



Medical students, residents and fellows making an impact

**Submissions to the 2021 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 eight years, it is clear that it has made a significant and positive impact on the medical education continuum, the health system, and most importantly, patients.

Today, a total of 37 schools (20% of all eligible U.S. allopathic and osteopathic medical schools) are 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.

One of the most notable innovations to emerge from our work is the need for medical students to learn health systems science as the third pillar of medical education along with the other two pillars—basic and clinical sciences. Health systems science is a foundational platform and framework for the study and understanding of how care is delivered, how health professionals work together to deliver that care and how the health system can improve patient care and health care delivery. It has been called a mark of excellence for medical education.

We first held the first Accelerating Change in Medical Education Health Systems Science Student Impact Competition in 2018 to determine if the medical students from our consortium schools were improving health outcomes, practice sustainability and the lives of patients and physicians before they even graduated from medical school. What kind of impact could a medical student have if they were trained in health systems science? The entries we received far exceeded our expectations and tackled some of the most intractable problems faced in medical education and by health systems.

In 2020, we expanded the competition to medical students in non-consortium schools and to residents and fellows. We also focused on projects that addressed the then emerging COVID-19 pandemic and highlighted the extraordinary role learners played in every facet of pandemic response.

This year’s entries are no less impressive. The COVID-19 pandemic has evolved from an emergent threat consuming all of our health care resources to a sustained challenge. As such, some of the equally impressive entries this year addressed COVID-19 while many others took on health care challenges that either never went away during the pandemic or were worsened by the situation.

We are very proud that, not only did the AMA “Accelerating Change in Medical Education” initiative make a difference in medical education, it made a difference in the lives of medical students, residents and fellows. These learners, in turn, equipped with health systems science skills made a difference in the lives of patients, physicians and their communities during one of the most compelling medical crises of the century and beyond.



Sanjay V. Desai, MD
Group vice president, Medical Education
AMA

Preface

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

In 2018, we launched the Accelerating Change in Medical Education Health Systems Science Student Impact Competition with that prompt. The competition was open to all medical students at member schools of the AMA Accelerating Change in Medical Education Consortium. In 2020, we expanded the competition to all U.S.-based medical students, residents, and fellows and focused on projects related to the COVID-19 pandemic. This year, we are once again open to all U.S.-based medical students, residents and fellows, but the projects focus on any aspect of health systems science.

Each year, we have asked for students, residents and fellows to think impactful, think innovative and think inspirational. Eligible projects address one of the health systems science domains, such as leadership, patient safety, quality improvement or population health.

We are never disappointed, and this year is no exception. Actually, we are *astounded* by the impact learners have on the lives of patients around the world, their fellow learners and the health system. The submissions are evidence of the anecdotes that educators have long been sharing about how learners make a huge difference in their health systems.

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

In this book, you will find the abstracts for the 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



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Winning abstracts



First place

Construction and Coordination of Care Continuity via Telehealth for Homeless Population of Norfolk, Virginia

Project lead

Monica Hana, Eastern Virginia Medical School

Teammates

Sümer Sebik and Blake Nowakowski

Faculty mentor

Amanda Gibson, MD, Assistant Professor and EVMS Street Health Faculty Facilitator, Eastern Virginia Medical School

Project location

Eastern Virginia Medical School

Abstract

Eastern Virginia Medical School (EVMS) Street Health is a student-run clinic that offers free care to unhoused, uninsured and low-income individuals in Norfolk, Virginia. In response to the COVID-19 pandemic, which exacerbated gaps in care for communities experiencing homelessness, we constructed a telehealth system involving medical students, residents, physicians and church volunteers that served as an infrastructure to provide immediate medical services and coordinate future medical care for people experiencing homelessness in our community. By bringing computers and medical supplies to a local church, where individuals also received free breakfasts and showers throughout the pandemic, we were able to meet our patients where they were and offer a consistent source of free and friendly care to a community whose needs were often overlooked during the pandemic. We created a system to ensure better continuity of care, including Medicaid enrollment, appointment scheduling and consistent follow-up to improve patient outcomes.

Project addressed/problem discovered

During the COVID-19 pandemic, the homeless population in Norfolk, Virginia faced more barriers to health care than ever before. Many medical groups shut their doors to prevent the spread of the virus, Emergency departments were filled to the brim, and there was nowhere for people experiencing homelessness to isolate themselves or even practice social distancing—only community shelters were available. Things like hand sanitizer and face masks were luxuries that some people simply could not afford, and in the pandemonium of the pandemic many homeless patients were seemingly

overlooked. These obstacles compounded with preexistent barriers to health, such as low medical literacy, lack of transportation, inhibitory costs of services and lack of health insurance. Having so many difficulties bred distrust between underserved communities and the health care system, exacerbating patients' social determinants of health.

The mission of the Street Health Telehealth Clinic is to provide an avenue for patients experiencing homelessness to access health providers in a way that is safe and free, while aiming to address their specific health needs and re-integrate them into the health care system. Through this initiative, we were able to coordinate the care of our patients with a variety of medical providers, establish patients with primary care providers, assist in Medicaid enrollment, and present ourselves as a friendly face to begin forming meaningful relationships with our patient population. Through the telehealth clinics, we were able to close gaps in the health care system while also serving those most in need of help.

Approach

EVMS Street Health was founded to address the numerous social determinants of health (SDOH) that impact the homeless population of Norfolk, Virginia, and to bring value to health care by providing a medical home for our patients. As the pandemic closed medical offices, filled emergency departments (EDs) with COVID patients, and prevented Street Health from holding in-person clinics, homeless individuals faced more barriers to accessing medical care than ever before.

In response, EVMS Street Health founded a telehealth clinic to continue our weekly direct contact with patients. Our system was simple—four laptops were made available at a local church for anyone who wanted to speak with one of our volunteer providers. Initially we focused on health screening and medication refills, with simple visits for the management of chronic medical conditions like hypertension and diabetes. We also ensured that our patients did not need immediate medical attention; if they did, we provided them with transportation to the emergency department. These interactions aimed to reduce the number of patients going to the emergency department for chronic care management and other concerns better managed in an outpatient setting. By providing our patients a medical home, we improved health outcomes for our entire community.

Soon we began coordinating our patients' care between multiple different physicians, meeting their medical needs within the constraints of their SDOH. These follow-up services ranged from making specialty appointments to obtaining eyeglasses and from wound care to mental health evaluations. To address transportation issues, we made maps directing patients to their appointments and provided complimentary bus passes for safe travel to their destination. To combat the inhibitory cost of medical services and a lack of health insurance, we ensured that all medical services provided, both at our telehealth clinics and at any follow-up visits, were free. Additionally, we established a Medicaid enrollment team to streamline patients' reintegration into the health care system.

With our weekly telehealth clinics, we continued our pursuit of establishing trusting relationships with our patients. This project ensured that our patients had a friendly, welcoming face to speak with each week, knowing someone in the medical community was watching out for them.

Outcomes

Street Health's telehealth clinics were started in May 2020 to respond to a need for care created by the pandemic. From May 1 2020 to July 1 2021, we held 63 clinics with an average of 5 patients per clinic. Our teams of physicians, residents and students saw 107 unique patients and made and distributed over 1,500 care packages, including clothes, hygiene kits, masks and other patient-requested items. Our focus for these clinics was to provide an avenue for patients experiencing homelessness to access health providers in a way that was safe, free and welcoming to address their health needs and reintegrate them into the health care system. We refilled

prescriptions, provided over-the-counter medications on site and monitored vitals weekly to help patients manage acute and chronic conditions.

To assist patients in reentering the health care system, we screened 34 patients for Medicaid and SNAP (food stamps) enrollment and enrolled 20 (8 pending approval, 6 lost to follow up). Our patient navigation team referred and scheduled appointments for dozens of patients, following up with each patient to ensure they knew how and when to get to their medical and social service appointments. Each patient was asked what barriers to care they faced, including a lack of ID, transportation, and proof of income and address, and we worked with them to address and hopefully eliminate as many as possible. By bridging the gap between patients and primary care providers, we sought to reduce the number of patients seeking care in emergency departments, decreasing the financial strain on the health care system.

Our goal for the next year is to transition to biweekly telehealth clinics, as they have been an effective way of being a consistent presence in our patients' lives in a familiar, comfortable setting. As more individuals become vaccinated, we will resume holding clinics in person while building rapport with the patient population we have grown to know over this year. Furthermore, we plan to continue implementing measures to increase the continuity of care we are able to offer, by expanding our referrals team and working to offer patients assistance in paying for prescription medications.

Personal impact

The mission of Eastern Virginia Medical School is to be the most community-oriented medical school in the country. An institution with such a mission statement therefore aims to produce physicians who are leaders in the communities in which they serve. To lead a community to better health outcomes, one must first know their community and the health care barriers they face.

Being leaders of the Street Health Telehealth Clinic has given us an early exposure to our future patients and their real-world barriers to health care. Each week we met with patients, and in helping them coordinate their care we experienced for ourselves the challenges they endure daily. We walked with patients through the process of enrolling in health insurance, working with them to identify and address barriers to care, and assisted them in reentering the health care system. We heard from patients directly about their acute and chronic conditions and which challenges they face in treating them.

By being Street Health Telehealth Clinic leaders, not only have we had first-hand exposure to the true impact of the social determinants of health, but in doing so we have also forged strong relationships with our community. This has been an excellent learning experience for us students and a fantastic resource for our patients, filling significant gaps in their care. It has been an honor and privilege to care for our patients and tackle these problems as a community, all while reinforcing our drive for pursuing medicine: helping people and communities live healthily.

Second place

The University of Connecticut Health Leaders (UCLH)

Project lead

Henry Siccardi, University of Connecticut School of Medicine

Teammates

Jacqueline Steele and Christopher Steele

Faculty mentor

Christopher L. Steele, MD, MPH, MS, Assistant Professor of Medicine, University of Connecticut School of Medicine

Project location

University of Connecticut School of Medicine

Abstract

There is growing consensus that social determinants and their associated needs are strong drivers of population health. Many patients perceive that their providers are equipped to help, but many providers are not trained or staffed to adequately address these factors in the clinical setting. We describe a model allowing for screening and addressing social determinants of health for patients at no cost while providing valuable education to pre-health professional students.

The University of Connecticut Health Leaders (UCLH) is promoting diversity in medicine as the UCLH volunteer cohort is 81% female, 54% are first-generation Americans and 38.1% receive need-based financial aid with volunteers reporting having gained valuable insights into the health care system. Pre-pandemic, volunteers screened 426 patients of whom 186 (43.7%) screened positive for at least one social determinant of health issue. In a virtual format, volunteers screened 1,240 patients with 681 screening positive for at least one social determinant of health issue.

Project addressed/problem discovered

Nearly 10-20% of an individual's health is modifiable, while the other 80-90% is a byproduct of their environment. These environmental factors are collectively termed the social determinants of health (SDH).¹ A significant majority of patients feel health systems should use social needs information in an attempt to improve patient care (79%), ask patients about social needs (85%) and intervene to assist with social needs (88.0%).² Similarly, 90% of clinicians working in safety net settings believe social factors strongly contribute to health care outcomes, but 80% report lacking the capacity to address these factors.³

There are numerous obstacles to conducting SDH screenings under the current design of our health care system. Though most hospitals screen at least some patients for health-related social needs, the screening is often fragmented and ad hoc.⁴ The most common barriers perceived by clinicians are lack of time to ask (60%) and resources (50%) to address social needs.⁵

The University of Connecticut Health Leaders (UCLH) program demonstrates a model for uniform and systematic screenings and interventions of SDH issues, including providing resources without disrupting clinical workflow or adding costs to practice or patient.

Sources

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Approach

I co-founded The University of Connecticut Community Health Leaders (UCHL) on a simple premise: that we could empower students and patients of diverse backgrounds by introducing student-volunteers to meaningful, challenging clinical opportunities addressing social determinant of health (SDH) issues for patients. UCHL is entirely student run. Our leadership team of six college students and three medical students oversees a coalition of ~80 volunteers. We developed a digital screening tool for SDH issues using validated questions. Volunteers screen patients for SDH concerns, and for each positive screen our tool utilizes an algorithm providing an appropriate community resource addressing the indicated issue(s). Community resources come from the local, state and federal level. Volunteers then connect the patients to the resources, either immediately or by phone via a scheduled follow-up. All of our resources are continuously vetted for quality by our leadership team. When in-person, the screening is performed while patients wait for their appointments, thus fitting seamlessly into existing workflows and processes. During the pandemic we pivoted to calling patients in advance to confirm their appointments, screen for COVID-19 and conduct the screenings. In either setting we essentially added value to health care encounters at no cost to patient, clinician or the system as a whole.

So, how does this look? While waiting for a diabetes problem visit, “Janice” is approached by a UCHL volunteer who introduces themselves and conducts a screening while Janice waits. In doing so, the screening indicates Janice is food insecure and that she may qualify for assistance through a local non-profit community partner. Janice goes back for her appointment and on the way out checks in again with the volunteer, who discusses the resource with her. She agrees to visit the non-profit, so the volunteer calls the community partner and arranges an appointment for Tuesday, when she will meet with one of the partner’s specialists. Two weeks later, Janice gets a call from a volunteer ensuring she was able to access the resource and continuing to help her, if not. This is just one example of what the program does day-to-day.

Outcomes

Based on a voluntary internal demographic survey we found over half our volunteers are first-generation Americans. A total of 20% are first-generation college students, 28.3% learned English as a second language, and 38.3% receive need-based financial aid. We are ethnically and racially diverse as well. Based on voluntary and anonymous self-reporting the UCHL volunteer cohort is 81% female, 31.7% Caucasian, 36.5%

Asian/Pacific Islander, 7.9% Hispanic/Latin-American, 9.5% multiracial, 6.3% Black/African American, with the remainder being ‘other’ or preferring not to respond. For 30.2% of volunteers, English is their second language, and 54% are first-generation Americans. 20.6% are first-generation college students, and 38.1% receive need-based financial aid. As such, we are helping usher in a diverse group of future practitioners whose first and foundational clinical experiences center on addressing social determinant of health (SDH) concerns.

We are exceptionally proud of our volunteers’ performance. In just one month, before the pandemic struck, our volunteers connected with over 500 patients, of whom over 300 agreed to participate in the screening. Nearly 150 screened positive for at least one social determinant of health issue, with 98 getting connected to resources. The most common issues addressed were transportation, medication costs and unemployment. When we shifted to a virtual format we expanded to three additional sites, allowing our volunteers to contact 12,657 patients in ten weeks. Despite our finding that screening participation is reduced over the phone compared to in clinic, we were able to screen 1,339 of patients contacted. Of those, 961 screened positive for at least one SDH issue, with 290 connecting to resources. The most common issues were un-or-underemployment, lack of high school diploma/GED, English as a second language and transportation. With a return to in-person screenings now underway, we are excited to continue positively impacting our patients’ and volunteers’ futures. We will soon be expanding to inpatient and emergency department environments where we will continue focusing on SDH while also connecting patients to primary care. In doing so, we believe we have instituted a systemic approach to addressing SDH that will improve both our greater community and the medical community at large.

Personal impact

I absolutely love this work for four reasons. First, I am able to impact health at a community level in a way I never could as a practitioner alone — and can do so while a medical student. I have the honor of touching the lives of hundreds of people, all while learning medicine.

Second, we are not only benefitting the community today but in the future. We will need a health care system with practitioners capable of creating workflows aimed at high-value care, and I believe in my heart we are taking steps in that direction.

Third, both our patients and our students come from diverse origins and different socioeconomic backgrounds. No one community is benefitting from our work. We serve urban, suburban and rural populations and people of all races and socioeconomic standing. Our volunteers reflect that diversity and can use this experience as a springboard into the medical field, bringing much-needed diversity.

Finally, I get to teach. We bolster this hands-on experience with out-of-clinic education on SDH, motivational interviewing and vulnerable populations. Volunteers can access mentoring and leadership opportunities. My professional and personal life has been defined by the teachers willing to go the extra mile and help me, a first-generation college student.

Taken together, this project inspired me to take an extra year for a dual MD/MPH degree. The added health care system education from the MPH classes has been and will continue to be instrumental in guiding the future iterations of UCHL.

Third place

Role of Telemedicine in Health Care Delivery to Vulnerable Populations during COVID-19

Project lead

Dania Shah, MD, HonorHealth

Teammates

Wesley Peng; Paul Sieckmann, MD; James Whitfill, MD; Craig Norquist, MD; Alison C. Essary, DHSc, MHPE, PA-C; Priya Radhakrishnan, MD and Dana Sall, MD

Faculty mentor

Rustan Sharer, MD, HonorHealth Medical Center

Project location

HonorHealth Medical Center

Abstract

The aim of this study is to assess the impact of telemedicine in creating health equity in vulnerable populations such as underrepresented minorities and the elderly during the COVID-19 pandemic. Our study shows that patients identified as Hispanic or Latino showed a 40.5% increase (p-value < 0.0001) and Black Americans showed a 22% rise (p-value < 0.004) in the total number of visits post-telemedicine implementation. Additionally, we noticed that initially there was a sharp rise in the no-show rates with the implementation of telemedicine in the elderly population. This could be attributed to difficulty in adapting to technology but eventually the rate declined significantly and plateaued, indicating that telemedicine has great potential in facilitating outpatient medical care in our vulnerable groups even post pandemic.

Project addressed/problem discovered

The onset of the COVID-19 pandemic brought the forced implementation of telemedicine as the medium of continuity of care for patients. We discuss the impact of telemedicine on our patient population and whether it is a sustainable tool for our health care in the future. At this stage, we are looking for ways to improve the use of telemedicine by reducing technical difficulties and using teleconferencing software that is easy to use for both patients and physicians.

Approach

The objective of this project was to assess the impact of telemedicine in reducing health care disparities. We used a large HonorHealth database to compare total number of visits in the primary care settings pre- and post- implementation of telemedicine. We also sent out surveys to patients and physicians to assess their views on telemedicine.

Outcomes

The outcome of the project shows that vulnerable populations benefitted the most from the use of telemedicine. We noticed a rise in the total number of visits post-telemedicine implementation among minority and elderly populations as compared to pre-telemedicine implementation. We also sent out surveys to patients and physicians, and although we do not have complete data, our preliminary results show that both patients and physicians have positive views on telemedicine. This shows that telemedicine can be an instrumental tool in reducing health care barriers even after the pandemic is over.

Personal impact

This project is very close to my heart. I have learned that everyone can have full access to health care if they are provided the right opportunities and medium. I am extremely humbled to be a part of this wonderful project. As physicians, we should be open to innovative methods in improving our health care system and adapt in the face of new as well as existing challenges.

Honorable mention

Increasing Reconciliation of Outside Clinical Information during Hospitalizations in a Rural Academic Medical System

Project lead

Gary Allen, Brody School of Medicine at East Carolina University

Teammate

Jessica Setzer

Faculty mentor

Gregory Knapp, MD, Associate Medical Director of Informatics, Vidant Health

Project location

Vidant Health and associated hospitals

Abstract

Modern electronic health records (EHRs) can facilitate the exchange of clinical information to improve communication during transitions of care. Recently, policymakers have structured financial incentives to improve the utilization of these features. This project team seeks to increase reconciliation of patient problems, medications and allergies with information from outside sources to 80% of all hospitalizations within a rural academic medical system. We have utilized a quality improvement Plan-Do-Study-Act methodology informed by education in health systems science to improve EHR workflows and train clinicians on the features. As a result, the percentage of complete reconciliation during all admissions in the organization increased from 26.5% in October 2020 to 71.4% in June 2021. Six of eight hospitals have recorded at least one month of complete reconciliation above 80%, and individual hospital rates range from 54.8% to 93.5%, with an average hospital rate of 80.5%.

Project addressed/problem discovered

Transitions of care between medical settings are high-risk periods for poor communication of critical health information. The health systems science core functional domains of patient safety, health care structures and processes, policy and economics, and value were essential in understanding the patient- and system-level problem. Primarily, information lapses at transfers of care are a patient safety issue, as lack of communication of patient information can lead to adverse events. System-level health care structures have created barriers to information exchange, including the changeover

of inpatient care by primary providers to hospitalists and patient privacy laws that restrict systematic transmission of clinical information between organizations. Additionally, the existence of multiple, disconnected EHRs without financial incentive to improve interoperability between records is a significant communication barrier.

Creating seamlessly interoperable EHRs is considered a key milestone in transforming American health care into a high value, learning health care system, where data used during patient care can be harvested to advance biomedical research, population health and quality improvement. Therefore, policies enforced through Medicare and Medicaid's Promoting Interoperability Initiative have structured financial incentives to increase information exchange between EHRs. Initially, hospitals were incentivized to adopt Certified Electronic Health Record Technology with the ability to create, send and receive Continuity of Care Documents (CCDs). CCDs are files that contain summary health information, like lists of patient problems, medications and allergies. Medicare recently began tying reimbursement to organizational rates of manual reconciliation of the differences between the local medical record and the information received on CCDs from outside organizations.

Approach

In November 2020, a team consisting of a physician informaticist, medical student and two public reporting professionals began improving the safety and value of care in an eight-hospital rural health care system by increasing the rates of complete reconciliation of clinical information during

hospitalizations. Our main outcome, complete reconciliation, was defined as manual acceptance or rejection of all patient problems, medications and allergies received from outside sources that are different from, or are not contained in, the local medical record. We first used flow mapping to acknowledge that a team of pharmacy technicians reconciled a large share of outside medications and allergies, however reconciling medical problems was outside of their scope. Therefore, the rate of complete reconciliation of problems, medications and allergies was low. Our approach has involved optimizing EHR workflows and training medical providers to reconcile. Throughout, we have been utilizing a quality improvement, Plan-Do-Study-Act (PDSA) model to design our interventions, study the impacts and measure our improvements.

First, we utilized knowledge of clinical decision support to brainstorm reminder systems to prompt reconciliation. Next, we consulted EHR analysts and nursing informaticists to create and test the features, understanding interprofessional collaboration would improve our outcomes. We then exemplified change advocacy by obtaining approval of EHR modifications from the inpatient informatics committee. Next, we designed presentations that created a sense of urgency for change, a foundational change management principle, followed by demonstrations of new EHR workflows. To date, we have conducted 24 trainings, and we have applied the PDSA methodology to modify our target audience and training content. Our audiences have included executive-level leadership, clinical divisions and individual providers. Analysis demonstrated that the greatest overall increases in reconciliation occurred after training clinical divisions. We have also utilized attendee feedback to improve sessions, most notably by incorporating live demonstrations into presentations. We communicate performance with clinical leaders on a monthly basis after training, as we recognize the influence local champions have on our initiative's success. Lastly, we have improved our performance analysis by creating reports based on clinical divisions, rather than analyzing reconciliation on hospital units served by multiple divisions.

Outcomes

In October 2020, complete reconciliation of problems, medications and allergies, as defined above, occurred in 729 of 2,747 hospitalizations (26.5%) in the system. At that time, individual hospital rates ranged from 13.3% to 50.9%, with an average hospital rate of 28.5%. This project is still in

progress, but in June 2020 complete reconciliation occurred during 3,162 of 4,428 hospitalizations (71.4%) in the system. Individual hospital rates now range from 54.8% to 93.5%, with an average hospital rate of 80.5%. Six of eight hospitals have recorded at least one calendar month of complete reconciliation above 80%. Gains have proven sustainable, as there have been only two incidents of a hospital or clinical division dropping below 80% after surpassing the goal. Increasing reconciliation rates above 80% has been accomplished more quickly at smaller community hospitals. These hospitals have typically required two training sessions, one with executive-level leadership and another with the hospitalist division, followed by communication of monthly performance to leadership.

Of the two hospitals remaining below goal, one is the largest hospital in the system and an academic medical center. Reconciliation rates at this center have improved from 26.1% in October to 64.7% in June after 12 training sessions with seven clinical divisions. This extrapolates to an improvement of approximately 1,174 patient hospitalizations with complete reconciliation compared to if baseline reconciliation rates had remained constant. For these patients, the main benefit of increased reconciliation is improved accuracy of key patient information in the EHR by incorporating new information from outside sources that would have been otherwise unknown to care providers. Secondly, increasing the accuracy of problem, medication and allergy lists aids system efforts at population health management and quality improvement initiatives. Ultimately, our goal is to increase the complete reconciliation of local and outside clinical information at all hospitals to 80% by October 2021. Additionally, meeting this goal reduces the financial penalty our organization sustains from public payers, which provide health insurance coverage for a disproportionately large percentage of patients in rural areas.

Personal impact

Formal education in health systems science through the Health Systems Transformation and Leadership Distinction Track at the Brody School of Medicine has provided the essential third pillar of my medical education as I am becoming a physician equipped to improve care in the United States. After learning principles in the classroom, the Distinction Track challenged me to apply the training to initiatives in our local health care system, and the experience has impacted my development as a physician in many ways. Primarily, I now appreciate the complexity of the existing

health care system and the many nuances required in making a change in a large organization. First, interprofessional collaboration is essential to ensure all perspectives are incorporated. We purposefully sought input from multiple disciplines, including front-line providers, clinical informaticists, and EHR analysts to optimize the workflows within the EHR. Second, I now recognize that knowledge and utilization of existing organizational leadership structures is a powerful change method. Specifically, convincing clinical leaders of the need for improvement, thereby creating influential local champions, has been essential to the noted improvements in reconciliation. Lastly, I now understand the delicate interplay between national, organizational and individual goals. Nationally, policymakers are promoting system interoperability by incentivizing organizations to ask individuals to perform an additional patient care task during every hospitalization, which they may or may not deem a valuable use of time. Overall, applying my formal health systems science training to a real-world problem has instilled the lessons above, and more, to influence my future career.

Honorable mention

Addressing Gaps in Education and Training for Radiation Oncology Professionals in Marginalized Settings

Project lead

Benjamin Li, University of California, San Francisco

Teammates

David Martinez (Oncosalud-AUNA, Lima, Peru); Oluwadamilola Oladeru (Massachusetts General Hospital, Boston, MA); Gustavo Sarria (University Medical Hospital Bonn, Bonn, Germany); Dante Roa (University of California, Irvine, Orange, CA); Layth Mula-Houssain (Ottawa Hospital Cancer Centre, Ottawa, Canada); Serguei Castaneda (Thomas Jefferson University, Philadelphia, PA); Daniel Wakefield (UT Health Science Center, Memphis, TN); Harvard T.H. Chan School of Public Health, Boston, MA); Soha Ahmed (Aswan University, Aswan, Egypt); Tomi Nano (University of California, San Francisco); Richel Bacley (Stanford University, Palo Alto, CA); Adam Shulman (National Center for Cancer Care & Research, Doha, Qatar); Apolo Salgado (Instituto Nacional del Cancer, Santiago, Chile) and Anuja Jhingran (MD Anderson Cancer Center, Houston, TX)

Faculty mentor

Steve Braunstein, Associate Professor and Program Director, Dept. of Radiation Oncology, University of California, San Francisco

Project location

University of California, San Francisco

Abstract

Infrastructure is lacking in limited resource settings where the burden of cancer weighs heavily. Local providers at understaffed, high-volume treatment centers struggle daily to balance an ever-growing influx of patients while trying to promote their own development efforts. The formation of Rayos Contra Cancer (RCC) is a response to these challenges and the urgency to address major gaps in cancer care in a collaborative fashion. RCC provides education and training programs for clinicians in areas where support is otherwise scarce for radiation therapy. We created, administered and measured 9 longitudinal curriculum programs to 77 clinics in limited-resource settings with the volunteer support of expert professional educators. We demonstrate the potential of coordinated education and training to reach and improve radiation oncology team confidence, knowledge and competence in clinics globally.

Project addressed/problem discovered

Radiation oncology professionals worldwide are faced with the difficult challenge of responding to the rising burden of cancer. The need to increase cancer treatment quality and capacity combined with market forces have driven the expansion to new radiotherapy technologies. These

technologies provide the promise to deliver higher quality care with more complex treatments than before. However, if used incorrectly, they can be detrimental and even dangerous for patients.

This dilemma is common in low-to-middle income countries (LMICs) where over 70% of cancer cases occur globally, and the incidence is projected to increase by approximately 50% in the next decade. Most LMIC health systems are still maturing to respond to this surge, and confronted with many obstacles, cancer centers struggle to receive the education and training needed to employ these technologies effectively. The result is either learning “on the job” informally or letting these expensive investments in equipment go unused.

Thus, there is a problem of radiotherapy centers with recent or expectant new equipment and little formal training opportunities for their safe transition to higher complexity care. Given the highly specialized nature of the field, notable barriers include lack of local training programs, limited access to training opportunities abroad, lack of funding for training, lack of awareness of what needs to be learned and lack of chance to receive longitudinal guidance by fellow clinical professionals with experience. The ability to self-organize new training initiatives is limited by the high demand and attention required for patient care.

Approach

A remote-support model for clinics in LMICs was proposed by a medical student and resident team at the Vanderbilt RadX innovation challenge. The model leveraged cloud-based technology for remote collaboration between clinicians in different radiotherapy centers, including a HIPAA-compliant repository for DICOM file sharing and treatment plan feedback for educational purposes. The proposal established an audience for support among prospective investors and business advisers in Nashville, TN in 2017.

Subsequently, core frameworks of business entrepreneurship were applied to refine the model and develop a social enterprise solution. These included 1) identify real problems, 2) understand the market, 3) identify the stakeholders, 4) develop a value-offering, 5) focus on incentive alignment and 6) create a tailored proposition with a sustainable and scalable operational model. The model was developed over many iterations based on feedback from key advisers, stakeholders, pilot partner sites abroad and experts globally, with a conscious goal to reduce siloed efforts and maximize synergies in the sector. To ensure sustainability, growth and impact, a decision was made to incorporate a 501(c)(3) non-profit organization.

This organization, Rayos Contra Cancer (RCC), established a multidisciplinary, clinic-centric approach that focuses on education and training programs in areas where support is otherwise scarce for radiotherapy. Programs connect pools of volunteer experts to cohorts of clinics who share a need for specific medical education and training. These experts work to empower clinics to provide higher quality treatments at each center.

From 2019 to 2021, RCC created, administered and measured 9 longitudinal curriculum programs to clinics with functioning medical equipment but gaps in education and training. Each curriculum focused on practical aspects of the clinic-wide transition to new radiotherapy techniques. RCC used the Project ECHO (Extension for Community Health Outcomes) telehealth model with professional peer-to-peer support and synchronous group learning in underserved communities via teleconferencing. Each curriculum consisted of live 1-hour sessions given 1-2 times per week over 3-4 months. Programs used multi-institutional collaboration; involved medical professional, trainee and student volunteers; and incorporated cloud-based technology. We measured participation, costs and educational outcomes and gathered facility operation details to estimate patient impact.

Outcomes

A total of 43 countries, 77 clinics and 1,060 clinicians participated in 9 training cohorts. The focus ranged from early technology transitions (e.g. from 2D- to 3D-external beam radiotherapy) to middle technology transitions (e.g. to intensity-modulated radiotherapy) to advanced technology transitions (e.g. to stereotactic body radiotherapy and stereotactic radiosurgery) as well as transitions to brachytherapy and contouring education for complex anatomical locations. Programs targeted regions in Latin America (36 clinics), Africa (22 clinics), the Middle East (10 clinics) and Southeast Asia (9 clinics) and included the support of bilingual volunteers by region.

A total 165 sessions were delivered by 9 education teams comprised of 82 radiation oncology professionals along with the support of 28 residents or physics graduate students, 35 medical or pre-medical students, and 76 on-site clinic coordinators. Notably, 28 (37.8%) of 74 US-based educators were originally from outside the U.S. All lecture materials and video recordings were provided to clinics following the sessions. Clinic participants included 398 (37.5%) radiation oncologists and residents, 240 (22.6%) medical physicists and physics trainees, 210 (19.8%) radiation therapists, 77 (7.3%) other roles, and 141 (13.3%) not recorded.

Paired measurements of pre- vs. post-curriculum clinician confidence, knowledge and competence significantly improved across multiple practical domains. For instance, in our first high-dose-rate (HDR) brachytherapy training program, post-curriculum score improvement was statistically significant ($P < .05$) for paired respondents in 11 of 15 domains. Absolute improvements were largest for confidence in applicator commissioning (2.3 to 3.8, $P = .009$), treatment planning system commissioning (2.2 to 3.9, $P = .0055$), and commissioning an HDR machine (2.2 to 4.0, $P = .0031$) on 1 to 5 Likert scales. Overall confidence in providing HDR brachytherapy services safely and teaching other providers increased from 3.1 to 3.8 and 3.0 to 3.5, respectively. Comprehensive reports for other training programs have been professionally presented, are currently being written or have been published.

Based on treatment facility data, the estimated clinical benefit to date is 75,017 cancer patient lives impacted per year. Low-cost coordination at the volunteer student through resident level was successful. The USD market value of all programs combined was \$3,176,000, and RCC charged \$0.

Personal impact

Establishing RCC, helping it grow and interacting with volunteers and clinics in so many diverse settings has taught me many things. Some of my top lessons are as follows:

1. There is no better way to truly understand the needs of a setting than by spending time with the people who you want to serve.
2. You will earn the respect of experienced leaders if you recognize the importance of economics, recognize the importance of different stakeholders, and have the knowledge to draw upon business frameworks to drive forward real-world, sustainable solutions.
3. It is good to share long-term goals to build traction but remember to identify simple short-term goals and achieve them. Make that your top priority, or you will not gain credibility. It will be hard to build support, and you will never get to your bigger goals.

I am grateful for the experience that this work has given me, and I feel it has already helped me in other domains of physician work. In any system, whether inside or outside the clinic, I try to identify the different stakeholders and understand their incentives. This helps me to guide my patients, promote actions and solutions that are more likely to work, and to identify gaps for improvement.

I have experienced how radiation oncology, an often-isolated department, can begin to leverage full campus support by engaging the graduate student body focusing on health care and secondary ties in society. A powerful idea with a strong mission can attract support outside our traditional boundaries.

Honorable mention

Utilizing Medical Students as Champions Against Misinformation During a Global Pandemic

Project lead

Naomi Tesema, University of Chicago Pritzker School of Medicine

Teammates

Maggie Collison, MD; Catherine Luo and Edwin Rosas, MD

Faculty mentor

Vineet Arora, MD MAPP, Dean for Medical Education and Herbert T. Abelson Professor of Medicine, University of Chicago Pritzker School of Medicine

Project location

University of Chicago Pritzker School of Medicine

Abstract

During the pandemic, scientists and health care workers struggled to curtail the misinformation surrounding vaccines, but little has been done to address this issue in medical school curricula. At the University of Chicago, the COVID Educational Support Team, a team of librarians, attendings, residents, fellows and medical students, was created to summarize key literature around vaccines using infographics and visual aids to help inform both clinicians and the community. To date, the infographics have reached over 700 views and 180,000 impressions online. Additionally, members of the team taught first-year medical students in a Scientific Communication and Misinformation class how to critically assess scientific evidence and deeply consider patients' perspectives to create infographics dispelling misinformation. This endeavor can contribute to the formulation of scientific communication courses as an explicit component of medical education, equipping trainees to reach broad populations, build trust with underserved communities and combat misinformation to empower patients.

Project addressed/problem discovered

Like most other trainees, much of our medical training in 2020 was set behind computer screens. By December 2020, the excitement surrounding the vaccines was palpable.

But a quick scroll through social media showed a vastly different response to these vaccines—apathy, distrust and

disappointment. Circulating infographics alleged the vaccine carried a microchip, or it was a way to control the population size and would make people sick. Genuine fear and curiosity coupled with the seemingly fast turnaround time for vaccine approval heightened the feelings of distrust and refusal. While the latest data indicates that half of the U.S adult population has been fully vaccinated against COVID-19 as of summer 2021, vaccine hesitancy is still a problem for many patient groups in some areas across the United States. With news surrounding the pause of the Johnson & Johnson vaccine, the delta variant, an additional booster shot and vaccinating young children, many patients are still understandably concerned about these vaccines' long-term effects. Due to various reasons, about 25% of U.S adults remain opposed to receiving the vaccine.

To care for patients holistically, it is important to assess vaccine hesitancy through the lens of health systems science, a framework through which an interdisciplinary approach can be used to increase vaccination efforts. With this project, we created educational materials centered on health equity and taught future health care leaders how to debunk myths using their infographics.

Approach

The foundation through which the COVID Education Support Team was built centered on change agency, management and advocacy. Our approach was a creative one—to use our

combined interest in art, graphic design and patient-centered messaging to summarize key literature around vaccines using infographics and visual aids to help inform both clinicians and the community. Our multi-disciplinary team included biomedical librarians, attendings, residents, fellows and medical students at the University of Chicago.

The pandemic exacerbated the discrepancies in obtaining health care that marginalized groups face. A fully vaccinated majority is what will improve the course of this pandemic. Doing so means not only encouraging individuals to get vaccinated but undoing years of medical mistrust. Acknowledging that medicine is not delivered in a vacuum, but rather through a network of systems informs how we reach out to patients and effect change.

As students entering our training amidst a global pandemic, we saw firsthand that communication skills adapting to the patient's perspective are essential to both the individual patient-clinician relationship and public health.

We needed to address these challenges as efficiently as possible to quickly decrease the rate of severe hospitalizations and deaths across the globe and dispel misinformation that quickly spread across social media. We utilized the most recent research studies to highlight key findings and dispel myths. As first-year medical students, we were able to read the technical language of the literature and find the best way to relay the information accurately and reliably to a non-medical audience.

We then focused our efforts on teaching first-year medical students in a Scientific Communication and Misinformation class how to critically assess scientific evidence and deeply consider their audience's perspectives. Our patients cited language differences, cultural barriers, and systemic racism as some of their main concerns regarding the vaccines. Our students debunked myths of their choosing and created infographics that addressed our patient's concerns with the tools we provided.

Outcomes

This project was a unique way to make a significant contribution to patient care and COVID-19 Education. To date, the initial infographics on the library site have reached over 700 views. To ensure the vital work of our team will continue, a medical school elective course was created starting in May 2020 for upcoming fourth-year medical students. The elective course was a success and was again offered in Spring 2021 for

14 first-year medical students. The thread for the infographics created by our students received over 180,000 impressions and 4,000 engagements on Twitter.

Being invited to teach a medical school elective class is normally an opportunity reserved for faculty. We were grateful for the trust our mentor, Dr. Arora, placed in us to teach our classmates how to create their infographics. Our preclinical curriculum provides many training opportunities centered on communicating effectively to patients and colleagues, but this was a unique opportunity that allowed us to combine our design skills with pedagogical strategies used in medical education. We believe that this will be extremely valuable to us as future medical educators and advocates. On our first day of medical school, our dean of multicultural affairs explained to us that most of our medical education will come from our classmates. Students enrolled in the medical elective course we taught referenced our dean's words and expressed how refreshing it was to learn tools we equipped them with that they will use again in their careers.

Educators from across the country have reached out to obtain our syllabus and create similar courses for students. Patients in our community benefited from our accessible materials, and clinicians also used our resources to inform their patients about their vaccine options and answer their most pressing questions. Additionally, the University of Chicago Medical Center benefited from the relief of overworked staff and an increase in efficiency due to the work of medical students who used their breaks in between classes to create these resources.

Personal impact

Evidence-based medicine is critical for delivering quality medical care but identifying and recalling high-yield information can be challenging with such a large volume of information. This is especially true for new medical students, who are tasked with becoming future health care leaders as we transition into practice. Art has always been a way for me to express myself and has played a big role in my journey toward medicine. I often supplement class materials with my drawings to solidify my learning, honing my skills experientially rather than through any formal training.

While the COVID-19 pandemic required that I physically distance myself from classmates, patients and professors, it also inspired me to discover new ways to engage with a worldwide health crisis and to make vital contributions to efforts at the University of Chicago Medical Center and

beyond. My work with the COVID-19 Educational Team was the first time I used my art skills for such a large-scale effort. The visuals I created synthesized complex ideas into a relatable form that reached thousands of people.

My involvement in this project has shown me that my skills can help people make informed decisions about their health. I foresee a career for myself that combines art and medicine through medical illustration and data visualization. Most importantly, I will continue to develop my skills in the realm of knowledge translation and health innovation, which will enhance my endeavors in becoming a competent, compassionate and formidable advocate for my patients.

Clinical informatics and health technology



Leveraging Multi-domain Health Technology and Informatics: A Group Effort Toward a Clinical Decision Tool in Stereotactic Body Radiotherapy

Project lead

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Teammates

Theodore Arsenault, MS (University Hospitals Cleveland Medical Center/ Case Western Reserve University, Department of Radiation Oncology); Tarun Podder, PhD (University Hospitals Cleveland Medical Center/ Case Western Reserve University, Department of Radiation Oncology); Lauryn Bailey (Case Western Reserve University, School of Medicine); Samar Bhat (Case Western Reserve University, School of Medicine); Lin Chen (Case Western Reserve University, School of Medicine); Benjamin George (Case Western Reserve University, School of Medicine); Kireem Nam (Case Western Reserve University, School of Medicine) and George Saieed (Case Western Reserve University, School of Medicine)

Faculty mentor

Tithi Biswas, MD, University Hospitals Cleveland Medical Center/Case Western Reserve University

Project location

University Hospitals Cleveland Medical Center/Case Western Reserve University

Abstract

Multiple health technology systems are employed in the management of oncology patients. Nevertheless, there is no current informatics tool that simultaneously integrates data from different clinical informatics systems to support clinical decisions.

In May 2020, we built an informatics-oriented group that aims to use deep learning (DL) for clinical decision making in radiation oncology. The group addressed the conundrum of patients' outcome after stereotactic body radiotherapy (SBRT), an ablative radiotherapy technique that requires complex planning. Therefore, we initiated a systematic review to assess the current evidence behind the potential use of DL in SBRT workflow. Furthermore, we started building one of the largest SBRT databases by deriving different clinical information attributes for more than 650 patients. Thereafter, we plan to devise a DL-based tool that leverages all the clinical informatics system into a single learning process and serves as a personalized decision support tool in the daily radiation oncology clinic.

Project addressed/problem discovered

The process of radiation therapy planning and delivery remains an inherently labor-intensive process. It requires from the radiation physicist and radiation oncologist an integrative approach of an abundance of inputs from different clinical information domains such as clinical charts for demographic and staging attributes, radiology systems for imaging data,

pathological and genomic platforms, and physics programs for dosimetric data.

Given its higher and more focal doses compared to the traditional radiation therapy procedure, the SBRT process itself is further complex as it requires appropriate patient selection, adequate treatment planning and a systematic post-treatment follow-up.

Despite the current advances in health information systems, there is no single clinical informatics system that can automatically leverage the input data from all the different clinical informatics platforms and serve as a clinical decision support tool for treatment delivery, prognostication or surveillance.

Under the concept of "innovation to improve the health care system for patients, physicians and the nation," the process of treatment personalization in oncology patients undergoing SBRT represented a meaningful challenge. Such challenge required:

1. a critical review of the current practice of SBRT delivery
2. a detailed examination of the current pitfalls of the clinical informatics systems in addressing the standards of SBRT care
3. a futuristic perspective in developing a technology able to meaningfully synthesize the multi-domain aspects of patients' data in the radiation oncology workflow.

Approach

As in every project entailing the use of computational informatics, the collection of “big data” was needed. Such endeavor can be taken only via a patient-centered and evidence-based teaming approach. Our team was composed of six medical students, a radiation physics resident, a radiation oncology medical resident, a senior radiation physicist with research track record, and a senior academic radiation oncologist with expertise on lung cancer and SBRT. The team skills covered a wide array of computational informatics, such as radiation physics, biostatistics, image processing and DL coding.

To underline the potential benefits of DL in enhancing the SBRT workflow, we first initiated a systematic review that allows us to highlight the evidence behind the current value of DL within the SBRT procedure.

As for the clinical data collection, we based it on two institutional review board (IRB)-approved studies at University Hospitals Cleveland Medical Center, for which the project mentor and physics co-mentor are the principal investigators. University Hospitals Cleveland Medical Center is considered a high-volume academic SBRT center, and it is one of the six international institutions that constitute the international Consortium for Oligometastases Research (CORE) group. Thus, a large number of patients treated with SBRT would be identified, which would facilitate the implementation and validation of our proposed clinical decision support system. After multiple discussions with the clinical and physics mentor, the decision was to start by data collection for lung and liver SBRT.

Prior to initiation of the project, several training sessions on evidence-based health care, SBRT processes, clinical information systems, multi-modality imaging storing platforms and radiation dosimetric tools were performed for the medical students by the project lead and the project physics co-lead. Unified process maps among the different students were created for data collection and processing.

In summary, the approach encompassed the domains of systems thinking, teaming, leadership, health care structure and process, value in health care, clinical informatics and health technology.

Outcomes

Our systematic review proposal is now initiated. We are in the process of systematic article screening, and we expect by the

end of this review to highlight the potential advantages of DL-based algorithms in the SBRT workflow. This review will also set the ground for devising our proposed DL-based clinical decision support tool, as it will also point to the deficiencies of the currently employed DL models.

To date, more than 650 patients who underwent SBRT at our institution have been identified. For each of these patients, all the clinical data is being collected: demographic, staging, medical comorbidities, three dimensional (3D) volumetric multi-modality images (Computed tomography, Magnetic resonance Imaging, and Positron Emission tomography), histopathology, genomics, delivered systemic therapy, delivered radiation therapy, and 3D dosimetric attributes. In addition, a variety of outcomes are being collected such as local and systemic recurrence, disease progression, treatment related toxicities and survival.

After the data collection, we will devise a DL-based workflow able to leverage the multi-domain data inputs of a patient into a single learning process. The DL-based workflow will be based on multi-path convolutional neural networks that accept multiple inputs of different dimensions and structures, then concatenate the inputs along the network path in order to predict an output.

The workflow will be trained, tested and validated using the data collected by our team. Such interface would accelerate and personalize the process of health care delivery, via treatment automation, outcomes and toxicity prediction, and prognostication.

The overall procedure will constitute a computational interface, that collects data from the clinical informatics and health technology systems, then integrates it in a DL-model in order to improve health care delivery and SBRT process.

Personal impact

As a physician in training, I examine and treat patients on a daily basis by applying general medical knowledge to the patient’s particular case. In contrast to this daily clinical scheme, working on a health systems science project broadened my perspective of health care delivery and incited me to combine patient’s individual data in order to draw impactful conclusions on a larger scale. This project provided me with the opportunity to develop my computational skills within the global perspective of health system improvement, health care processes, clinical informatics and health technology. On a personal level, I have experienced the

challenge and advantage of working with physics residents and medical students in a multidisciplinary setting. I had to develop — de novo — my organizational skills, in order to keep the progress of our project in accordance with our projected timeline. The project physics co-lead and I had to communicate on a daily basis in order to organize training sessions and data extraction maps, and the project settings improved — for both of us — our multi-tasking and communication skills.

In summary, I am proud to say that the project constituted an environment for academic and personal growth to each of the team members.

E-Drive: Analyzing a Health System to Expand Access to Clinical Guidelines

Project lead

Neha Pondicherry, University of California, San Francisco

Teammates

Nicholas Stark, MD; Jaskirat Dhanoa, MD and Hope Schwartz

Faculty mentor

Christopher R. Peabody, MD, MPH; University of California, San Francisco

Project location

University of California, San Francisco

Abstract

Like many urban-underserved, level-one trauma centers, our emergency department (ED) had extensive clinical/admission guidelines and service agreements designed to assist clinicians. However, front-line clinicians found it difficult to access this critical and at times verbose information. To improve access to clinical information in our ED, we created E-Drive, a homegrown, centralized, online clinical information hub. Through a design thinking process, our team distilled guidelines into clinically relevant information within standardized, color-coded flowcharts and succinct tables ready for immediate use in the ED. Surveys distributed following the platform's launch demonstrated ED clinicians felt confident accessing information on the platform, found the platform navigable, and felt the centralized information hub increased their efficiency. The design and development process, informed by real-time user feedback and usage data, highlights the importance of clinical informatics and health technology in improving health care delivery in the acute care setting.

Project addressed/problem discovered

The COVID-19 pandemic strained many aspects of our health care system. By utilizing the health systems science framework, through physician interviews, web analytics and end-user feedback, we exposed a critical gap in our hospital's ED — a lack of a streamlined, efficient platform to share critical, timely clinical information such as COVID-related protocols and clinical guidelines.

Prior to launching E-Drive (<https://edrive.ucsf.edu>), clinical guidelines at our hospital were located in a cloud-based folder system with unorganized, text-heavy files of varying

length and sizes. Despite a plethora of evidence pointing to the importance of clinical guidelines in the practice of medicine — ranging from guidelines pertaining to cancer screenings, antithrombotic therapy, subspecialty guidelines, etc. — the clinical guidelines at our hospital were only utilized a total of 25 times from June 2020 to September 2020. Realizing the need to rewrite the clinical guidelines into more concise, manageable formats, our team decided to focus on redesigning and converting existing clinical guidelines into a user-friendly format that can be easily and readily accessed by frontline clinicians.

Thus, E-Drive, a centralized, online clinical information hub was created. E-Drive also expanded to include guidelines, resources and announcements with the goal of having this information readily available in a fast-paced acute care environment. By utilizing our team's foundation in health systems science, combined with design thinking, we were able to develop a simple, cost-effective solution to this problem that has increased guideline access by 8,000%.

Approach

Health technology and clinical informatics: The development of E-Drive — a mobile-friendly, open-access web platform — relied heavily on health technology. The in-house no-code web platform Drupal allowed our team to rapidly respond to end users, incorporate feedback and update information in real time. We used a design-thinking process to create the mobile platform of E-Drive, which initially only held rapidly changing COVID-19 protocols and census sharing guidelines. Based on the success of the initial launch of this COVID-focused tool, E-Drive expanded to include all ED guidelines, resources and announcements, making this critical information readily available in a fast-paced environment.

Health care structure and process, value-based care and clinical informatics: E-Drive specifically focuses on health systems improvement and value-based care as it combines clinical information and health technology to create a user-friendly virtual platform readily available for clinical use. We assembled a team of designers, front-line clinicians and leadership to develop a standardized process for converting clinical guidelines into the mobile-friendly, PDF versions now available on E-Drive. We used an iterative design process, focusing on bottom-up end-user feedback along with rapid prototyping to ensure usability of guidelines in the ED. A model-centric approach using key principles of design, including spatial positioning, color and flow allowed us to create clinical flowchart algorithm maps, based on both end-user feedback and literature emphasizing the importance of flowchart algorithms for hospital guideline communication. We developed two templates: a multi-step protocol template with branch points and a single step protocol template. Several key qualities arose during our design process: 1) visualizing information on a single page; 2) eliminating and condensing text where possible; 3) utilizing left to right horizontal flow; 4) standardizing the use of color to indicate acuity and urgency of each step. A rigorous change-control process was formalized to ensure that redesigned guidelines retained clinical integrity. The guidelines were organized into categories and then uploaded to E-Drive. Sustainability of E-Drive was prioritized, with the development of a process map and templates on Google Slides for future guideline conversions.

Outcomes

Since the launch of E-Drive, more than 50 guidelines have been converted from lengthy PDF documents into standardized guidelines uploaded onto the platform under specific categories: pediatrics, trauma, medical, etc. The open-access, mobile-friendly aspect of E-Drive, along with guideline standardization and easy categorical division, allow for a system that can be easily accessed in a fast-paced ED environment. To assess E-Drive and its benefits to the health system, we used web traffic data and a survey of end-users.

User data indicates that standardized guidelines are increasingly accessed now compared to prior unstandardized versions, which were only accessed 25 times in total from June 2020 to September 2020. Usage of guidelines has grown by 8,000% since the E-Drive site launch in October 2020. Our redesigned digital platform, which houses the clinical guidelines along with other clinical resources, now averages

500 unique users per month. An average of 34 ED providers access E-Drive daily, compared to less than one weekly user prior to E-Drive. A survey of 110 clinical end-users in the ED was also conducted, with a total response rate of 47%. Prior to the start of E-Drive, only 12.5% felt confident accessing clinical guidelines. After the rollout of E-Drive, the numbers changed significantly. 76.6% of physicians agreed or strongly agreed that they could access clinical information more easily with E-Drive, 70.3% agreed or strongly agreed that their job was made more efficient with E-Drive, and 78.1% found the platform navigable and easy to access. The likelihood of recommending E-Drive to another clinician averaged out to about 8.02 on a scale of 1-10 (95% CI 7.49–8.55).

E-Drive is a low-cost, clinician-focused platform that has allowed our ED to embrace a system of continuous rapid bottom-up and top-down feedback to quickly add new features and minute-to-minute updates and develop guidelines in real time, with an undeniable positive impact on the care we are able to provide for our patients. There has been an undeniable improvement in overall health care delivery, health systems efficiency and physician satisfaction.

Personal impact

This work has had an undeniable impact on my development as a future physician. Prior to my involvement in this project, I was largely unaware of the value of health systems science research; I assumed that medical improvements and research only involved clinical or biomedical research. By exploring health systems science both in this work and my independent research, I have realized the importance of studying health care delivery from both a health system and health professionals view, to improve patient care and overall health care delivery. It was interesting to find out that just because the clinical information existed in a database did not mean that it was being used until it was presented in a more streamlined format. I now have experience utilizing end-user feedback to improve existing health platforms, utilizing health technology and informatics to improve health care delivery, and experience using design-thinking to come up with a way to distill verbose clinical guidelines into manageable clinical guidelines. I directly saw how health systems science can be used to understand health care delivery and how that understanding can directly improve health systems and patient care. This work will not only make me a better researcher, but a better physician who is able to incorporate health systems science in order to improve overall care for my patients.

Virtual Community Health Workers: Approaches to Patient Outreach During the COVID-19 Pandemic

Project lead

Ari Fish, Sidney Kimmel Medical College at Thomas Jefferson University

Teammates

Emily Romano; Paula Ostroff, RN, MS; Deborah Ziring, MD; Brandon George, PhD, MS and Rosemary Frasso, PhD, MSc

Faculty mentor

Geoffrey Hayden, MD, Associate Professor of Emergency Medicine, Thomas Jefferson University

Project location

Sidney Kimmel Medical College, Thomas Jefferson University

Abstract

Prior to the COVID-19 pandemic, community health workers (CHWs) in our health system screened patients in-person for social determinants of health and connected them to community resources. However, when our CHWs were required to work remotely from home due to the pandemic, the best platform to optimize contacting these patients was unknown. This study sought to evaluate the effectiveness of three outgoing phone call approaches (*67, Google Voice* and Doximity Dialer*) in successfully contacting patients.

We performed a retrospective analysis comparing reach rates across the three outgoing call approaches.

Reach rates were highest when Doximity Dialer was used (64.0%, 95% CI: 58.8-69.0) compared with *67 (40.8%, 95% CI: 30.8-51.6) or Google Voice (53.2%, 95% CI: 48.4-57.8) in this analysis of 1,144 outreach calls.

Due to higher reach rates, we recommend Doximity Dialer for phone-based outreach to patients. Additional research to improve the efficacy of remote outreach is warranted.

Project addressed/problem discovered

According to the American Public Health Association, a community health worker (CHW) is "a frontline public health worker who is a trusted member of and/or has an unusually close understanding of the community served." This enables CHWs to serve as liaisons between patients and health/social services while advocating for the public health needs of communities. In the Thomas Jefferson University health system, CHWs have been serving as integral members of the care team in both the emergency department and various clinic-based settings since 2017. They screen for social

determinants of health (SDOH) and assist social workers, case managers and care coordinators with a variety of patient-centered activities. In March 2020, the COVID-19 pandemic led to an enterprise decision to allow CHWs to work remotely from their homes. While the CHW team was able to access the electronic health record through a secure virtual desktop, they were left to make outreach calls from their personal phones. As there are no established best practices regarding phone-based outreach from a remote setting, we sought to create an outgoing call workflow that would mask CHWs' personal cell phone numbers while simultaneously maximizing the frequency of successfully reaching the patient by phone. We tested three approaches to making outreach calls: *67, Google Voice* and Doximity Dialer*. This study aimed to compare the effectiveness of these three outgoing call approaches in primary and follow-up call reach rates, all with the goal of improving CHW effectiveness in addressing SDOH inequities of our patient population.

Approach

Our main project approach was to leverage health technology to effectively identify and address the social determinants of health (SDOH) inequities of our patients. This was a retrospective analysis of data collected on outreach calls placed to discharged adult emergency department (ED) patients. The setting was an urban, academic ED with an annual census of 73,000 patients.

Data from calls placed to patients during the remote work period (3/19/20 – 5/15/20) were analyzed retrospectively. During this period, our team of CHWs (n=4) used three different patient outreach phone call techniques in three phases. In the first phase (3/19/20 – 3/23/20), the CHWs called patients using a blocked caller ID; they would type

“*67” prior to the outgoing phone number, which would display a message such as “Blocked” or “Private Number” on the recipient’s phone in place of the CHW’s phone number or caller ID.

During the second phase (3/26/20 – 5/8/20), we tested an approach using the free Google Voice mobile application. Google Voice assigns a unique phone number to the user, who can choose the area code but not the 7-digit phone number. The CHWs chose “215” area codes to represent Philadelphia-based phone numbers.

In the third phase (4/6/20 – 5/15/20), the CHWs used the Dialer function of the free Doximity mobile phone application. Doximity Dialer has several features, in particular the customizability of the outgoing call. For example, users can choose the exact 10-digit phone number to display on caller ID during outgoing calls from their personal cell phones. The CHWs using Doximity Dialer chose to display the numbers from their hospital-based office landlines, which might be recognized by patients as a call originating from the hospital.

A retrospective analysis of the de-identified data from the case management system was performed, and “reach rates” were calculated to determine how effective each calling mechanism was at reaching the patient, and thus, at addressing their SDOH needs.

A generalized linear mixed model with a random effect for the patient was used to look at the association of the individual call techniques with the reach rates. Post-hoc tests between groups were performed with a Bonferroni correction.

Outcomes

Community health workers are uniquely positioned to support patients and connect them to clinical and non-clinical services which promote health equity, especially during public health crises such as the COVID-19 pandemic. Although COVID-19 posed challenges for the CHWs who had previously relied on face-to-face interactions with patients, we found that the CHWs who were redeployed to a remote work setting were able to continue their outreach efforts to patients by phone.

Overall, 1,144 outreach calls were made during the study period. Of these, 771 (67%) were primary outreach calls, and 373 (33%) were follow-up calls. There were 107 outreach calls (9%) made using *67; 619 calls (54%) using Google Voice, and 418 calls (37%) using Doximity Dialer. Follow-up calls were made to 303 (39%) of the 771 patients, and 116 (38%) of

those 303 follow-up calls had a different approach from the primary call. Primary outreach calls accounted for 93% of the *67 calls, 72% of the Google Voice calls and 54% of the Doximity Dialer calls.

There was a strong association between the primary call approach and whether the patient answered ($p=.0024$). We observed that *67 had lower reach rates than Google Voice (adjusted $p=.0025$) and Doximity Dialer (adjusted $p=.0075$), which did not differ distinctly (adjusted $p=1.0000$).

When considering all of the calls via the generalized linear mixed model, we observed strong evidence of an association between the call approach and whether the patient answered the outgoing call ($p=.0002$). We estimated that Doximity Dialer had the highest reach rate (64.0%, 95% CI: 58.8-69.0), followed by Google Voice (53.2%, 95% CI: 48.4-57.8) then *67 (40.8%, 95% CI: 30.8-51.6). The post-hoc testing found strong evidence of a difference between Doximity Dialer and both *67 (adjusted $p=.0004$) and Google Voice (adjusted $p=.0070$), but not between Google Voice and *67 (adjusted $p=.0906$).

This project allowed us to analyze mechanisms to better engage patients and CHWs in the process of designing remote outreach workflows which maximize reach rates and facilitate addressing patients’ social needs by linking them to community-based organizations.

Personal impact

As a nation, we learned this past year that we must adapt to unforeseen circumstances. Health inequities don’t just stop when in-person health care is halted; in fact, those inequities become more pronounced. This project helped me to better understand how disparities can still be addressed successfully if we are creative in our approach to reaching patients outside of the hospital. Personally, this project also helped to bridge the gap between my experiences interacting with diverse groups, and my understanding of the types of health care issues that they may be going through on a daily basis.

I was also grateful to play a part in each aspect of this project — from beginning to the middle to the end. Of course, no project of this depth can be completed alone. My manuscript had multiple co-authors. As I took on the role of first author, I quickly learned what it meant to lead in this capacity. My role was not to know everything. In fact, this project was a success because we brought together world-class experts in a wide range of fields — each with varying skill sets. I worked alongside physicians, statisticians, nurses and community

health workers toward a common goal, and throughout the drafting and submission process, I sought their advice as we worked together to harness one another's talents and produce the best possible product. As I work on future projects through medical school and beyond, I will bring with me the lessons and skills I learned from this meaningful, collaborative research experience.

Telemedicine Video Visit Launch

Project lead

Lindsey Spiegelman, University of California, Irvine Medical Center

Teammate

Judi Smith

Faculty mentor

Scott Rudkin, MD, CMIO and Clinical Informatics Fellowship Director, University of California, Irvine Medical Center

Project location

University of California, Irvine Medical Center

Abstract

This project launched telemedicine video visits at all of the University of California Irvine's (UCI's) ambulatory sites. Previously, virtual care was not an established mode of care delivery for UCI's ambulatory physicians. This project was started prior to the COVID-19 pandemic and was planned to occur over a year long period. The initial project plan included phased sprints with each sprint including a small group of clinics. We were launching a video visit platform that utilized Zoom for Healthcare that is integrated into Epic (EHR). When the pandemic hit the U.S., the project was expedited to be completed within three months. Instead of small groups of clinics spread over a year, all the clinics went live with video visits access within three months.

Project addressed/problem discovered

Video visits increase access to care. They increase flexibility of care delivery for both the physician and the patient. They remove transportation and time barriers. Virtual care is beneficial for patients and for the overall health system. This became even more evident when COVID-19 added the additional layer of patient and physician safety. Our video visit launch helped address the problem of getting patients access to care during a global pandemic.

At the beginning of the pandemic all ambulatory sites at UCI were closed. Clinicians needed to maintain communication with their patients and continue to provide care. Patients only had the emergency department and urgent care site for in-person care. At the time, UCI clinics did not have an established video visit workflow. Without video visits established through Epic, clinicians had to utilize phone visits, their own personal Zoom accounts or other video-based technology like Doximity. Without a streamlined workflow, each clinician was providing care on a slightly different platform.

With our technological and educational efforts, we implemented video visits for all UCI ambulatory clinics. This utilized Zoom for Healthcare in an integrated platform through Epic. Epic is the electronic health record that UCI already utilizes and that our physicians are comfortable navigating. This solution allowed for a streamlined approach to provide care, review the patient's chart and document all within the same location.

Approach

For our video visit project, we initially planned to launch clinics in series during designated sprints. These sprints were planned to each last 2-3 weeks and would include 5-10 clinics. The first week would involve a launch meeting with the video visit project team and the clinic practice managers. We would review the necessary information with the project managers including their tasks. The project managers would be required to designate how many cameras and speakers they would need, where in the clinic they would perform the visits, how many physicians would be providing the visits and the types of clinic visits they would use the virtual option for. During the sprint we would work with our Epic analysts to activate the physicians within that clinic to have the "video visit" tab. In addition, we would provide physician education on the video visit workflow prior to clinic go live. Lastly, we would physically set up the cameras and speakers in their clinic location.

During the initial sprint, the COVID-19 pandemic hit Orange County. Instead of continuing with our planned, structured, yearlong virtual care roll out, we shifted our approach. We shifted the rollout plan to include every UCI clinic at once with a go-live date of April 1st. We recruited the help from our IT physician team and assigned each of the physicians to a set of clinics. We performed three larger go-live meetings, similar to the initial meeting mentioned above. At this meeting we

invited the practice managers, key physician stakeholders from the clinics and the IT physicians. We instructed the practice managers to perform the same tasks as written above. The IT physicians were responsible for working with the practice managers at their clinics to ensure they decided on the correct location for the visits, the cameras and speakers were ordered and set up and the physicians were educated on the workflow through elearning and peer coaching.

Prior to go-live, the IT physician team hosted a campus wide Zoom video visit demo. In this demo we provided a visual representation of the workflow both from the physician and patients' perspectives. We also created a support team to answer physician and patient questions during go-live.

Outcomes

The most impactful outcome of this project is that we were able to go-live and provide video visit capability for all of UCI's clinics by April 1st, 2020. We have performed over 200,000 video visits representing around 25% of our total ambulatory encounters. In addition, UCI has been able to provide care nationally to support our patients during the pandemic.

Personal impact

This project was extremely impactful for my training as a clinical informaticist. I learned firsthand the intricacies of project management for a rapid enterprise-wide program deployment. At the beginning of the project, before COVID-19, we had to emphasize the importance of this new technology to clinicians. Many clinicians were skeptical about using video visits in their clinical practice. At the beginning we were wondering whether there would be enough adoption of the new technology at all. Once COVID-19 hit Orange County, everything shifted. Physicians and clinic managers were reaching out to our team continuously asking when their clinic would be live so their physicians could perform video visits.

I learned how important it is to get all stakeholders on board. I learned how quickly project enthusiasm and adoption can shift based on external factors. I also felt that my involvement in this project helped move it forward and allowed for the valuable care of our UCI patient population to continue during the pandemic. I am so grateful for the experience and to have been able to contribute to the greater good for our patients.

Community resources for patients



Standardization of Protocol for Screening for Food Insecurity and Process for Ensuring Referral to Community and Food Resources

Project lead

Chhavi Chaudhary, University of Texas Health Science Center at Tyler

Teammates

Eyuel Terefe MD; Debra Livergood RN and Sharon Miles RN

Faculty mentor

Phyllis Ramirez, MD, Assistant Professor of Psychiatry and Behavioral Medicine, University of Texas Health Science Center at Tyler

Project location

The University of Texas Health Science Center at Tyler

Abstract

Food insecurity (FI) is a condition in a person or household lacking physical and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life. FI has a high prevalence among the senior population and is most pronounced amidst disabilities, poverty and seniors living alone. As a result, seniors have a greater vulnerability and risk of developing chronic diseases and disabilities. Consequently, FI is a driving factor in health disparities among our patient population; furthermore, FI overall has been exacerbated by the COVID-19 pandemic's socioeconomic consequences. We implemented a quality improvement (QI) initiative to standardize a new protocol for fostering screening of FI status and ensuring a follow-up referral process to community food resources at the time of discharge for inpatient psychiatric patients identified as FI within the Geriatric Behavioral Unit (GBU).

Project addressed/problem discovered

Feeding America estimates that 45 million people (1 in 7) may have experienced food insecurity in 2020. In comparison, 7.3% of the senior population were food insecure in 2018, a figure that is expected to be more elevated amidst the COVID-19 pandemic. Hunger and social isolation not only jeopardize the health and well-being of older adults, but they also place a significant strain on our health care system. Half of the seniors living alone lack the financial resources to pay for basic needs and are forced to make trade-offs between basic needs, such as medical expenses, housing and purchasing nutritionally adequate food; this keeps food-insecure individuals in a cycle of chronic disease, difficult to overcome eating behaviors, decreasing employability and increasing health care expenditures. We identified that the Geriatric Behavioral Unit

(GBU) of at University of Texas Health Science Center at Tyler (UTHSCT) lacked a formal process of assessing and addressing food insecurity; additionally, there was not a process of tracking referrals to free community food resources such as Meals on Wheels (MOW).

Our overall aim was to ensure a standardized process to identify food insecurity status with our acute geriatric psychiatric inpatient population and establish a referral process to ameliorate food insecurity. Lastly, we aimed to develop a pilot proof-of-concept QI to utilize QI methodology in conjunction with community engagement as a tool for psychiatry trainee providers to address and tackle the social and medical dilemmas and health disparities in our patient population and community.

Approach

We implemented a validated two-item questionnaire for food insecurity and discovered the necessity for increased collaboration between our hospital system and with our community-based organizations to assist food-insecure individuals. We believe the best means of addressing a social determinant of health is to incorporate it within our treatment plans and screenings as a component of the well-being of a health care encounter by providing healthy foods paired with nutrition education.

Our goals were to develop a process that ensures efficient and effective utilization of social services and programs in the community to our marginalized patients, most specifically, upon discharge from our hospital settings, to reduce the many psychosocial stressors that exacerbate, and consequently result in, poor health outcomes and health disparities. Per the implementation of the screening

process within the geriatric inpatient psychiatric patient population, patients who screened positive for food insecurity were assigned ICD-10 CM Code Z59.4 Lack of Adequate Food diagnosis code within our electronic health record (EHR) system. This permits future providers on subsequent admissions or outpatient visit to identify these individuals, monitor their status, and foster consideration in their treatment plan. Overall, we believe that this leads to greater interdependence and efficiency of communication between inpatient and outpatient clinical services. In addition, patients who screened positive for FI were referred to MOW using a modified referral form we developed. This updated form curtailed inclusion of protected health information and provided the necessary information for qualification criteria for MOW screeners to follow-up with patients for further screening; thus, this greatly reduced the barrier for patient participation and reduced structural barriers to qualify for such programs for certain patients. Furthermore, the patients who screened positive for food insecurity were allowed to obtain a 2-week supply of non-perishable food boxes provided by the East Texas Food Bank and developed by a registered dietitian. This was a collaboration and partnership between our organization to further expand the reach to the inpatient psychiatric patient population.

Outcomes

Our QI aim was to increase the percentage of patients screened for Food Insecurity from a baseline of 0% to a goal of 75%, to obtain a referral completion rate greater than 50% to MOW and to obtain the distribution of food boxes at discharge and assigning ICD-10 code Z59.4 from 0% to 55% within 4-month of implementation of a standardized protocol within our GBU.

Our QI resulted in screening 93% (28/30) of qualified new admits — exceeding our goal of 75%. 53% (15/28) of screened individuals were positive for food insecurity, and all were assigned diagnosis Z59.4 Lack of Adequate Food. 50% (14/28) of individuals identified as food insecure were referred to MOW, and 100% (14/14) received a 2-week Food-Box at discharge home. 28% (4/14) Food-insecure patients obtained continuous services with MOW, which was below our benchmark of 50%.

Overall, this was a successful pilot for the proof-of-concept QI initiative, but it was limited in scope due to decreased admission secondary to COVID-19 pandemic restrictions. Fortunately, our project has been recognized as contributing value to patient outcomes and advancing our hospital system mission, goals and values to serve the community and lower the burden of health disparities. As a result, our QI will be

expanded within our UTHSCT system to other inpatient units to incorporate addressing biopsychological components as part of the standard collaborative treatment and care model.

For direct patient benefits, the cost-saving was calculated to average \$6-\$7 per meal, \$30-\$35 per week and \$120-\$140 per month. Patients received nutritionally balanced meals that were diabetic-friendly, prepared fresh and met recommended dietary allowance requirements, which may serve as the only hot, fresh meal of the day for many home-bound patients due to lack of transportation or disability. The 2-week food box provided at discharge costs \$15 and is designed by a registered dietitian, including low sodium, low fat, and low sugar non-perishables. The establishment with MOW services also provided safety checks on the individual's well-being with protocols in place to get emergency help and increase independence for the elderly to continue living in their own homes.

Personal impact

Hippocrates said, "Let food be thy medicine, and let medicine be thy food." This project solidified my understanding of the patient-centered approach in the hospital and the community that patients return to after discharge. Food insecurity is better targeted at health care visits for patients. Hence, patients return to their community with tools and resources that foster and cultivate improved attendance to the diet/lifestyle that aligns with improvement in their health. With this project, it was apparent that as physicians, we have an opportunity and duty to provide leadership, take up initiatives to advocate and improve upon infrastructure and process of hospital systems, and advocate for the equitable, effective, and efficient access of resources to the patient population we serve. Ultimately, we as individuals ethically must be cognizant and accountable for the holistic wellness of the socially and culturally diverse communities we serve and target the challenging socioeconomic domains that significantly affect the medical aspects we dearly cherish.

Our project's impact on me realizes the potential of utilizing QI tools and methodology with community engagement initiatives; we have a great potential for addressing the social and medical dilemmas we will confront and address the prevalent health disparities in our community. We must take charge and commit to contributing and championing newly expanded roles as clinicians and leaders, educators, innovators and advocates for the application of a health systems approach to tackling the social determinants of our local communities for improved health care delivery as well as better quality outcomes and processes.

Improving Accessibility and Awareness of Community Resources in Norfolk

Project lead

Phillip Pham, Eastern Virginia Medical School

Teammate

James Lau

Faculty mentor

Dr. Brooke Hooper, Assistant Vice Dean, Clinical Education, Eastern Virginia Medical School

Project location

Eastern Virginia Medical School

Abstract

Based on discussions with local physicians and working with our local acute care clinic, we saw a need for updating and expanding the local resources. Our goal was to produce an updated, online resource for physicians, patients and students to use with the goal of continuous updates that would be beneficial to the community. A secondary goal of the project was to determine our resident and student population's knowledge of these same resources. The project discovered that over half of the resources (51%) we had were out of date and that many of the residents and students had low awareness of local resources. Based on this information, our institution was able to get a professionally updated online database and incorporate updating resources into the medical school curriculum. Our future outcomes involve analyzing the impact this online database has made on patient health outcomes.

Project addressed/problem discovered

The project began with a clinic resource book in our acute care clinic. This clinic focused on addressing all of the patient's medical and social needs at one time to help avoid future recurrent visits to the hospital. The book had dozens of resources meant to be provided to patients who required needs outside of the medical field. The goal of these resources was to address the different social determinants of health needs of the population at this clinic. Initially, we had the goal of modernizing this resource book so that physicians could more easily access and offer our patients these resources. However, as we began checking some of these resources, we realized that not all the information was accurate. This led to the first problem we wanted to address — the accuracy of local resources meant to help the social

needs of our patients. During the project, I realized I had a lack of knowledge regarding non-medical patient resources. As we further explored if this sentiment was shared by other students and residents, we found that there seemed to be a lower awareness. This led to the second problem we wanted to address which was improving the knowledge of local resources that improve social determinants of health at the medical student and hopefully resident level. Finally, as the project expands, the goal is to improve overall awareness and accessibility to resources that improve individual health and eventually population health.

Approach

The focus of the project revolved around social determinates of health and how we could offer more assistance to patients during clinic visits. Our approach was to first directly improve patient care by obtaining updated resource information so that we could offer it to patients, first in our local clinic but with goals to expand it to other clinics. We initially categorized and reviewed all the resources provided to patients in our acute care clinic based on their social determinant of health. We reached out to each resource based on the contact information we had and the information we could find online, including the use of the government 2-1-1 website. We then updated the information for each resource and created an online database with the resources we could easily access. We then surveyed local medical students, residents and attending physicians on their knowledge of these resources and how often they see patients who potentially benefit from these resources. The next step was addressing our goal of improving awareness both in patients and clinicians. Medical students at our institution have a third-year rotation in community and population health, and our approach was to incorporate part of this project into the curriculum so that

students could understand how to find and utilize resources. For patients, we wanted to modernize our resources with the creation of an online database that was easily available. It first was a datasheet that medical students had access to, but as the project expanded our institution was able to reach out to a professional service to create an online database.

Outcomes

The project discovered that a large percentage of information was out of date. Out of the 73 resources we had at the clinic, 36 had correct information (49%), 15 had outdated information and 22 didn't respond when we reached out. The distribution of the resources was also not uniform between the different social determinants of health. Out of the 51 resources, the majority focused on food instability (49%) and housing (17%). Few addressed economic stability support, such as employment (6%), or other educational and environmental factors. Through our surveys of medical students, residents and attendings, we discovered that very few had "extensive knowledge" in regard to local resources. The surveys also revealed that many of the physicians encountered patients who would benefit from the utilization of these resources. After the presentation of this at our school's research day, with the help of clinical educators and administrators, they created a broader project entitled the "757 Project." This project incorporated resource updating and discovery as part of the medical student and physician assistant curriculum in the community and population health rotation. Furthermore, the project created a professional online database that uses the updated information obtained by students. This database is more extensive than the original project, addresses nearly all of the social determinants of health and asks more specific

questions such as ease of use and the impact of COVID on the resource. This project is currently in progress and aims to study the health outcomes in the community for patients who are introduced to this resource.

Personal impact

I have enjoyed my time working on this project throughout medical school. At the start of this project, I just saw a problem that I wanted to fix at a local clinic, but it has evolved into something much greater. Much of my medical education has focused on growing my medical knowledge base to provide the best care in my future career. As this project has continued, I realized that these social factors, which are less often stressed, are under the realm of my patient care. Furthermore, talking to some of the people who work for these local resources, even briefly, demonstrated that the care extends outside the clinic walls. Being able to work with my great mentors and seeing some of the impact brought on by this project has shaped my vision of what an effective physician can be. My goal is that in every community that I work in as a physician, I get to understand the local resources as well as I do right now.

Seeing my project get incorporated into a curriculum and into a broader hospital system project has also given me more practical knowledge. It has shown me how to take an innovative idea and implement it through the correct channels. I believe every physician's goal is to improve the health of their patients, community and the health system as a whole, and this experience has demonstrated how I can do that in the future.

Leadership



Disaster Preparedness and Financial Relief Following a Natural Disaster

Project lead

Bradley Jimerson, Christus Oschner St. Patrick Hospital

Teammates

Dr. John K. Pourciau; Maggie Pankhurst, RN and Dr. Cody Gaupel

Faculty mentor

Dr. Tyson Green, Residency Director, Christus Oschner St. Patrick Hospital

Project location

Christus Oschner Saint Patrick Hospital

Abstract

On August 27, 2020, Hurricane Laura struck Southwest Louisiana as the strongest recorded hurricane in that region since records began in 1851. This hurricane caused destruction across the region resulting in approximately \$12 billion dollars in damage to residential and commercial property. Six weeks later, Hurricane Delta made landfall just 12 miles east of Hurricane Laura. This caused further damage to properties that were still recovering from Hurricane Laura. During recovery efforts, hospital staff had the daunting task of simultaneously caring for patients while dealing with the devastation left behind by two natural disasters. It is crucial for health care systems to have disaster preparedness and relief plans in place to ensure patient care standards are maintained during a natural disaster. In response to the hurricanes, our team raised \$15,000 for financial aid to hospital staff and started a committee to train future residents about disaster preparedness and relief planning.

Project addressed/problem discovered

This project was started to provide relief to hospital workers who were struggling to balance their financial and social needs at home with the requirements that come with working in the medical field after a natural disaster. We also wanted to ensure health care systems were adequately prepared in the future to support community and staff in the event of a disaster. While many industries closed following the hurricanes that struck Southwest Louisiana in 2020, hospitals remained open and required round-the-clock staff to provide patient care. Many outpatient care services were damaged following the storms. This meant patients relied heavily on hospital services instead placing added pressure on already fatigued health care systems. In addition, financial aid from federal institutions and insurance companies were

slow and are still inadequate one year later. When looking at social and economic determinants of health, we often focus on patient social determinants and how they affect access to quality care. This project focused on social and economic determinants that effect health care workers and how coping with outside social and economic stress while simultaneously caring for patients in need may alter the administration of quality health care. By providing relief to health care workers in the aftermath of a natural disaster, the economic burden that may preoccupy staff is minimized allowing them to focus on quality care for their patients. In addition, by creating a plan for future natural disasters we may be able more efficiently support our health care systems and ensure patient care is prioritized.

Approach

Most of Southwest Louisiana was without power and potable water for approximately 4 weeks. Individuals were powering their homes using portable generators, and the only access to drinkable water was by purchasing bottled water. In addition, many homes required extensive repairs to remain livable. With lagging insurance reimbursements and lack of federal disaster relief, we recognized that this created an added financial burden for employees and their families. This effected the social and economic determinants of health because it generated an outside stress for hospital employees that could adversely affect quality of care for patients while they were working. Recognizing this, a fundraiser was created to raise money to ease the financial burdens and social stress allowing hospital staff to focus on quality care. Eligible participants included nurses, certified nurse assistants, licensed practical nurses, physical therapists, physical therapy assistants, technicians and desk clerks. Each department was tasked with nominating one employee who they felt was in the most

need of financial relief. In addition, a committee was started to create a disaster relief plan, train resident physicians and create funds to allow rapid support for employees following a natural disaster.

Outcomes

A total of \$15,000 was raised during the course of this project. These funds were gifted to multiple hospital employees to be used during hurricane recovery efforts. In addition, a committee was created and chaired by Dr. Tyson Green with the goal of educating future resident physicians about disaster preparedness and creating a plan to provide support should a natural disaster strike again. This committee is an ongoing project. Following a natural disaster, patient care is extremely crucial. Access to essential outpatient services become scarce. This responsibility for patient care falls on the hospital systems that support the areas affected by these natural disasters. The stress of balancing the economic and social burdens that come with recovering from a natural disaster while simultaneously caring for increasing patient loads can be a daunting task for hospital systems. This project helped address these economic and social stresses by providing financial relief to hospital employees in need so they were able to focus more on patient care and creating a committee to create a disaster preparedness and financial relief plan for future natural disasters.

Personal impact

As a resident physician it is crucial to understand the importance of disaster preparedness and the role we play in supporting the hospital system and its employees following a natural disaster. Appropriate patient care requires an entire team effort, and if members of the team are burdened by social and economic factors outside of the health care system it can affect patient care within the system. This project taught me the importance of recognizing the social and economic effects a natural disaster can have on a hospital system and to create a plan to mitigate those effects. By creating a disaster preparedness plan and providing relief to the hospital staff who care for patients following a disaster, we can positively impact the social and economic determinants that effect delivery of quality health care. Also, I realized that we cannot rely on government assistance alone during disaster recovery efforts. We must be prepared to support health care systems and our colleagues by using disaster preparedness plans and local economic relief efforts. Unlike every other major national disaster, no relief bill has been passed to support recovery efforts in Southwest Louisiana to this day. Support for our own communities is crucial to the success of our health care systems.

Overcoming Barriers to Collaborative Learning: Pioneering a Virtual Student-Led Longitudinal Interprofessional Education Program

Project lead

Eshan Kaul, Rutgers Robert Wood Johnson Medical School

Teammates

Melissa Coward, PharmD (Rutgers Robert Wood Johnson Medical School); Ray Espinosa (Rutgers Robert Wood Johnson Medical School); Nehar Damle, PharmD (Rutgers Robert Wood Johnson Medical School); Abhilasha Borad, PharmD (Rutgers Robert Wood Johnson Medical School); Megha Shah, PharmD (Rutgers Robert Wood Johnson Medical School); Lauren O'Mara (Rutgers School of Health Professions); Elizabeth Popov (Rutgers School of Health Professions); Michele Palmer, DPT (Rutgers School of Health Professions); Verna Aiad (Rutgers School of Nursing); Fatimah Mosaad, PharmD (Rutgers-Ernest Mario School of Pharmacy) and Afra Guia Antoi Trinidad, PharmD (Rutgers-Ernest Mario School of Pharmacy).

Faculty mentors

Paul Weber, MD, RPh, MBA, Associate Dean for Continuing Medical Education, Director for the Health Systems Science Curriculum Thread, Rutgers Robert Wood Johnson Medical School.

Joyce Afran, MD, Assistant Professor-Department of Family Medicine and Community Health, Director-Family Medicine Clerkship & Associate Dean for Regional Medical Campus at Somerset. Rutgers Robert Wood Johnson Medical School

Project location

Rutgers Robert Wood Johnson Medical School

Abstract

In today's complex health care system, physicians function as part of interprofessional teams, requiring medical students to be equipped with several systems-based competencies. Despite this, medical students often feel they lack expertise upon reaching their clinical rotations due to limited opportunities to develop these skills during their pre-clinical training.

Our goal was to design, implement and evaluate a novel, student-led longitudinal course that offered a collaborative, interactive case-based approach to health system science (HSS) with a specific focus on interprofessional education (IPE). Our course garnered interest from more than 100 students in various professional health education programs across Rutgers University, ultimately enrolling more than 60 students to ensure a balanced team structure. The overwhelmingly positive student feedback demonstrates that interdisciplinary collaboration, passionate student leadership and leveraging virtual platforms can help overcome barriers to delivering high-quality IPE. Our model provides a framework to develop a complementary elective to enhance HSS curricula.

Project addressed/problem discovered

Within the past decade, there has been a shift to highlight

the third pillar of medical education, HSS, which centers around domains of interprofessional collaboration and systems thinking. However, in our experiences as student leaders, we found that compared to their clinical studies, our pre-clerkship peers lacked the same level of motivation for HSS learning and were often less satisfied with their IPE experiences. Using our understanding of the role of health care structures and systems thinking, we began exploring the root cause of this dissonance.

At Rutgers Biomedical and Health Sciences (RBHS), effectively integrating IPE into student curricula comes with various challenges. Creating meaningful experiences is limited by coordinating across different schools, including students' asynchronous schedules, geographically dispersed training locations, and varying curriculum approval processes. Health care students often learn about IPE within their respective silos or with limited exposure to allied health care professional students due to the aforementioned challenges. Yet, when these students graduate, they are expected to be prepared to navigate the challenges of cross-disciplinary care.

Through this increased attention to HSS, we discovered that there was room to grow at our institution. We found the HSS domains of teaming, change agency and health systems improvement particularly relevant and felt a strong desire to increase its presence within our curriculum. As a result, we

sought to create a program to address this need for a more comprehensive, effective and longitudinal IPE program.

Approach

With the domains of leadership, teaming, change agency and health system improvement in mind, we envisioned a student-led, longitudinal, case-based course that would overcome many of the challenges surrounding IPE. To accomplish this, we constructed six student-led sessions within a year-long elective. Each session was structured with a five-minute case introduction, followed by a 15-minute discipline-specific lecture and a 60-minute small-group interdisciplinary breakout session. A moderator from the leadership team led each small group. Our student leadership team then tailored published cases and applied personal clinical experiences to highlight the cross-cutting domains of teamwork, professionalism, leadership and ethics. They promoted inclusive behaviors, served as professional role models and gleaned narrative feedback for iterative improvement across sessions.

In one case-based session on Parkinson's disease, teams created a collaborative care plan for a patient early in the disease course, utilizing their understanding of each providers' skills and roles and identifying the patient's social determinants of health. Students then elicited the patient's care goals and examined the impact of non-clinical factors, including patient and family preferences. Participants then received an update on the patient 15 years later, leading them to discuss end-of-life care. They considered the challenges and ethics of health care through the lens of palliative and hospice care. Students also reflected on the complexity of terminal illness care and the caregiver burden on families and providers. The session ended with a 15-minute Q&A with a licensed social worker, who discussed the realities of health care policy and economics in the context of health care structures and processes. In closing, they discussed their roles in supporting patient values and recognized their power to be change agents and advocates. With this design, students actively learned HSS from a provider's perspective supporting a patient and their family. Combined with session continuity and moderator mentorship, we provided students with a learning experience to understand systems thinking and apply the principles of HSS to foster systems citizens.

Outcomes

Our primary objective was to assess and improve the effectiveness of our novel curricular design. We achieved this through a quality improvement project that was Rutgers

eIRB approved. Anonymous, optional surveys (response rate 47%, N=102) were collected from participants following each program session, allowing for real-time consecutive Plan-Do-Study-Act (PDSA) cycles for program improvement.

In post-session survey responses, approximately 90% of participants agreed or strongly agreed that their discipline was effectively integrated into the program session, that the cases were a valuable part of their time, and that the sessions were helpful for their learning. Constructive feedback included a desire for supplement enrichment and inclusion of social work perspectives. Participants demonstrated an inspiring passion for this course, which translated to comments highlighting their positive views and anticipated application of HSS knowledge.

Our post-hoc moderator focus group further highlighted the above sentiment. Moderators commented that the program's elements of "active participation," "fresh perspectives" and continuity promoted student understanding of the importance of HSS to clinical practice. They particularly emphasized the student-led, peer-to-peer education model as key to generating student motivation.

Approximately 90% of participant responses agreed or strongly agreed that they understood their team members' information, communication and roles and felt valued as members of their small groups. Through narrative feedback, students emphasized how this course improved their inter-team communication skills, expanded their knowledge base on various health care roles and allowed them to understand different barriers to health care. Presently, we are exploring this change in attitudes and skill set through a post-course survey which only has preliminary data at the time of this submission. We anticipate the true impact of this program will be the downstream effects of the collaborative patient care that the participants will deliver.

This course fostered a focused environment about IPE and HSS and facilitated the formation of informal relationships between students of other health professions. We anticipate it will enable them to practice inclusive behaviors, promote a culture of safety, be actively cooperative with the health care team and serve as change agents for our system.

Personal impact

Learning with, from and about our health care peers during the creation of this program has given us invaluable experience in our growth as clinicians. Working alongside

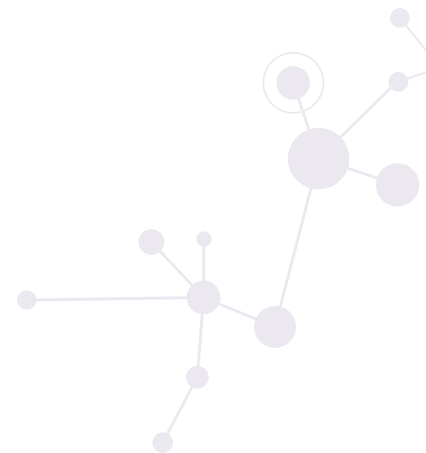
our fellow student leaders to create and prepare for cases multiple times per week not only allowed us to learn about each discipline but also allowed us to forge friendships and develop a shared respect among our group. While in this case we shared a common goal to develop our program, the effective communication and teamwork skills gained in the case development and session preparation process will undoubtedly translate to the future goal of delivering high-quality patient care.

Moreover, our growth as future physician leaders has been fostered through our experiences coordinating an effective interdisciplinary team with varied communication styles, diverse backgrounds and differing perspectives. Specific skills were further developed by gaining institution approvals

and adapting to logistical hurdles required to organize extensive sessions for 50+ participants. This has given us invaluable practice toward becoming patient advocates, educators and leaders.

As we advanced through our own clinical experiences, our beliefs in how vital IPE and HSS are to clinical education were solidified. This made the extraordinary amount of passion and engagement displayed by our participants even more impactful. Hearing participants comment on how they will use their new knowledge and skills once they arrive to the clinical setting drives us in our belief that we can make a difference and further motivates us to continue to promote HSS and IPE.

Opioid epidemic



Substance Use Disorder Training for Medical Students: Safe Prescription and Use of Naloxone and Tools to Engage a Support System

Project lead

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Teammates

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Faculty mentor

Greg Schneider, MD, Associate professor, Florida International University Herbert Wertheim College of Medicine

Project location

Florida International University Herbert Wertheim College of Medicine

Abstract

Between 1998 and 2018, almost 450,000 individuals died from an opioid-related overdose in the United States. Naloxone co-prescription with opioids and the implementation of naloxone education and training may lead to substantial harm reduction, including decreased mortality. Despite significant increases in naloxone prescribing, the Centers for Disease Control and Prevention reports that distribution continues to lag in parts of the country still suffering from large numbers of opioid-related overdoses. Appropriate training in the prescription and use of naloxone must begin early because the literature suggests resident physicians report high levels of discomfort when prescribing naloxone and often do not prescribe it appropriately. In addition, studies have shown that the presence of a strong social support system increases rates of substance use abstinence. Therefore, we are conducting opioid overdose identification and naloxone administration training for fourth-year medical students before residency to increase confidence in prescription and use of naloxone while also training students to provide appropriate substance abuse counseling to members of the patient's support system.

Project addressed/problem discovered

Residents report high levels of discomfort prescribing naloxone and have difficulty discussing this topic with patients even when it directly relates to their care. In addition, studies have shown that patients with substance use disorder (SUD) undergoing behavioral family therapy (BFT) in addition to individual behavioral therapy (IBT) remain in treatment longer than those undergoing IBT alone. Considering the unacceptably high number of deaths caused by the opioid

epidemic, changes to how we approach and treat patients with opioid abuse are necessary.

Our initiative to foster change uses a two-workshop train-the-trainer program for medical students. During the first workshop, students learn to recognize an opioid overdose and to use naloxone administration kits. The second workshop is designed to give future physicians strategies for creating a support system for patients. Both sessions can be done in person or remotely. In addition, both workshops are designed to equip students to lead similar sessions for their peers, thereby multiplying the effects of each session. Early training of aspiring physicians will address the fundamentals of recognizing and treating opioid overdose and connecting patients and their families with resources.

During my second year of medical school, I worked with an upperclassman to develop an abstract submission for the naloxone training and support system counseling portions of this project. Since her graduation, I have further developed the project to broaden the "train-the-trainer" aspect to improve health systems, increase health care value, change management, and emphasize patient advocacy.

Approach

This project aims to increase the confidence and knowledge of future physicians in identifying opioid overdose, using an opioid reversal agent, and prescribing naloxone. Additionally, it aims to educate future providers on how to involve family and friends of patients with SUD as a social support system and to lead similar training sessions to their peers.

Health systems improvement: This curriculum was developed as a “train-the-trainer” program. The sessions are designed to increase participants’ comfort and knowledge with the aims discussed above and to be prepared to lead similar sessions at their respective residency programs. Providing sessions like this early in the training of medical doctors may contribute to decreased opioid fatality rates and help to ameliorate the stigma associated with SUD. Furthermore, participating medical students will be equipped with tools to lead similar sessions for their peers.

Value in health care: This program’s overall goal is to reduce harm by improving health care systems and reducing costs associated with treating this patient population. The techniques taught will reduce costs associated with overdose and relapse.

Change agency, management and advocacy: One of the outcomes of early training in SUD will be the amelioration of stigma experienced by this patient population. These sessions will help to foster compassion and empathy in trainees who will become advocates for these patients and adjust management to a more holistic approach that promotes abstinence.

Outcomes

This project aims to educate medical students on the guidelines for prescribing and using naloxone and how to help the family and/or friends of patients with SUD become reliable support systems. Having a prescription for naloxone will allow these patients to be prepared in case of need, rather than rely on emergency medical services (which may be delayed or not contacted at all out of fear). Additionally, improving social support systems and training compassionate physicians will help decrease the use of resources, ultimately decreasing healthcare expenditures.

Data from our first session (5-point Likert scale, 1=strongly agree through 5 =strongly disagree) revealed mean pre-session confidence scores of 3.4 (SD 0.49) for assessing a patient with potential overdose, 4.0 (SD 0.94) for proper delivery of naloxone to a patient, and 3.9 (SD 0.64) for continuing management of a patient after administration of naloxone. Mean post-session agreement with the statement, “This session improved my ability to recognize, treat and manage an opioid overdose” was 1.1 (SD 0.29).

Our short-term goal is to continue to provide these sessions to all medical students and to collect additional data for improvement. During our first iteration, we found an increase in participant confidence in using naloxone. For our future iterations, I have developed multiple-choice questions, OSCE checklists, and surveys that will help to analyze student knowledge and confidence gains with better precision.

Our long-term goal is to include these sessions in the curriculum at Florida International University Herbert Wertheim College of Medicine. After developing better ways to evaluate participants and detailed facilitator guides, the project will significantly impact future residents and health systems science.

Personal impact

Before medical school, I completed paramedic firefighter school. Unfortunately, I have seen many cases of opioid overdose. In my experience, patients suffering from addiction are almost always lacking a social support system. Though it was amazing to use reversal agents to treat victims of an acute overdose, it was only temporary gratification. Fixing the current issue and addressing the underlying addiction are two very distinct goals. The latter requires more than the administration of a drug and is, of course, much more challenging to accomplish. Having the opportunity to be part of a project that treats patients with SUD through medicine and social support has taught me the importance of treating patients holistically and within a biopsychosocial model. I appreciate the importance of a reliable social support system to treat the addiction and ultimately increase the chances of maintaining abstinence. Additionally, I have developed my leadership skills. I have learned how to develop a didactic session, create an OSCE checklist, and provide feedback to participants.

Overall, this experience has helped me to develop compassion and empathy for patients suffering from SUD. These lessons will carry on to guide me in the treatment of other patients presenting with stigmatized illnesses. I believe that I have become a more well-rounded student and human. As my knowledge and experience grow, I will not only treat patients to the best of my ability but also develop train-the-trainer-type curricula in my future endeavors.

A Student-led Response to Impact the Opioid Overdose Crisis

Project lead

Sarah Follman, University of Chicago Pritzker School of Medicine

Teammates

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Faculty mentor

Vineet Arora, MD MAPP, Dean for Medical Education and Herbert T. Abelson Professor of Medicine, University of Chicago Pritzker School of Medicine

Project location

University of Chicago Pritzker School of Medicine

Abstract

A large portion of patients in health care settings are affected by substance use, including opioid use disorder. Harm reduction strategies, including naloxone distribution, are safe, effective solutions to mitigate the morbidity and mortality of opioid overdose. Yet, implementation of harm reduction in health care settings remains limited, and medical school curricula often provide inadequate training on the identification and treatment of substance use disorders. The goals of our student-led quality improvement initiative were: 1) to provide patients at risk of opioid overdose with naloxone and opioid overdose education, and 2) to provide medical students with exposure to addiction medicine in value-added roles. Through this novel system change, we also hoped to positively impact provider attitudes and practice with training on harm reduction strategies including distribution of take-home naloxone.

Project addressed/problem discovered

Opioid overdoses have been steadily increasing for many years. Prior to the COVID-19 pandemic, overdose deaths were at record highs, and the pandemic only accelerated the crisis. Provisional Centers for Disease Control and Prevention data indicate that there were over 93,000 drug overdose deaths in 2020, a 29.4% increase from 2019. This is the largest year-over-year increase ever recorded in the U.S.

Patients across multiple clinical settings are affected by substance use, including opioid use. Substance use complicates medical problems yet is often not adequately addressed by health care providers. Stigma, unconscious biases and poor understanding negatively impact care. This

may be due to a gap in medical education as the diagnosis and treatment of substance use disorders are not consistently taught.

Harm reduction, including naloxone distribution, has been shown to be a safe, practical and effective approach to addressing opioid use. Despite the life-saving benefits, naloxone prescribing has been underutilized in the clinical setting. In a retrospective cohort study using administrative data of over 130,000 patients at high risk for overdose, I found that naloxone was rarely prescribed despite many interactions with the health care system, including emergency department visits (Follman, et al. JAMA Network Open, 2018).

At the University of Chicago, I created a student-led interprofessional team of medical students, residents, pharmacists, and attending physicians to design an opioid overdose education and naloxone distribution (OEND) protocol. The goals were to: provide patients with naloxone and develop a curricular innovation for medical students who were trained in value-added roles.

Approach

In the spring of 2018, I helped create a multidisciplinary working group with the aim of designing an opioid-overdose education and naloxone distribution (OEND) protocol. The protocol was designed to provide take-home naloxone to patients at high risk of opioid overdose prior to their discharge from the emergency department (ED). Patients were eligible for naloxone kits if they had ever overdosed on opioids or combination of substances, had used illicit or prescribed opioids within the past year, had witnessed an overdose, or had a friend or family member who used opioids.

If patients did not have sufficient insurance coverage to cover the cost, intramuscular naloxone was provided at no cost to the patient, which was supported with grant funding from the Portes Foundation/Institute of Medicine Chicago (IOMC).

At the same time, we created a curricular innovation component for first-year medical students enrolled in the University of Chicago's Pritzker School of Medicine. First-year medical students enrolled in the emergency medicine elective received a didactic addressing opioid use disorder, harm reduction strategies, recognition and response to overdose, and naloxone distribution. Students were also trained in the new OEND protocol. During their required clinical shifts in the ED, students served in value-added roles screening patients for naloxone eligibility, facilitating naloxone distribution and providing education and teach-backs to patients who received the take-home naloxone kits.

Our novel protocol aligns with the health systems science's core domains: health care policy, population and public health, and health systems improvement. It also manifests the cross-cutting domains of leadership and change agency, as well as teamwork and interprofessional education. The curricular innovation and change to workflow resulted in an improvement in patient care, which is a clear product of the overarching domain of systems thinking.

Outcomes

During the initiation of the protocol, our working group trained over 90 physicians, 100 nurses, and the entire ED pharmacy staff on the novel systems change. In the first eight months, we dispensed 117 naloxone kits, and our novel protocol's naloxone distribution rate surpassed previously published benchmarks.

In the inaugural year, all 30 first-year medical students enrolled in the elective participated. The students collectively screened 147 patients, with 40.1% (n=59) identified as eligible for naloxone. Of the patients screened, 21.1% (n=31) reported that someone close to them used opioids, 17.7% (n=26) having witnessed an opioid overdose, 11.6% (n=17) having previously overdosed themselves, and 12.2% (n=18) previously knowing what naloxone was.

After the completion of the elective, 75% of participating students reported they were satisfied or very satisfied with the didactic and clinical experience, 100% reported having more or far more knowledge of the opioid epidemic, 100% reported feeling more or far more comfortable in discussing

issues related to substance use, 75% reported feeling more or far more integrated with the ED team, and 88% believed they were likely or very likely to use the learned skills in the future. All students received the educational training and completed their clinical shifts with no reported adverse events.

Overall, this initiative highlights the feasibility of implementing OEND in a busy, urban ED using preclinical medical students in value-added roles. Given the positive impact on the health system, patients, providers and trainees, the OEND protocol will continue to evolve and grow. The success of this model suggests that we can expand it to include other harm reduction measures and adapt it to address other unmet social needs in the ED. We also hope to expand the protocol to other departments and grow the educational component to reach additional undergraduate and graduate medical trainees. Although we did not assess provider attitudes before and after the intervention, our hope is that the overall effort will help shape more positive provider attitudes and mitigate stigma as this process has become part of standard workflow.

Personal impact

Working on this quality improvement initiative was a formative experience during medical school. While there were many hurdles inherent in the process, it proved to be an incredibly rewarding, successful endeavor that has continued to expand since its inception over 3 years ago. In terms of our patients and the community, it felt especially meaningful to have a positive impact on a group that is often marginalized and misunderstood. It also felt impactful to work toward reducing stigma and biases held by health care providers, including the next generation of health care providers. I was pleasantly surprised that medical students received the project with enthusiasm. It was refreshing to see that the next generation of physicians is energized about addressing psychological and social determinants of health, which is an important paradigm shift.

It was especially exciting to prescribe take-home naloxone recently in my first few shifts as an emergency medicine resident. Although I have a lot to learn as an incoming resident, I hope to continue following my passion to improve health systems with patient-centered care in mind. There are so many opportunities to innovate creative solutions to improve our health system with quality, value-based care in mind, and it will be my continued focus to leverage resources for care of traditionally underserved populations. As health care becomes increasingly costly, burdensome and

inaccessible to many, medicine will need to continually evolve in a way that maintains a patient-centered ethos. I hope to remain engaged in quality improvement efforts that prioritize this important mission.

Experiences with Harm Reduction Services During a Pandemic: Qualitative Interviews with People Who Use Drugs in Rural Illinois

Project lead

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Teammates

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Faculty mentor

Dr. Mai Tuyet Pho, Associate Professor of Medicine, University of Chicago Medicine

Project location

University of Chicago Pritzker School of Medicine

Abstract

The opioid overdose crisis has had devastating effects nationwide which have been exacerbated in the context of the COVID-19 pandemic, although manifestations have varied based on geospatial characteristics. This study addressed a gap in research around rural milieus by investigating COVID-19's impacts on access to harm reduction, health care and other services in the rural Illinois Delta Region. Through collaboration with a regional harm reduction organization and community members, semi-structured, qualitative interviews based on the Consolidated Framework for Intervention Research and other domains pertaining to COVID-19 were conducted. Interviewees included two groups of people who use drugs — those who access formal harm reduction services and those who do not, but who may access services via peers — to understand barriers and facilitators to access from various perspectives. Interview transcripts were evaluated for recurrent themes related to the experience of the pandemic and of health and social services among the study sample.

Project addressed/problem discovered

In the wake of the COVID-19 pandemic, the death toll of the opioid overdose epidemic has continued to mount from its already staggering numbers: from May 2019 to May 2020, over 81,000 people in the U.S. died from a drug overdose, an increase of over 10,000 from the previous year. One strategy to address the losses caused by the opioid overdose crisis has been the implementation of harm reduction services. But despite the improved outcomes associated with harm reduction, there are still numerous

barriers that stall implementation. These barriers, which span from geographical distribution to resource availability and to cultural attitudes around drug use and harm reduction, impact rural and urban populations differently. Seeing as rural rates of overdose mortality and blood borne infections have skyrocketed over the last three decades, there is a pressing need to develop specific interventions that meet the needs of and decrease the risks facing people who use drugs in rural regions of the U.S. This project addresses the gap in the existing research when it comes to the effects of the pandemic on people who use drugs in rural environments and seeks to elucidate the salient health disparities impacting these populations as well as understand which interventions — those related to government policies, mechanisms of service delivery, financial accessibility, stigma and discrimination — would make a difference in the risk environment these individuals navigate daily. The scope of these interviews ranged from individual day-to-day challenges to macro-level problems that participants viewed as negatively impacting their well-being.

Approach

Among individuals living in rural environments, experiencing financial insecurity or homelessness, using illicit drugs, and possessing other marginalized identities on the basis of race, gender, sexuality, and more, there are countless intersections of identity which can impact the ability to successfully maintain physical, mental and emotional health. The drive to understand these social determinants of health in a rural risk environment and in the context of a pandemic with clearly disparate effects on different populations was

the foundation for this project. The approach taken in the interviews that followed aimed to incorporate questions for participants that facilitated engagement with domains of health systems science from a micro to a macro level. On an individual, narrative-based level, the project seeks to elucidate the impacts — both directly related to health care as well as other aspects of well-being (financial, social, emotional, etc.) — of the pandemic on patients, families and communities of people who use drugs in the rural Midwest and how those impacts intersect with marginalized identities that these individuals hold. Furthermore, interview items around community representation and accessibility, as well as secondary service exchange between peers, explore the social networks enveloping interviewees and opportunities to widen community feedback in local harm reduction, health care and advocacy spheres. Questions around potentially implementing mobile telehealth services as a means of harm reduction seek to address the role of health technology in the midst of COVID-19 and the challenges of accessing health care in a rural environment. Policy, economics and value in health care are addressed through interview items around insurance and accessibility to health care services, with the goal of understanding 1) areas for advocacy that would lead to decreased health care costs and increased quality of life for these individuals and 2) whether any interventions on these fronts (e.g. offering wound care, vaccinations, dental care or treatment for Hepatitis C or HIV) could effectively take place in a harm reduction setting. This approach was developed prior to the start of interviews, but these threads continually re-emerged in interviewees' responses, with insights ranging from the personal to the policy-based.

Outcomes

While the project is currently still underway and outcomes are pending, there are three aims that guide the present work and help to contextualize its goals. These are to: 1) understand the barriers to accessing harm reduction services as reported by people who inject drugs in high-risk rural areas, 2) explore the impact of COVID-19 on mental health, substance use, risk and health seeking behaviors and utilization of harm reduction services among interviewees, and 3) to understand gaps in service delivery to maximize utility of local harm reduction organizations. Outcomes of this work can help to guide patient care and changes to the health system at large in several ways. First, and most immediately, findings from this work can highlight the immediate needs of people who use drugs in the Illinois Delta Region. In response, collaborators at local harm reduction organizations can begin

to implement appropriate services. These could include the following: distributing COVID-19 information, conducting COVID-19 testing and vaccinations, supplying PrEP, providing hepatitis C treatment or making small-scale changes based on clientele preference, such as stocking more needles of a certain length or Narcan of a certain administration method. Furthermore, other health professionals can be mobilized to join in this work: if there is a crucial need for a service — say, dental or OBGYN — among people who use drugs in rural environments, physicians or other providers could arrange clinic nights during which they travel with mobile harm reduction units. Moving from an on-the-ground approach to a more systemic level, the possible directions are just as numerous and meaningful. Advocacy in the health care field for reducing bias against these populations could serve to improve health care experiences and facilitate engagement with services among this population. Furthermore, adding to the evidence base around harm reduction and its benefits serves to mobilize policymakers in the direction of overdose prevention. Criminal-legal reform around drug criminalization also arises, illustrating just how broad the impacts of this work can be. From small-scale to large-scale changes, the outcomes of this work highlight the insights and ideas of an often-marginalized population.

Personal impact

I have long had a vested interest in working with people who use drugs given my upbringing in rural Kentucky, an area heavily impacted by the opioid overdose crisis. However, my vision of what this professional path will look like has both broadened in scope and focused in direction as I have carried out this research. Previously, my goals were largely defined by my desire to engage in compassionate, humble and collaborative clinical care in one-on-one patient encounters. While I knew that I wanted to advocate on a larger scale for people who use drugs and the communities that surround them, that element was more amorphous and harder to visualize in terms of actionable steps. Since beginning this work, though, questions, ideas and directions for the future have materialized in my mind; so, too have relationships and collaborations with community members, researchers and advocates who can support these. With these new resources, I have a keener sense of the system-wide improvements I hope to make in addition to continuing my pursuit of exceptional patient care. These include the pursuit of policy measures rooted in evidence (e.g. harm reduction measures, increased availability of mental health and social services) that address the costs of this crisis, as well as contributing to the body of

research supporting these measures. I am thankful for this work, as it has shown me the many approaches I can take in pursuing justice on this front and given me the resources and frameworks to do so.

Population, public and social determinants of health



Mapping Dermatological Access to Care in North Carolina

Project lead

Joseph Nenow, Indiana University School of Medicine

Teammates

Kenai Rhodes, Andrew Nenow and Philip Boyer

Faculty mentor

Philip Boyer, MD/PhD. Brody School of Medicine

Project location

Indiana University School of Medicine

Abstract

Access to adequate and timely dermatology care can be challenging for patients facing acute conditions with wait periods averaging 32-35 days in urban areas. Delays in care are associated with increases in hospitalization due to infection and increased severity of chief complaint at the time of presentation. More timely care promises to improve management in patients with acne and skin cancer. Numerous solutions have been proposed to expand access to care. However, geography represents an underappreciated obstacle in the necessity for and appropriateness of individual solutions. In this project, we visualize geographic access to dermatological care in North Carolina through exploring 1) provider density in North Carolina counties and 2) drive-time maps to closest dermatology practice. Based on our findings, we endorse teledermatological triage as a cost-effect method for expanding dermatological care in North Carolina.

Project addressed/problem discovered

Patients in rural areas can face additional barriers to dermatological coverage which urban-based counterparts do not. This project strives to analyze which counties within North Carolina are most impacted by population distribution and geographic barriers to health care access. We aim to understand which areas of North Carolina can be labeled as access-poor for dermatological care, defined as a drive time of greater than 60 minutes to closest dermatological practice. By distinguishing between systemic and geographic barriers to care, we can evaluate proposed solutions to poor dermatological access in rural areas outside of the traditional provider-patient paradigm. This will also improve access to higher-value treatment as we move away from tertiary prevention and equip practitioners to provide primary and secondary prevention.

Approach

With the goal of analyzing care access in North Carolina, we first situate geographical distance to a provider as a potential systemic barrier to care. From the perspective of population health, dermatological care is often spatially concentrated in urban centers with rural locations facing farther distances and longer commutes to access care. These high commute times translate into less frequent visits to clinicians and a longer period of time for diseases and ailments to progress without medical intervention. Travel time is estimated using road distance and speed limit information rather than Euclidean distance (i.e. straight line) in order to better approximate the transportation burden on the patient in the dermatological care system. Identifying counties and areas with longer travel times to care centers (and therefore larger barriers to access) is crucial to informing policy decisions that intend to improve access to care and ultimately improve quality of care. We gather the necessary data from two locations: the NPPES registry for practice location information and NCHealthWorkforce for information on provider density per county population. Rural patients typically face worse outcomes than urban counterparts, and the digital infrastructure used to estimate travel time to dermatological care in this project could have crossover utility in estimating access to care within other specialties and disciplines.

Outcomes

The outcomes of our project result from the superposition of two maps: the first portraying drive distance to nearest dermatology practice and the second portraying dermatological provider density by county. As expected, metropolitan areas such as Raleigh-Durham, Charlotte, Greensboro and Winston-Salem contain the greatest concentration of providers per 10,000 residents. Of North

Carolina's 100 counties, approximately 60 do not have any access to a dedicated dermatologist. However, the superposition of drive time onto these access-poor counties reveals that only the very periphery of North Carolina counties are greater than a 60 minute drive from the closest provider. In the northeast of the state, these areas include portions of Camben, Berdie and Tyrell counties. In the southwest, these access-poor areas include portions of Clay and Cherokee county. As such, the etiologies behind poor access to care in rural areas may not be strictly geographical. Rather, the core issue behind poor access to dermatological care may be a supply-demand mismatch between providers and patients. If this is the case, providers interested in expanding access to care in rural areas must seek to expand the supply of dermatological care. Suggested methods for expanding supply can be through lobbying for greater dermatological trainee numbers, offering more appointments, providing primary care physicians with stronger dermatological training

and consult availability, or implementing teledermatological triage systems which have shown to be both economical and efficacious in expanding care in academic settings.

Personal impact

This project has imprinted me with the idea that clinicians are called to be analysts, leaders, advocates and innovators in order to treat our patients. I am simultaneously impressed by the power of data in the hands of clinicians. I realized that I was only able to lead this project strategically due to my background as a clinician. Yet, I was only able to advise it technically through a passion for data science. I am thankful for the opportunity to serve my community and assist in medical innovation and hope to pay this realization forward. I recognize how important it is to be an educator and mentor in this field and to help others serve their communities through innovations in health systems science.

LiteraCE

Project lead

Shreyas Chandragiri, Sidney Kimmel Medical College at Thomas Jefferson University

Teammates

Emily Huang, Jasmine Phun, Colin Yost, Young Sheng and Madalyne Sunday

Faculty mentor

Geoffrey Hayden, Jefferson Health-Thomas Jefferson University Hospitals

Project location

Jefferson Health-Thomas Jefferson University Hospitals

Abstract

Low health literacy is a major problem in the United States, which leads to poor health outcomes, increased medical errors and significant economic burden. However, there is no consensus on a specific protocol for identifying patients with low health literacy. In this project, we performed a telephone-based, health literacy screen with 16 patients that received COVID-19 testing in Pennsylvania and New Jersey. The screening tool used, adapted from previously validated models, consisted of four questions assessing patients' general health literacy and an additional question regarding COVID-19 vaccination status. Patients that screened positive for low health literacy received a teach-back intervention about Centers for Disease Control and Prevention guidelines for COVID-19 red flag symptoms, safety precautions, and, as needed, vaccination recommendations. Eleven participants (69%) screened positive for at least one marker of low health literacy, and 8 were unvaccinated against COVID-19. Overall, the results of our pilot study supported the implementation of the health literacy screens.

Project addressed/problem discovered

Limited health literacy is a public health concern of epic proportions, with nearly 4 in 10 adults reported as lacking proficient health literacy. The link between poor health literacy and poor health outcomes has been thoroughly established. As such, the federal government has designated improving health literacy as a key priority, declaring it as a central focus of the Healthy People 2030 initiative. Healthy People 2030 emphasizes that organizations have a responsibility to ensure that patients can use health information appropriately. Several peer-reviewed screening tools have been designed

to identify patients who might have trouble understanding health information. Yet, at present, there is no established protocol to identify low health literacy and provide an effective intervention within a large health system. While many organizations have moved toward broadly addressing social determinants of health by integrating social workers, community outreach programs and advocacy groups, few have instituted protocols directly designed to ensure that patients appropriately comprehend their care. During the COVID-19 pandemic, the general population was inundated with information from many sources. Amid this climate, many people were exposed to misinformation at an unprecedented speed and scale. This misinformation paired with a population suffering from limited health literacy created an extremely problematic environment regarding compliance with public health measures, vaccines, physical distancing, etc. People's capacity to retain and process health information is highly situational, and the COVID-19 pandemic posed a challenging situation in which this information was disseminated in a high-stress environment clouded by sociopolitical influences.

Approach

The approach to our project centers on social determinants of health, specifically in the time of the COVID-19 pandemic. Our project is designed to screen patients via a series of four questions with respect to their understanding of 1) the COVID-19 virus, 2) documents related to discharge of COVID-positive patients and 3) national guidelines regarding COVID-19 and vaccinations. Not only does the act of screening patients improve our understanding of gaps in health care communication, it also helps to identify patients who might need extra counseling with respect to reading and understanding written and verbal information.

Therefore, our project seeks to implement improvements in the value of health care by enhancing our identification of social determinants of health in the context of the COVID-19 pandemic.

Outcomes

By screening for health literacy, we were able to identify ways that our health care systems and medical students could work together to optimize patient care. Additionally, the results of our screening process helped to generate useful hypotheses about health literacy challenges in the population at large. For example, although all 16 participants of this screening tool had been hospitalized with COVID-19, only half of the patients interviewed with this screening tool had received both doses of the vaccine over 3 months after their recovery from COVID-19. Of the non-vaccinated individuals, reasons for not getting the vaccine included lack of confidence with vaccine safety, uncertainty of when to get it after hospitalization, current pregnancy, or a lack of desire. Furthermore, half of all participants in this study also did not fully understand written information about COVID-19 or their other medical conditions, and more than half reported requiring assistance reading hospital/pharmacy materials or were not fully confident filling out discharge paperwork. Patient-centered outcomes resulting from this process included identifying patients with low health literacy, revealing gaps in patient-provider communication, dispelling misinformation and creating opportunities for patient education.

Our project also revealed a variety of medical student-centered outcomes such as teach-back method training, involving preclinical students in patient care, and creating

confidence with telehealth visits. In the future, we hope to expand our screening beyond phone interviews and into the emergency department, conducting this interview during admission rather than after discharge, and incorporate our tool into the larger medical student social determinants of health (SDOH) screening program called "Clinical Experience." Additionally, we plan to create visual aids to support patient education and establish a workflow to document screening encounters into the electronic health record in hopes of giving providers a more holistic understanding of their patient's SDOH needs.

Personal impact

This health literacy project galvanized my will to continue developing clear, humble communication practices for my patients. Our experiences screening COVID-19 patients demonstrated that effective clinical communication goes beyond accessing an interpreter to meet patients in their preferred language. My patient care going forward will carefully screen for issues in patient understanding that may exist beyond a linguistic barrier. For example, I will begin from the root understanding that our medical vocabulary or clinical reasoning may not be universally accessible for the general population. Additionally, I will employ teach-backs or understanding check-ins to make sure that vital ideas are received after they are spoken. I believe that the future of effective clinical communication will include leveraging technological infrastructure, evidence-supported care standards, plain language communication training and systemic protocols to empower all our patients with medical knowledge, decision-making and informed consent.

Understanding the Presentation of the Construct of Race in Medical Curricula and its Impact on Students' Learning Experiences and Behaviors

Project lead

Marcus Mosley, CUNY School of Medicine

Teammates

Nowshin Tasfia (CUNY School of Medicine), Kimberly Serna (CUNY School of Medicine), Marlene Camacho-Rivera (SUNY Downstate School of Public Health) and Victoria Frye (CUNY School of Medicine)

Faculty mentor

Dr. Victoria Frye, CUNY School of Medicine

Project location

CUNY School of Medicine

Abstract

How "race" is presented to medical students may influence both their implicit biases and future clinical practices, potentially widening racial disparities in care. We conducted in-depth interviews with 22 pre-clinical mostly non-white medical students attending a public medical school in a major metropolitan area in the northeastern United States.

Participants described being most aware of the presentation of race in board-style questions and least aware of the presentation of race during lectures. They were aware of race in problem-based learning (PBL) modules if the case revolved around a likely race-disease association. They identified imprecision in how race was presented during lectures and insufficient explanations of the causes of racial disparities in health. Participants described feeling ill-prepared to obtain racial self-identification and receiving mixed messages around the utility of race in diagnosing a patient. Participants reported experiences of cognitive dissonance.

Critical evaluation of the presentation of and instruction around "race" is needed to address whether it is presented as a biological vs. social construct, the level of precision of racial categorization in curricular content and the causes of and mechanisms behind race-disease associations. This has the potential to minimize false beliefs about race as a biological construct and the resultant negative impacts on clinical care.

Project addressed/problem discovered

Our project addressed the problem of the lack of attention devoted to understanding how medical students conceptualize race and whether they felt competent to use a

patient's race in an ethical manner without harm. This relates to the population, public health and social determinants of health domain of health systems science and helping medical students to develop cultural skills to work with patients from diverse racial backgrounds.

A health systems science approach impacted our research because we were not concerned about one particular class but rather the system of medical education at large.

Approach

Our project relates to the change agency, management and advocacy domain of health systems science. The project itself was student-led and sought to unearth the perspectives of mainly non-white medical students as related to their experiences of the presentation of race in pre-clinical medical education and how they envision using a patient's race in the future. One of the themes that emerged was "cognitive dissonance." Participants professed wanting to use a patient's race in an ethical manner to provide quality care that is free of bias and discrimination. However, participants expressed concerns that the process of standardized testing of race-disease associations and the lack of uniform curriculum or advice on how to acknowledge racial health disparities or utilize such information in an individual-patient encounter without promoting stereotyping, etc. would lead them to be ill-equipped to properly use a patient's race (with all of its psycho-social-biomedical implications) in a clinical encounter.

Outcomes

The outcome of our project was publication in *Medical Education* and an additional article under review. Although

“upstream,” our research can benefit patients by raising awareness about the lack of education around using race in a biomedical context. Hopefully, this will lead to curricular reform and future interventions that will leave medical students more competent and comfortable treating patients from diverse backgrounds and treating them holistically.

Personal impact

This project was deeply satisfying as I was able to bring to light the perspectives of my peers and illuminate the current pitfalls and gaps in terms of the way medical education is (and is not) teaching and discussing the role of race.

In terms of my development as a future physician, undertaking such a project and seeing its progress from proposal to IRB process to completion has provided me valuable lessons in teamwork, delegation, appealing to concerned stakeholders, time-management and health systems science.

Quality improvement



Assessment of Behavioral Health Care Costs for Pediatric Emergency Department Patients using Time-Driven Activity-Based Costing

Project lead

Marcella Jewell, University of Massachusetts Medical School-Baystate

Teammates

Jack Fanton, MD (Baystate Medical Center); Syed Shehab, MD (Harvard Business School) and Robert Kaplan, PhD (Harvard Business School)

Faculty mentor

Joeli Hettler, MD, Chief of Pediatric Emergency Medicine, Baystate Medical Center

Project location

Baystate Medical Center

Abstract

The demand on pediatric emergency departments (ED) to provide behavioral health care has increased over the past decade. An accurate cost analysis of providing this care in ED versus other treatment settings could inform the design of the most appropriate care model for these patients. The true cost is largely unknown as many parts of the care are undocumented and unreimbursed. The objective of this study was to identify the cost of caring for behavioral health patients using time-driven activity-based costing at an academic pediatric ED with a yearly behavioral health census of 1000. The team used process mapping and capacity cost rates, measured in dollars-per-minute to identify the time and cost associated with each activity during an ED encounter. 39 patient encounters covering 1,102 hours of behavioral health care time were observed. Twenty-two activities categorized into four generalizable stages (medical clearance, wait time, behavioral assessment and boarding) were described. The average length of stay was 18 hours (SD 16) with the care costing \$219 per hour. The behavioral assessment was the shortest and least expensive stage. Wait time and boarding, considered non-value-added stages, represented 82% of the cost with mandated safety companions comprising 69%. Total year costs were \$3,900,000 of which \$3,100,000 was non-value added. We believe this is the first application of time-driven activity-based costing to a pediatric behavioral health population.

Project addressed/problem discovered

Pediatric emergency departments (ED) are now tasked with providing on-demand behavioral health services given that half of America's children do not receive adequate

mental health care. This two-decade long trend in rising behavioral health visits to pediatric EDs coupled with declining psychiatric treatment centers demonstrates a "capacity-demand mismatch" within health systems that leads to prolonged boarding and poor patient outcomes. For example, behavioral health visits in the pediatric ED are twice as likely to last more than four hours compared to visits for medical issues, with durations lasting up to weeks at our institution. Additionally, each hour in the ED spent waiting for an inpatient psychiatric bed increases the likelihood of an adverse safety event. These events can lead to the use of harmful chemical restraints for these patients, which have increased threefold in the past 10 years in pediatric EDs.

When considering how to focus our efforts on this issue, we referred to the health care value equation of outcomes divided by cost. It is clear that the outcome of this care in this location is poor nationwide, yet the trend of boarding continues to rise. Therefore, we hypothesized that assessing the cost may offer administrators more concrete, quantifiable data on which to make decisions about the care process. The costs incurred by the ED to assess, triage and manage behavioral health care have traditionally been estimated using charge-based costing systems. These systems are likely to be inaccurate since such methods do not capture the cost of the many activities that are undocumented or not reimbursed under current insurance policy thus erroneously underestimating the cost and potentially hiding just how little value this care process offers this population.

Since the trend of behavioral health boarding in the ED did not seem to be reversing itself despite the widely documented poor outcomes, we hypothesized that demonstrating the actual high cost and low value of care

offered to this population could inspire change from the top. Time-driven activity-based costing (TDABC), a micro-costing, patient-level method provides such an approach to identify this cost.

Approach

Project's history and design approach: My PI, Dr. Hettler, and I began working together in early 2018 to understand behavioral health care in our pediatric ED. After one year of exploratory research, quality improvement work to decrease wait times and length of stay, health care policy activism with the Department of Mental Health, and the acquisition of grant funding all aimed to support this population, we exhausted our intra-departmental efforts and realized we need structural change backed by the health system to achieve our goals. It became clear that a financial argument would be the strongest motivator of change by shifting the conversation toward the value and quality provided to these patients with this poor practice of boarding. To start, we focused on the denominator of the value equation: cost. We decided to utilize a micro-costing method after spending considerable time with our finance department and realizing the health system didn't capture the true cost of this population in a digestible way.

Project Methods: Thus, in October of 2019, we began the journey of implementing TDABC. All patient encounters, up to 18 years of age, presenting to the Baystate Pediatric ED seeking non-acute psychiatric or crisis services during the observation period (7:00 AM October 14, 2019, to 7:00 AM October 28, 2019) were included in the analysis. We first used process mapping to identify each activity step in the patient's care cycle. We categorized our activities into common "stages" understood by many hospital systems to generalize our results. Stages included medical clearance, wait time, crisis evaluation and boarding. Next, we quantified the various resources required to complete each activity through a direct observation period where trained research associates rotated nearly 24 hours a day documenting the time (in minutes) needed for each resource to complete that activity step. Once time estimates for each activity were collected, activity-based costing was then used to calculate the cost per minute for all resources (personnel, equipment and space) to be available during the patient's care cycle called the capacity cost rate (CCR). The CCR for all resources was calculated as a dollar per minute rate. The total direct costs to treat patients are calculated by multiplying the CCR for each resource by the average minutes that the resource needs to be available for each activity step. The average cost and variation among the cohort per resource, per activity and per stage were identified.

Outcomes

The outcome of this project is two-fold: 1) It offered us granular information into the true cost of care and bottlenecks plaguing our ability to offer high value care to this population. 2) It contributed to the development of a system-wide task force (currently ongoing) to understand and address our behavioral health boarding crisis.

Outcome 1: We discovered the weighted average length of stay for a pediatric behavioral health patient at our hospital was 18 hours costing \$3,919.00 in total or \$219.00 per hour. The TDABC method allowed us to understand the time and resources spent on each stage, offering direction for quality improvement efforts. Twenty-two activities identified were categorized into 4 Stages: medical clearance, wait time, behavioral assessment and boarding. The behavioral assessment, representing the most value to the patient, was ironically the shortest and least expensive stage. Wait time and boarding, representing the least valuable stages to the patient, were 82% of the total cost. Total year costs for this population at our institution were \$3,900,000 of which \$3,100,000 represents non-value-added time.

The following are some additional notable findings that quantified the true burden on boarding on our staff and patients: First, the nursing staff spent nearly 50% more time on administrative tasks during the highly regulated medical clearance than on direct patient care during this stage, uncovering a potential source for burnout among psych nursing staff due to mandated requirements that do not necessarily fit our population's needs. Second, patients waited an average of 5.5 hours for the behavioral assessment to begin by our crisis provider. This second stage comprised 35% of the total time a patient spent in the ED and represented 24% of the overall cost. A decrease to the contractual 1-hour goal time would save nearly \$621,000/year (based on 980 discharged BH patients/year at \$144 per hour). Since the pediatric ED was nested within an adult ED with similar processes and the contracted crisis provider serves both adult and pediatric patients, a similar calculation indicates a \$2.6 million dollar savings if the system could meet the one-hour response time goal for a yearly census of 4,093 behavioral patients. Third, boarding comprised the longest and the most expensive stage in the care cycle lasting 11.7 hours on average. The reasons for this are exhaustive, but it demonstrates the capacity-demand mismatch in that our system cannot get patients into the proper treatment within an appropriate time frame.

Outcome 2: Dr. Hettler has been championing this issue for years, and we believe this work helped encourage administrators to develop a system-wide task force to reduce behavioral health boarding. The task force is bringing together the division chiefs of all departments that board or treat psych patients, social work, case management, nursing, crisis, and the information and technology department (I&T). Since its inception June 2021, members of the task force meet daily. I am on the operations subcommittee this summer, which is chaired by Dr. Hettler. I am the liaison between the clinical leaders on the task force and I&T and project managing the development of a dashboard that will offer information into the state of behavioral health boarding on a patient, unit, hospital and system-wide level. You can view a mockup of it here (thejewellster.github.io).

Personal impact

The reason this project so profoundly affected me is two-fold: the work itself and the mentorship under which I completed it. There are many experiences I can say changed my life, but there are few people that single handedly changed it; Dr. Hettler is one of those people. I had disparate jobs in my 5 years between college and med school which gave me a wide but shallow skill set in organizational management, knowledge of governmental policy and data science. She took me under her wing, taught me how to combine all of them, and then gave me the autonomy to apply it. Supporting the pediatric behavioral health population boarding in the ED required all of these skills that I thought I'd have to abandon by choosing medicine. She taught me to see the fallacy of that assumption, and soon enough, the issue that precluded this patient population from thriving quickly became the heart of my work as a pre-med and now as a medical student.

This project specifically required considerable effort working with all the different groups of people in medicine from quality improvement to nursing to consulting with the co-creator of the methodology. I was responsible for taking initiative to develop those relationships and make it happen. My true identity at heart is that of a community organizer, which developed during my first job out of college on the 2016 Hillary Clinton campaign. My identity as an organizer did not end after leaving politics for medicine. In fact, it only strengthened during this project where I learned how those skills I built during my gap years may be useful and valuable, not only to my future patients, but also the health system. This project helped strengthen my conviction that practicing medicine is so much more than diagnostics and science; it gave me much needed confidence to embrace my unique expertise from the experiences that led me here in the first place. It taught me to not necessarily try to fit in but to try to find how I can be most valuable. It taught me to be okay with the fact that I may not ever be a super specialized physician, but perhaps one that spends time thinking about a patient's well-being and social institutions that preclude that optimization. It showed me my place in medicine, and that has honestly been one of the biggest motivators when medical school seems impossible.

Improving Transitions of Care Following Acute Ischemic Stroke

Project lead

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Teammate

Jennifer Simpson MD

Faculty mentor

Michelle Leppert, MD, Vascular Neurologist & Neurohospitalist, University of Colorado School of Medicine

Project location

University of Colorado, Anschutz Medical Campus

Abstract

Stroke is a leading cause of long-term disability in the United States and accounts for more than 46 billion health care dollars annually. Patients who are hospitalized after stroke are at high risk of recurrence and complications that may result in hospital readmission and poor functional outcomes. A recent retrospective analysis found that early primary care provider (PCP) follow-up after stroke was associated with a reduction in rehospitalization within 30-days. PCPs are essential after stroke to help surveil and manage modifiable vascular risk factors that contribute to the risk of recurrent stroke. The primary aim of this project is to schedule PCP follow-up for patients who are admitted with a primary diagnosis of acute ischemic stroke and who are discharged with a homebound destination. We will implement plan-do-study-act (PDSA) methodology to measure the rate of successful appointment scheduling prior to discharge for eligible patients, perform a root cause analysis of the most common barriers to scheduling, and make adaptations that lead to prompt primary care visits. A secondary aim will be to examine the impact of this intervention on 30-day readmissions after stroke.

Project addressed/problem discovered

Readmission after ischemic stroke within 30 days is associated with high morbidity and cost. Many risk factors for readmission are non-modifiable, such as age, length of stay and stroke severity. However, health system interventions that target transitions of care in other conditions, such as in patients with heart failure, have found that early follow up may improve outcomes and reduce readmissions. A recent study utilizing a nationally representative claims database of insured Americans showed that primary care follow-up within 30 days of stroke reduced all-cause hospital readmissions.

However, less than 4% of patients discharged after stroke see a primary care physician within this time frame. Thirty-day readmission occurred in 7.3% of patients, of which approximately 40% were related to recurrent cerebrovascular events. These findings compelled us to explore our institutional discharge process for patients hospitalized with ischemic stroke. We found that in 2019, the rate of scheduled primary care follow-up for patients hospitalized with acute stroke and discharged to a homebound destination was 50.5%. No formal PCP scheduling guidelines or requirements were in place prior to this quality improvement initiative for stroke patients leaving the hospital. Furthermore, we identified barriers to scheduling primary care appointments include lack of insurance, lack of established primary care provider and undocumented immigration status.

Approach

Our project aims to address health care structure and process by instituting guidelines for scheduling primary care follow-up prior to discharge after acute ischemic stroke based on the patient's resources, proximity to home and destination of disposition. We collaborated as an interprofessional team, comprised of neurology providers, primary care physicians, care coordinators, stroke coordinators and social workers to identify and navigate known barriers to PCP scheduling. We developed a flowsheet diagram to standardize our scheduling process at discharge and created a shared reminder list within the electronic health record to enhance the collaboration between the invested parties. We will apply PDSA methodology to analyze the impact of our intervention, develop solutions to newly identified barriers and refine our process based on feedback and outcomes.

Outcomes

Outcomes for this project include the rate of primary care scheduling prior to discharge as well as the rate of successful scheduling within the goal time frame per disposition. We will also examine the rate at which patients who are scheduled to follow up within our system ultimately complete their appointment. We will study the rate of readmission after ischemic stroke for 2019 and compare it to the 9-month intervention period in June 2021. Other qualitative outcomes include identifying the most common reasons PCP scheduling cannot be completed before discharge. We collect feedback on the quality and thoroughness of discharge information delivered from the inpatient stroke team to the PCPs within our health care system who saw the patients following their hospitalization.

Personal impact

This project has been an opportunity to better understand breadth of expertise required for patients to leave the hospital in a method that increases the odds of successful recovery. I have gained insight to the significance of standardizing procedures and creating collaborative environments to achieve a shared objective. This project has also revealed the inequities and limitations in our health care system to provide consistent high-quality care to those of low socioeconomic status. Developing partnerships with local care centers dedicated to serving those without insurance has helped me realize how social determinants of health influence the odds of success of medical interventions and impact the quality of life of our patients.

Systems thinking



Less Broccoli, More Games: Driving Health System Science Learning through Gamification

Project lead

Steven Grossen, University of Utah

Teammates

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Faculty mentor

Damian Borbolla, MD, Biomedical Informatics School of Medicine, University of Utah

Project location

University of Utah School of Medicine

Abstract

Health systems science (HSS) has been increasingly implemented into medical school curricula, including at the University of Utah. However, not all students are consistently motivated to learn HSS. HSS is often seen as the “broccoli of medical student education”,¹ as it is viewed as important for physicians but is unpalatable to learn as a student.

We suggest a different pedagogical approach for teaching HSS: games. When we gamified HSS instruction, students were generally excited to try a new way of learning and looked forward to friendly competition with their classmates. In addition, the game format allowed students to empathize with disadvantaged patients who are at increased risk of negative experiences due to implicit bias and other factors and encouraged discussions on resolving barriers to equitable care. This approach also allowed us to teach HSS principles remotely and enabled students to act as peer instructors and facilitators.

Project addressed/problem discovered

To address current health needs in America and around the world, there has been a drive for medical schools to create excellent student physicians committed to advocacy, cultural understanding, and development of professional skills. To complement the foundational and clinical sciences, HSS has been increasingly implemented into medical school curricula as the third pillar of medical education. HSS focuses on improving health care delivery, interprofessional teamwork, and the patient experience. HSS uses informatics and data-driven evidence to drive change at the population level, differentiating it from the individualized approach taught by traditional medical education. Physicians increasingly need

to be aware of the relationship between the patient and the system, indicating the need for HSS medical education.

Unfortunately, student engagement in HSS material is often mixed, resulting in its moniker, the “broccoli of medical student education”.¹ Students recognize its value but are hesitant to engage fully in learning it.

We wanted to provide HSS information in an interesting, relevant way, using a learning format many students were already familiar with—games. Due to increased distance learning needs in 2020, we also faced an additional hurdle. We had to create games that could be streamed online during a video conference call.

Source

1. Gonzalo, Jed D. MD, MSc; Ogrinc, Greg MD, MS Health Systems Science: The “Broccoli” of Undergraduate Medical Education, *Academic Medicine*: October 2019 - Volume 94 - Issue 10 - p 1425-1432 doi: 10.1097/ACM.0000000000002815

Approach

As a team, we developed two games to teach HSS information and highly promoted them among the 2024 class. Prior to the learning session, students were provided with AMA-developed introductory reading material. After a brief introduction, students were split into small groups that were overseen by faculty or student facilitators.

We created a Jeopardy!®-style presentation with definitions of HSS terms, case studies and discussion questions associated with the following domains and concepts: clinical informatics and health system innovation, payment reform and value in health care, structural and social determinants of health, and leadership and teaming. Some questions were geared

specifically toward specific health challenges in Utah including mental health care access, rising insurance costs, and challenges facing rural Utah. Facilitators oversaw discussions and allocated points to students who answered correctly. Using this gaming format, many students were excited about systems thinking and discussing inequity in health care. Each group found different subjects interesting, resulting in unique enriching experiences for the students. This led to stimulating conversations between students after the session.

We also created a Chutes and Ladders® game that followed the progress of patients with various randomized social determinants of health through the medical system: race, gender, language/ethnicity, socio-economic status, body size/BMI, sexual orientation, education level, and drug use. Each patient had three social determinants of health, illustrating the importance of intersectionality. In this game, students would draw “cards” that could either allow them forward through the medical system, detour them, or push them out of the medical system entirely, depending on how the card applied to their patient’s characteristics. The cards were in the following categories of the medical system: access, onboarding, care team, provider, treatment, and ongoing care. This allowed students to put themselves into the shoes of a patient and recognize the biases, barriers and discrimination encountered by patients that keep them from receiving equitable care. The expertise and experiences of the team made this game particularly poignant, particularly the lived experiences of LGBTQIA+ patients facing bias and discrimination in a health care setting. The Chutes and Ladders® game can be freely accessed at: <https://gbayles.itch.io/hss-barriers>.

Outcomes

Our primary goal was to create and evaluate educational games as part of an innovative game-based HSS curriculum, working cooperatively with students to increase student engagement, motivation and academic performance. Our original plans included near peer teaching from upper-level students, but we extended an invitation to first year students in the medical education pathway to be facilitators. Their performance was impressive, and their enthusiasm was contagious.

We had the additional goal of creating games that could be streamed online over a video conference call. This was accomplished with only minor technological hiccups, including issues with scoring points and the presentation occasionally running slowly over the video call.

Student reactions were largely positive, and they expressed appreciation for the lived experiences and expertise of their facilitators. Many students were shocked at some of the inequities discussed in case reports and expressed a desire to do something to change the status quo. As students considered barriers to health care, innovative solutions were explored. Some students reported they felt more confident in the material and preferred the gaming format to the traditional lecture format. Several students mentioned that they felt more interested in and motivated to learn about health systems science. A few students requested more time for discussion after the session, an indicator of increased enthusiasm and curiosity about HSS.

It should be noted that one student felt that the gaming approach trivialized the challenges facing vulnerable members of the population. This is an important consideration when designing an instructional game. It is important to acknowledge that bias and discrimination are experienced by real people, not just characters in a game. This may be accomplished with a quick briefing session prior to starting the game. Additionally, gaming activities may be referred to by another name, such as “experiential learning activities” to reduce the negative connotations that may be associated with terminology such as “games” or “gaming.” One student’s suggestion was to add a reflection assignment after the educational gaming activity, which may assist the applicability and relevance of the game, while keeping it firmly grounded in reality.

Personal impact

Games and learning through games have always been a big part of my life. As a child, I learned to read and spell by playing with letter dice and learned to count by playing mancala. I also played biology, math and language card games, as well as several technology-based educational games: Reader Rabbit®, Where in the World is Carmen SanDiego?®, Zoombinis®, etc. In school, I created games, including a Clue® game based on Revolutionary War figures, locations and weapons.

Prior to medical school, I worked as an 8th grade science teacher, where I developed and utilized multiple games. When COVID-19 arrived in America, we learned about viral pandemics for weeks, then demonstrated exponential growth, spread and viral mutations through playing Plague, Inc.® as a class.

In designing the HSS game, I was grateful to work with a diverse team with multiple backgrounds: population health, informatics and game development. I hope to continue to collaborate in similar ways in my career.

Like many students, I have also struggled with motivation to learn about HSS and population health. However, preparing for and engaging in the HSS games made those principles “stick” and helped me apply those principles to real-life problems by enabling me to brainstorm solutions with classmates. It also helped me empathize with patients and recognize their unique stories and struggles as I was briefly put into their shoes. I highly recommend using games to teach HSS principles. It worked for me, and it may work for your students as well.

Encouraging Trauma-Informed Care of Sexual Assault Survivors: An Interprofessional Curriculum

Project lead

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Teammates

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Faculty mentor

Keme Carter, MD, University of Chicago Pritzker School of Medicine

Project location

University of Chicago Pritzker School of Medicine

Abstract

Although many patients have experienced sexual assault during their lifetime, health care providers often are untrained in trauma-informed care. This is particularly problematic in emergency departments, where sexual assault survivors frequently seek post-assault care and are sometimes met with providers who are not confident in their ability to avoid re-traumatization or conduct forensic examinations. To address this, medical students at the University of Chicago (UoC) collaborated with sexual assault nurse examiners (SANEs) and physicians to develop a curriculum for emergency medicine residents. A pilot of the curriculum led to increases in residents' self-perceived confidence in taking histories and conducting forensic examinations. Positive feedback from residents has cemented the training into UoC's emergency medicine curriculum. We are optimistic about the impact of survivors being treated by providers who are equipped to set them on a path toward healing and hope to distribute elements of this curriculum as a resource for other programs.

Project addressed/problem discovered

Despite the fact that 1/5 of female-identifying patients and an even higher proportion of women of color and LGBTQ+ patients have experienced sexual assault during their lifetime, many providers lack confidence in providing trauma-informed care. Emergency department (ED) care of sexual assault survivors epitomizes these challenges. While the acute care and forensic examinations provided by ED staff are often survivors' first post-assault health care interactions, ED staff are not immune to misconceptions about sexual assault, and providers expressing disbelief, victim-blaming attitudes and insensitivity is widely documented.

As medical students with experience volunteering in EDs as sexual assault patient advocates, we have actively observed dozens of these scenarios. Using systems thinking, we considered the factors that contributed to the quality of care delivered to survivors in EDs. One factor stood out as a major determinant of the success of the provider-patient dynamic: provider comfort and training. In particular, we noticed positive interactions occurring between survivors and specially trained and highly experienced sexual assault nurse examiners (SANEs).

our observations add to an existing body of evidence that SANEs are effective in improving sexual assault patient care, SANEs are frequently not available in many ED settings. In the state-wide context of our medical center, only 32 of Illinois' 10,000 ED nurses are certified SANEs as of 2018. Therefore, improved training of ED staff, including resident physicians, is critical.

Approach

Observing emergency department providers' gaps in trauma-informed patient care strategies prompted us to use systems thinking to improve providers' agency, management and advocacy. We reviewed quality improvement studies in sexual assault survivor care and found that negative interpersonal interactions between ED staff and survivors often reflect systemic failures to provide ED staff with adequate training and time to care for this patient population rather than unmodifiable attitudes toward sexual assault survivors.

To understand barriers to high-quality sexual assault patient care in our local ED context, we developed a cross-sectional needs assessment survey which was distributed to ED staff.

The Likert-style survey assessed providers' self-perceived attitudes and beliefs regarding sexual assault, knowledge of hospital/state sexual assault laws and policies, and the comfort and barriers to providing sexual assault medical care, conducting a forensic exam, and avoiding re-traumatizing survivors. The survey was distributed via email and was voluntary and anonymous.

While providers felt comfortable with many aspects of the medical management of survivors, such as counseling regarding the need for HIV prophylaxis and emergency contraceptives, only 29% of respondents indicated that they were comfortable conducting a sexual assault forensic exam, and only 51% felt confident in their ability to avoid re-traumatizing sexual assault patients through their words and actions. Notably, only 26% agreed or strongly agreed that they felt adequately trained in trauma-informed care, and 87% agreed that physicians should be specifically trained to care for sexual assault patients.

With these key learning objectives in mind, we recognized that SANE nurses' wealth of experiential knowledge would be critical to designing an effective curriculum. Through a collaboration between SANEs and physicians with expertise in trauma-informed care and medical education, we developed a sexual assault patient care curriculum for emergency medicine residents, comprised of a didactic lecture, two standardized patient cases and a forensic pelvic exam simulation. Standardized patient cases included a patient who had been raped by an acquaintance and a patient who worked as a sex worker and was raped by a client. In both the 2019 and 2021 implementations of the curriculum standardized patients were certified sexual assault patient advocates.

Outcomes

The initial pilot of the curriculum occurred in May 2019 during a monthly EM resident simulation day. Pre-and-post training, residents were given versions of the initial needs-assessment survey modified to the specific curriculum learning objectives.

Post-training surveys showed increases in residents' self-perceived confidence in caring for sexual assault survivors. Specific examples include an increase in the percentage of residents who agreed or strongly agreed that they felt comfortable counseling patients about the forensic exam from 41% to 86% ($p < 0.01$). The proportion of attendees who agreed or strongly agreed that they felt comfortable conducting an Illinois State Police Evidence Collection Kit

(ISPECK) increased from 44% to 87% ($p < 0.01$). Perhaps most importantly, residents were more likely to agree or strongly agree that they felt confident in their ability to avoid re-traumatizing patients through their words and actions, increasing from 33% to 80% ($p < 0.01$). The results of the needs assessment and resident training described above were published in the April 2020 issue of the *Journal of Forensic Nursing*.

Positive feedback from residents and the support of UofC's emergency medicine residency program led us to solicit feedback about how to cement the training as a component of the emergency medicine graduate medical education curriculum. During debriefs, residents stated that they would prefer to receive the training at the start of their intern year, prior to caring for any sexual assault survivors in the ED context. While COVID-19 restrictions delayed the second iteration of the training until July 2021, the training was again met with enthusiasm from residents.

We recognize that many of the sequelae of sexual assault occur beyond the walls of the ED and that improved provider training is just one component of a health systems approach to improving trauma-informed care of sexual assault survivors. However, we are optimistic about the impact of survivors being treated in the ED by providers who are equipped to set them on a path toward healing. Going forward, we plan to distribute the key elements of this curriculum as a resource to other training programs.

Personal impact

Before medical school, I trained as a volunteer rape crisis hotline counselor and gained experience supporting survivors of sexual assault. I had the privilege to work in a setting where I could be a confidant and offer significant help, which shaped my ideal of my future patient care settings. However, when I entered medical school and my role changed from social services volunteer to medical trainee, I was aware that this came with new systems-level constraints. I worried about finding ways to have meaningful interactions with patients and, most importantly, to not be a source of re-traumatization.

The opportunity to collaborate with this team has helped me to see the potential of using health systems science research to implement changes in clinical environments that empower providers to practice trauma-informed care. Whether through additional provider trainings, access to resources to address social determinants of health or increased longitudinal care, I am hopeful about the impact of systems-level changes.

I am particularly excited about using patient perspectives to inform change and am currently engaged with projects soliciting feedback directly from survivors of trauma about their experiences with health care. Moving forward, I hope to combine what I have learned through working on the emergency department sexual assault care curriculum with these qualitative research projects to create medical education materials that are centered in patients' self-described needs. As I develop as a physician, I'm excited to play a role in using research to shape a system that promotes healing from trauma.

Improving Provider Knowledge on Recurrent Clostridium difficile Infection Management in Adults During the COVID-19 Pandemic

Project lead

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Faculty mentor

Krishna Rao, MD; Assistant Professor, Division of Infectious Diseases; Director, Fecal Microbiota Transplant Program, University of Michigan Health

Project location

University of Michigan Health

Abstract

During the COVID-19 pandemic, the Fecal Microbiota Transplant Program at the University of Michigan Health was suspended due to concerns over possible transmission of SARS-CoV-2 via stool. Without this treatment option, alternative treatments for recurrent Clostridium difficile infection (rCDI) gained importance. We assessed provider knowledge of alternate approaches to treating rCDI and addressed knowledge gaps on best practices in rCDI management.

We designed an online module consisting of a pre-test, educational materials and a post-test. Using email recruitment, we invited providers from gastroenterology (GI), infectious diseases (ID) and internal medicine (IM), as they treat the most difficult rCDI cases.

In total, 95 of 291 (33%) invited providers reviewed the module. Overall, the module resulted in $\geq 20\%$ improvement in knowledge. 95% of the participants self-reported that the module improved their knowledge. Knowledge around best practices in rCDI management is suboptimal, even among expert providers. A short, online educational module could improve outcomes.

Project addressed/problem discovered

Clostridium difficile infection (CDI) is the most commonly identified cause of health care-associated infection in adults in the United States. In 2017, the number of health care-associated CDI cases in the U.S. was estimated to be 235,700. The University of Michigan Health has a CDI rate that is similar to the national benchmark based on the Centers for Disease Control and Prevention (CDC) data on April 28, 2021. rCDI occurs in 10-30% of CDI cases and is associated with increased mortality. It is important that appropriate treatment is provided for symptom resolution and prevention of mortality.

Without the FMT treatment option during the COVID-19 pandemic, alternative treatments for rCDI gained importance. We assessed provider knowledge of alternate approaches to treating rCDI and addressed knowledge gaps on best practices in rCDI management.

Health systems science impacted the identification of the problem under a few domains. Under systems thinking, we identified the area for improvement by considering aspects of care affected by the COVID-19 pandemic. Under the health system improvement domain, we measured the problem through a pre-test, provided educational materials and measured improvement in knowledge through a post-test. Under the health care structure and process domain, we identified the relevant participants for the module.

Approach

To assess the knowledge and practice of providers on rCDI management and address knowledge gaps, we designed and created an online module using Qualtrics. The module consisted of a pre-test, educational materials and a post-test. Health systems science guided our approach under a few domains.

1. Assessment of the knowledge and practice of providers on treating rCDI in adults

Guided by the health system improvement domain, we measured the problem by assessing provider knowledge and practice through a pre-test. The questions focused on how the providers prescribed vancomycin and fidaxomicin to treat rCDI in adults. Other questions assessed their knowledge on the use of probiotics and situations where probiotics should be avoided (e.g. patients with bacteremia). Under the health care structure and process domain, we identified that the relevant participants for the module were GI

and ID physicians and physician assistants (there were no employed nurse practitioners in the divisions), as they treat the most difficult rCDI cases, and IM residents as they treat inpatients who frequently experience rCDI.

2. Educational materials to highlight information on treatments for rCDI based on the University of Michigan Health and the Infectious Diseases Society of America's (IDSA) guidelines

Under the health system improvement domain, we created an 8-point educational page that specified how to prescribe a vancomycin and fidaxomicin taper for rCDI. We listed key situations where probiotics should be avoided, such as in immunocompromised patients (e.g. transplant patients, neutropenic patients, patients with AIDS). The goal was to design a short summary of the University of Michigan Health and the Infectious Diseases Society of America's (IDSA) guidelines that was easy to remember.

3. Assessment of the knowledge of providers after reviewing the educational materials

Under the health system domain, we measured improvement in knowledge of providers after the review of the educational materials. The post-test consisted of the same questions as the pre-test, which allowed us to directly compare the improvement. An initial and reminder email was sent to eligible participants. The initial emails were individualized to maximize participation. Participants were eligible to receive a gift card.

Outcomes

Of 291 providers invited, 95 participated (18 from GI including 2 physician assistants, 16 from ID, and 61 from IM). 73% (69/95) reported treating patients with CDI only monthly to several times a year.

1. Knowledge on Vancomycin Taper

In the pre-test, providers did worst in correctly identifying an appropriate vancomycin taper for rCDI, with 56% (53/95) choosing a more frequent dosing and shorter duration. Only 22% (21/95) chose the correct taper, which increased to 47% (45/95) after review of the educational materials.

2. Practice on Fidaxomicin Prescription

In the pre-test, 65% (62/95) of providers chose the correct fidaxomicin prescription. This increased to 83% (79/95) after review of the educational materials.

53% (49/93) of providers reported cost/insurance coverage as their reason for choosing vancomycin over fidaxomicin. Only 18% (17/95) of providers reported referring patients to online coupons or engaging in other methods (e.g. prior authorizations) to enable patients to afford fidaxomicin.

3. Practice on Prescribing Probiotic

In the pre-test, the item that was missed the second most was identifying situations where probiotics should be avoided (e.g. bacteremia). Only 25% (24/95) of the participants chose the correct scenarios, which increased to 43% (41/95) after review of the educational materials.

4. Mean Scores Categorized by Specialty, Frequency of Treatment and Level of Training

The mean pre-test scores varied among specialties: 57% for GI and IM, and 71% for ID. All post-test scores increased to 86%, showing an increase of >20%.

The mean pre-test scores did not vary according to providers' frequency of treating patients with CDI: 57% for providers treating CDI weekly to several times a month and those treating CDI less than once a year. The mean pre-test scores increased as the level of medical training increased: 43% for post-graduate year 1 and 71% for those who have been faculty for > 10 years. This suggested that the educational materials may have most benefited providers with a lower level of medical training. On self-assessment, 95% (90/95) of the participants reported the module improved their knowledge in rCDI management.

Personal impact

In going through the quality improvement process of identifying a potential area of improvement, I applied systems thinking and recognized the broad impact of the COVID-19 pandemic on CDI care. I've gained a deeper appreciation of the interconnectedness of parts of a health care system. Having a broader view of the health care system will allow me to identify areas of improvement as a future physician.

Learning the skills and principles in survey design will also be applicable in my future role as a physician. One of my goals is to continue to design quality initiatives. Because surveys are commonly used for data collection in quality initiatives, I'll be able to apply lessons from this experience to achieve that goal.

Collaborating with an expert in the field, Dr. Rao, was a valuable experience. His unique perspective on the needs of the CDI patient population was helpful in achieving our goal of addressing an existing area of improvement. He serves as an inspiration for me on how to be an academic physician who is able to impact care at a system-level.

Working Outside the Exam Room: Implementation of Systems Thinking to Improve Care at the HOPES Clinic

Project lead

Miranda Teixeira, Eastern Virginia Medical School

Teammate

Kaitlin Hardy

Faculty mentor

Dr. Amanda Gibson, Assistant Professor and HOPES Free Clinic Facilitator, Eastern Virginia Medical School

Project location

Eastern Virginia Medical School

Abstract

As future physicians, the desire to serve is present in all of us, the goal being to one day improve a patient's life. However, the aspects of serving outside the exam room are often overlooked. Fueled by lectures on health system science, we set out to make some improvements at HOPES, Eastern Virginia Medical School's free clinic for uninsured patients.

HOPES has a purpose that is meant to reach past the boundaries of the exam room. The goal is to not only treat patients but also to improve quality of life. As the clinic continues to grow, it is necessary to modify the approach and management in order to maintain high value care. Utilizing systems thinking, we developed and implemented a plan of several seemingly minute adjustments in order to address the clinic's weaknesses.

Project addressed/problem discovered

Volunteering at HOPES is a wonderful opportunity to serve. However, as a clinic completely staffed by student volunteers, there are times when the inexperience leads to inefficiency.

The Health System Science Learning Series modules began alongside our classes in the fall of M1 year, the first module being Systems Thinking. During this course, my thoughts were drawn to HOPES, and by the conclusion, my understanding was altered. If I was to enable to enact change that would be a service to the clinic, I first needed to understand the bigger picture. To accomplish this, I sought out insight from attendings, fellow volunteers and administrators, all of whom provided a glimpse of the system. This information, combined with the knowledge that at times patients were frustrated by our organization, volunteers by the lack of consistency, and staff by the late nights, led to defining an obvious but complex problem:

diminished quality and continuity for both patients and volunteers stemming from underutilization of systems thinking in the context of the clinic.

This led us to three interconnected goals: streamlining clinic operations; fostering an environment of teamwork and collaboration between medical students, physician assistant students, residents, and supervising attending physicians; and improving patient and volunteer experience. Teamwork aids the streamlining, while increasing collaboration and efficiency improve the experience.

Approach

With the goal defined, the next step was to identify ways to make tangible changes to address the clinic's difficulties, while also growing morale. This was accomplished by utilizing the habits of a systems thinker, four habits in particular were most crucial.

First was "recognizing that a system's structure generates behavior." This led to the examination of the volunteer structure and perception of the clinic. We found that even though students were initially excited to volunteer as staff, participation diminished over time. Noting this along with some other input on disorganization, we updated protocols and reorganized supplies. The intention was to increase clarity and ease of access for volunteers.

The next two habits coexist in their implementation, "make meaningful connections within and between systems" and to "identify the circular nature of complex cause and effect relationships." Within HOPES, we have many teams and types of volunteers, including lab, EHR, shift management, continuity and clinic coordinators, student clinicians and attending physicians. For the clinic to function all of these

people must work effectively, but their interactions and interdependence cannot be overlooked. One person's position affects another's, and they all ultimately affect our patients. To properly implement this habit, we had to learn how to more effectively work as a team, and this started by simply communicating with one another. The lab team had an idea to decrease patient time in clinic by increasing the speed at which labs were ordered. The best way to accomplish this was by working with shift management to make sure the student clinicians got the lab order forms as they received patient charts. The Medicaid team was not seeing every patient, so we started bringing the Medicaid team to the patient's room before the clinical exam began. These are just a few examples of the sharing of needs between teams that not only improved function but also the clinic environment.

Lastly all modifications to the clinic were weighed against their potential benefits and "short-term, long-term and unintended consequences." This meant discussing changes with various team leaders and Eastern Virginia Medical School faculty before implementation, as well as reevaluating if necessary.

Outcomes

The results of our project implementations can be broken down into four parts: the benefits to staff, the benefits to clinicians, the benefits to patients and the benefits to the surrounding community.

Starting with the benefits to our staff, through the increase in and maintenance of protocols and other structural components, we saw an improvement in volunteer experiences and fulfillment measured through verbal feedback. The increase in collaboration also allowed for an increase in the bonds made between peers which added value to the work environment. There was also successful recruiting of volunteers from other Eastern Virginia Medical School programs outside the medical doctorate program to increase diversity of perspective. During this time, we also saw an increase in overall volunteer sign-ups.

The student clinicians commented on the increase in information they received and that they felt more prepared for their role. The attending noticed and applauded the decrease in time between their arrival and being presented patients by the students.

With the many small changes being made, the increase in positivity and motivation among volunteers was notable

around the clinic. The patients benefited not only by the increase in value of care that came with more motivated volunteers but also by decreased wait times and decreased transitions between rooms. They also had more consistency between student providers, which increased quality as well as comfort. Patients were also offered more resources in a single visit.

The surrounding community benefited throughout this process as well. With the increase in communication and organization we were able to identify expiring supplies and donate them to other local clinics to use before expiration. There has also been an increase of word-of-mouth information about our clinic through patients and volunteers that has expanded our outreach efforts.

Although this project implemented seemingly small interventions, the impact has been momentous. As time goes on more changes are being made, and actions are being reevaluated to continually improve the clinic as it grows. These changes provide benefits beyond our volunteers and our patients but to the clinic's overarching goal of improving the quality of life in our area.

Personal impact

When HOPES appeared as an opportunity, I was ready to serve but I was unsure how. I knew that although I could learn by observing in the exam room, I was limited in helpfulness by my knowledge. Therefore, I wanted to pursue an avenue where I could be more beneficial to the community, which led to my role as a shift manager. Having previously interned in clinic administration, I already had some insight that a clinic had more factors affecting its operation than just doctor and patient. Nonetheless, it was not until my experience with HOPES that I truly understood the vastness of variables involved in the maintenance and success of a clinic.

The more I serve in roles that let me see the interworking of the health care system, the more I want to incorporate management into my future career. I have learned that we can better our patients in more ways than being the provider in the exam room. We can shape the structure and process and have the same or an even greater magnitude of impact. This experience has not only shaped my career ambitions, but also has once again emphasized the importance of every aspect of clinic care and the many clinical roles that are so essential, some of which go unrecognized. It has shined a spotlight on the importance of working as a team in which each member is valued. I look forward to continuing my work in systems thinking at HOPES and in my future career.

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