas at Austin HVC modules. Participating students will submit a reflective paper discussing foundational concepts and their relation to clinical practice. The investigative thinking component includes the formulation of an aim statement to address a gap in health care or clinical practice followed by a group discussion.

We launched a needs-assessment survey to gauge interest in this proposed Dean's Distinction program exploring the topics of HVC and QI in April 2020. The primary objective was to understand the extent of interest in completing the program described above among the BCM medical student body, particularly at a time when students had more free time with clinical rotations suspended due to the COVID-19 pandemic. In the internet survey, participating students used a Likert scale to indicate how interested they were in learning more about topics in HVC and QI and how likely they were to participate in the program as described above. The survey was launched via class Facebook pages and class-wide group chats to the MS1-MS3 classes. It is estimated to have reached approximately 500 students.

Outcomes

100 students completed the needs assessment survey. 47% of students were MS2s, 30% were MS1s, and 22% were MS3s. Of those who filled out the survey, 54% marked a 5 on the Likert scale (very interested), 41% marked a 4 on the Likert scale (moderately interested), and 5% marked a 3 on the Likert scale (somewhat interested). 45% marked that they were very likely to complete the program, 43% marked "moderately likely," and 12% marked that they were "somewhat likely." Interest from roughly 20% of the student body suggests this new proposed program is meeting a need in the curriculum. Further, the spread of interest among the classes suggests students who just started clinical rotations (MS2s at the time of survey launch) are especially inclined to learn about HVC and QI and build a strong foundation to implement these concepts in their future careers.

The program was launched in July 2020, and as of September 2020, 103 students have enrolled in this program. 34% are MS2s (MS1s at time of needs assessment), 25% are MS3s (previously MS2s), and 36% are MS4s (previously MS3s). Because the program contains a pre-test and post-test, we will soon be able to measure outcomes in terms of how much students have learned about HVC concepts and QI initiatives. The pre- and post-test surveys consist of questions testing material covered in the program and Likert scale questions assessing student confidence level. By comparing the results of the surveys, we will measure the effectiveness of these learning tools and measure changes in students' confidence levels. We will use constructive feedback to improve this program and further incorporate these topics into other aspects of curriculum reform. Ideally, medical students will take concepts they have learned from this program and apply them in their future careers through resource stewardship and QI initiatives. We hope to promote changes in individual behavior as well as broader systemic change in future medical practices and affiliated institutions. This program has the potential to improve systems of care and patient outcomes by enhancing awareness and training of future physicians in HVC and QI.

Personal impact

This project has directly shaped my development as a physician in light of my goals to become a medical educator as well as my practices as a future clinician. In terms of medical education, the design and implementation of this project in collaboration with the BCM Offices of Curriculum Design and Student Affairs have taught me about curriculum development. I have learned about the interdisciplinary processes behind designing medical school education and have been challenged with the goal to keep students engaged in evolving times with ever-developing methods of instruction. These skills will

serve me well as I continue to move forward in my medical career and pursue additional opportunities to remain involved in medical education. Furthermore, this project has made me aware of gaps that exist within medical school curricula at BCM SOM and likely across the nation. Moving forward, I hope to continue to shed light on topics such as high-value care that are not consistently covered in required core curriculum. I have also learned that input from students is a vital part of shaping future curricula reform nationwide. Finally, developing the material covered in our optional curriculum has given me the opportunity to learn more about the concepts of high-value care and their application to our health care system and its unnecessary spending. I have an obligation as a future provider to not only educate those around me about the importance of health care stewardship, but also to serve as a role model to future trainees and colleagues.

Integrating Value-Based Health Care Delivery Principles into Undergraduate Medical Education Curriculum

Project lead
Mustfa Manzur, Sidney Kimmel Medical College at Thomas Jefferson University

Teammates
Ricky Burns, Margaret Pearce, Madeline McGovern and Rhea Powell, MD, MPH

Faculty mentor
Mitchell Kaminski, MD, Professor of Population Health, Sidney Kimmel Medical College at Thomas Jefferson University, Geoffrey Hayden, MD, Professor of Emergency Medicine, Sidney Kimmel Medical College at Thomas Jefferson University

Abstract

Waste is estimated to account for 30% of the aggregate national health care expenditure. Wasteful care is primarily attributable to physician decision-making. Choosing Wisely is an evidence-based inter-specialty initiative designed to promote health care delivery. Examining medical student awareness of both Choosing Wisely and value-based health care delivery is important to create resource conscious physicians. An IRB-approved survey was distributed to all students (n=1,100) at Sidney Kimmel Medical College (SKMC) in June, July and August 2020. Approximately 35.6% medical students (n=392) responded. Baseline awareness of Choosing Wisely for first-year students was 27.3% with 96% of fourth-year medical students reporting awareness. Perception of health care delivery waste was noted to either be a somewhat serious problem (62%), very serious problem (33.9%), or not too serious a problem (3.8%). Only 49.5% of students correctly approximated the amount of health care expenditure associated with waste, while 74.7% correctly attributed this waste to unnecessary provision of health care services. Modifications to the SKMC didactic curriculum are being developed to provide education on the critical role physician decision-making plays in reducing health care waste. Future work includes re-administration of the survey to monitor efficacy of curricular modifications.

Project addressed/problem discovered

Health care is a major portion of the United States' gross domestic product. It is forecasted to grow by 5.5% annually and is expected to make up 20% of the economy before 2030, but 30% of that contribution is considered medical waste. Given that millions of U.S. residents do not have proper access to these resources, my colleagues and I were inspired to find a way to help solve this problem in our community.

Our team is participating in the national Choosing Wisely Initiative (co-sponsored by the American Board of Internal Medicine Foundation and Dell Medical School at the University of Texas at Austin) to exchange ideas and approaches for innovating medical school curricula to emphasize value-based health care delivery. Physicians must learn how to focus their diagnostic tests to correctly manage the health of their patients without contributing to medical waste. The classic example in this literature is management of low back pain. Generally, low back pain spontaneously resolves within six weeks for most patients. A radiograph (X-ray) is often ordered despite the imaging not influencing management of the episode (rest, stretching, physical therapy). We addressed this and similar scenarios throughout the basic science portion of the undergraduate medical education curriculum of our institution.

SARS-CoV-2 has served as a reminder to why resource allocation is one of the most-pressing issues in medicine today. Our desire to promote change at a medical school level has been heightened with the ongoing pandemic. In coordination with our medical school's health systems science (HSS) curriculum director, Dr. Dimitri Papanagnou, we have emphasized better medical stewardship in the HSS curriculum thread by connecting the cases to

COVID-19. Given that our institution incorporates clinical training in telehealth early on, it is also our hope that incorporating medical stewardship principles early on in the undergraduate curriculum will enable students to be efficient providers ready for the future of health care delivery.

Approach

We focused on the domain of value in health care. Our project's approach involved assessment of our institution's undergraduate medical education (UME) curriculum. With the help of professors, we integrated learning objectives reflecting value-based health care delivery principles during case-based small group discussion sessions. Each session focused on a specific diagnosis related to the organ system being taught.

One such example is a second-year small group case-based learning session focused on a patient who presented with acute nephrolithiasis. The learning objective we included during that week was "apply principles of Choosing Wisely when considering diagnostic testing. (Focus on Acute Presentation of Kidney Stone Management)." While the understanding of treatment and diagnosis is crucial to the health of the patient, we also wanted students to understand this can be achieved in a cost-effective way. We introduced these types of learning objectives into several lectures to emphasize the concept of value-based health care delivery during regularly scheduled didactics.

Through this multi-modal approach, we aimed to incorporate critical stewardship concepts throughout the first two years of our institution's UME curriculum. While we felt that students were becoming more aware of value in health care delivery, we realized that this awareness needed to be quantified. In order to achieve this, we modified a survey tool developed at Dell Medical School at the University of Texas at Austin to assess the impact of our curricular intervention.

Outcomes

The outcomes of our project are pending. The goals are (1) to integrate the topic of value-based health care delivery principles throughout the basic science portion of the undergraduate medical education curriculum at our institution and (2) assess the efficacy of this intervention over time. We anticipate that medical students will have more awareness and understanding of the health system and the role medical decision-making plays in generating waste during health care delivery. Additionally, though it is not something we are able to assess at this time, we anticipate that these students will become more conscientious in their proposed treatment plans as they learn to provide clinical care in the latter half of their medical education on the wards and in the clinics.

Personal impact

Exploring the domain of health systems science through this project has enabled me to develop a grounded understanding of the complex environment within which future physicians will be practicing in. By focusing on value-based care delivery principles, I now realize how important continuing medical education will be to ensure my practice of medicine will be maximally evidenced-based. Research, particularly clinical research, is an ever-burgeoning field that is furthering the frontiers of medical knowledge. To ensure the most efficacious care (maximizing value and minimizing cost/pain/stress) for future patients will require staying up the latest clinical research findings. When I began medical school, I was often reminded that I was beginning a career as a "lifelong learner." Now I know why.

The Art and Practice of High Value Care

Project lead
Emily Fink, University of North Carolina School of Medicine

Teammate
Elexis Hollingsworth

Faculty mentor
Sarah Smithson, MD/MPH, University of North Carolina School of Medicine

Abstract

The pandemic presents an opportunity to think critically about transforming our current health care system to one defined by quality versus volume. Clinical leaders believe that medical schools should teach high value care (HVC), with many institutions already implementing it into undergraduate medical education; however, none have yet delivered a completely student-facilitated course. In May 2020, two medical students at a school of medicine in the southeastern United States developed a four-week, virtual elective on value-based medicine. Participants were both pre-clinical and clinical students. Coursework included modules and readings on HVC principles, innovative practice strategies, patient communication techniques and alternative payment models. Students led class discussions and heard from local institutional leaders on related issues. Overall, participants responded favorably to the elective, granting it a 9.8/10 rating on post-course evaluations. Still pending is further evaluation on the immediate and long-lasting impacts of the course on student attitudes toward value-based reform.

Project addressed/problem discovered

University of North Carolina School of Medicine strongly emphasizes health systems science through a longitudinal course spanning all four years of the curriculum. Among many topics, students learn the political, economic and social underpinnings to health care, core bioethical principles, the social determinants of health and the importance of interprofessional collaboration. This approach introduced implications of our inequitable health care system but didn't devote enough time on ways to address it.

In 2019, I attended the Choosing Wisely STARS conference at Dell Medical School at the University of Texas at Austin, which introduced the scale of America's health care waste problem. Most importantly, the conference injected an optimism that large-scale, innovative reform was possible. My colleague and "co-STAR" Elexis Hollingsworth and I returned to UNC, motivated to inspire students that ensuring value can bring equitable, patient-centered reform to medicine. By introducing first year medical students to the concepts of high value care, we believed we could stoke some of the cultural change that medicine requires.

To first tackle this goal, we designed a three-pronged approach embedding principles of high value care into existing courses, including our doctoring class, clinical epidemiology and self-directed case-based learning exercises. We're still evaluating the efficacy of this asynchronous approach; however, with the disruptions brought on by COVID-19, I recognized an opportunity to also create a cohort of high value care champions. Rather than reinvent new materials, I borrowed from leaders in the value-based medicine space, including Dr. Chris Moriates of Dell Medical School at the University of Texas at Austin, Dr. Neel Shah of Costs of Care, Dr. Amit Pahwa and Dr. Pamela Johnson of Johns Hopkins University School of Medicine and founder of HVPAA and others, who collectively produced a trove of educational resources that convey the foundational ideas of value-based medicine. In just a few weeks, with the help of Elexis and faculty mentors, I curated these resources into a comprehensive, 4-week virtual elective.

Approach

The course met two days per week to discuss takeaways from modules, readings and other activities. Dell Medical School's modules were the course's backbone, instructing students on the key elements to high value care delivery, modes of bringing value to the clinic, structural payment models and other topics. Pivotal to the course's success were the weekly presentations from local health care leaders. We hoped that speakers from UNC would inspire students of their own potential to be thought leaders and change-makers. In fact, this was the most highly rated aspect of the course.

Among the goals of the course was to encourage questioning of what's taught; we believe this curiosity is pivotal to ensuring continued innovation in the health systems science space. Most identify reducing health care spending as the only goal of high value care, so in our course, we strove to expand that understanding. Instead, students learned that a value-based approach helps patients achieve the outcomes that matter to them at the most affordable cost. To achieve this, first we delineated between disease- versus patient-oriented outcomes. In emphasizing evidence-based medicine, we acknowledged the disparities inherent to clinical research and the importance of individualizing patient care. Conversation on the social determinants of health included role-play exercises where students practiced discussing financial toxicity with patients. We also reviewed various apps, programs and other web-based resources that supported affordable care and clinical decision-making. We evaluated various models of health care payment reform, fostering conversation about their strengths and shortcomings. Finally, we reiterated that organizational culture was critical to bringing high value change. In reflective exercises, students endorsed this particular discussion for it illustrated some of the barriers to widespread reform. Naturally, this topic required discussion of the Quadruple Aim. Students learned that value-based medicine is a holistic endeavor that can inspire change at the bedside and bring meaning to all facets of a clinical career.

Outcomes

Through this course, we aimed to instruct students on the foundational principles of value-based medicine, but also hoped to instill in students the motivation, the confidence and the desire to pursue health system reform in their careers. Part of our study is limited by the fact that students chose to participate in the course; therefore, we captured only the students who were especially interested in this topic.

Initial impressions of the course, collected by a school-based survey with 10-point scale measures, revealed a 9.8 on course organization, 9.8 on achieving learning objectives, 9.6 on efficacy of various teaching modalities (i.e., live guest lectures, small groups, journal articles), 10 on an engaging and positive learning environment, and an overall rating of 9.8.

In a more comprehensive evaluation of the course, we hope to identify knowledge of high value care, drivers of health care waste, opinions on the physician's role in reducing costs, as well as empowerment to address these issues in the clinic. In addition to the mentioned school-sanctioned course evaluation, we have some data on initial and post-course impressions of those topics. Next steps include a review of the course's lasting impact on medical student clinical decision-making, rapport with their clinical team, hopefulness of institutional and systems-wide reform, ability to address financial toxicity with patients, and whether future professional goals include high value care. This will involve a different survey to be distributed by email to the students about twelve months from the course's initial end date in May 2020.

Personal impact

I came to medical school so that my future efforts could support change at the individual and societal level. I love learning about people and what motivates them, as well as what forces outside of their control shape who they are and the lives they lead. Studying the humanities in college helped me recognize the power of the social determinants of health; and it was learning about this space that pushed me to a medical career. I feel that as a clinician, one has the unique privilege to hopefully address these issues with patients. (Or, at the very least, help patients navigate them).

When I learned about Choosing Wisely, I felt that its mission to ensure patient-centered, evidence-driven, equitable, affordable care directly aligned with my reasons to become

a doctor. Additionally, its commitment to changing how we think about health and the current system resonated strongly with me. I knew I wanted to be part of this energetic, hopeful group and have since aligned myself to its goals. This passion for value-based change brought me down some incredible paths already. One arena is within medical education. As described, I led some initiatives to embed high value care into existing undergraduate curricula at UNC. This work made it clear to me that I want an academic component to my career. I also collaborated with students at other institutions to support a nationwide virtual speaker series where leaders in the high value care space speak on related topics. We got a huge turnout at our first event — over 170 students — and we're excited to see how this unfolds over the next year. Our hope is to evaluate the efficacy of this platform for getting students as excited about high value care as we are.

Another area of interest is quality improvement (QI). Because of my work with Choosing Wisely, I learned about a budding startup in Boston called CareZooming, which aggregates QI projects and other innovative work for leaders to learn about and adopt at their own institutions. I had the opportunity to work part-time for them and create content for their platform, which deepened my interest in QI. Additionally, UNC's curriculum strongly emphasizes QI; and through the Institute for Healthcare Improvement (IHI), I learned some basics and already had the opportunity to work with a few students on a small project at a community clinic. I hope to make QI a substantial part of my clinical career moving forward.

Index

First author

Institution