INSIGHT

INDIANA UNIVERSITY MEDICAL STUDENT RESEARCH JOURNAL

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In This Issue

Essays

From the Advisor

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Melting Pot

A debate has long simmered among students of American history and culture. On one side are those who advance a vision of the United States as a "melting pot." Writing in 1782, de Crevecoeur described an American as one who has left "behind him all his ancient prejudices and manners, receiving new ones from the new mode of life he has embraced, the government he obeys, and the new rank he holds." English, Scotch Irish, French, Dutch, Germans, and Swedes would cease to be what they were and become something new – Americans. "Here," in America, he writes, "individuals of all nations are melted into a new race of men."

Switching from the sphere of national identity to medical education, such a metaphor might have special appeal at a school as large as ours. With 365 students in each class spread around nine campuses, no one – faculty, staff, or student – can know all the students in a single class, let alone the whole student body. So instead of dwelling on the myriad distinctive traits that characterize each student, we often focus on standardization – what every student is expected to become. Students arrive with a wide variety of cultural, geographical, biographical, and academic backgrounds, but here, at the IU School of Medicine, they are all melted down and reshaped into physicians.

The melting pot metaphor offers important insights. Above all, it helps to explain both how a new nation can be forged from a highly diverse influx of immigrants and how premedical students from widely different backgrounds can be made into physicians. In the case of nationality, the blast furnace is daily immersion in American culture, including the English language. In the case of medical education, each student enrolls in the same classes, takes the same examinations, and demonstrates the same competencies. What matters is not so much the distinctive resources immigrants or students bring with them, but their malleability. In the words of Star Treks' Borg, each will be assimilated.

In recent decades a new way of thinking about national identity has gradually replaced the melting pot metaphor and something similar may happen in medical education. Instead of seeking to make Americans into a monoculture, which often turns out to represent the vision of a dominant

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group, recent commentators have emphasized the metaphor of multi-culturalism, sometimes described as a cultural mosaic or salad bowl. Instead of the mass production model of citizenship favored by industrialist Henry Ford, in which immigrants abandoned their distinctive modes of dress and emerged clad in the same costume and waving American flags, the heritage of immigrants would be preserved and celebrated.

Multi-culturalism regards diversity not as an unacceptable degree of deviation from the mean but as a source of vitality and creativity. The United States is culturally richer because it consists of not a single state but 50 states and America thrives in part because it consists of regions such as the Northeast and the South. Herman Melville could not have written "Moby Dick" in Mississippi, nor could Faulkner have penned "The Sound and the Fury" in New York; likewise, baseball was a natural product of a northeastern mentality, and the blues could only have originated in the south. Diversity has always been the wellspring of American vigor and ingenuity.

As these examples illustrate, diversity is not confined to characteristics that can be captured in a photograph or a sample of a person's speech. In its fullest sense, it is far richer and includes answers to such questions as these: What are your favorite memories? Who do you most admire, and why? What are you most afraid of? What matters most to you in life, and what sacrifices are you prepared to make to protect and promote it? What role do you think human beings are called to play in the larger order of creation? Each student who enters the IU School of Medicine would answer these questions somewhat differently, and therein lies an only partially tapped opportunity for excellence.

What would a fully diversity-prizing culture of medical education look like? Above all, it would not focus on homogenization. Instead of trying to ensure that each student has the same experiences and emerges looking more or less the same as every other, it would strive to get to know each student sufficiently well to identify distinctive interests and abilities and provide opportunities to develop them as fully as possible. Instead of basing evaluation on how well each student performs on the same tests every other student takes, it would seek out opportunities for students to focus on what they can do best, a dimension of distinctiveness barely touched by the choice of medical specialization.

One of my favorite cartoons features an educator looking across the desk at a collection of creatures including a bird, monkey, penguin, elephant, fish, seal, and dog. Behind them is a tree. The educator says, "For a fair selection, everybody has to take the same exam: climb that tree." The allure of objectivity, fairness, and efficiency is great, but medicine could take a cue from doctoral-level graduate study, in which each student is expected to produce a distinctive work of scholarship. Particularly at the largest schools, where it is especially difficult to know each student, the metaphor of a single score on a high-stakes standardized exam needs to be replaced by how students develop and contribute in distinctive ways.

The year I graduated from medical school, the cover of the senior skit program showed a student passing along a cheese grater. The implicit message: Don't let who you are and what is best about you get peeled away. To resist assimilation, you need to take some responsibility for your own education, not just by dedicating many hours to learning independently, but also by cultivating what makes you special. If you are a reader, make sure you keep reading, and reading well. If you find peace and fulfillment from playing an instrument or singing, make sure you find at least a few hours each week to do so. If service is your calling, make sure you keep serving outside of medicine.

And tend not only to yourself but also your colleagues. Resist the temptation to boast about how busy you are, how you hardly have time to eat or sleep, or to glory in your own assimilation. Such self-destructive braggadocio only contributes to a self-destructively vicious cycle. Instead, make it a point to talk about the passions that make you you and your classmates themselves, and how you and they are making time for things that matter. Do well on your tests, but not at the expense of whittling away your capacity to make distinctive contributions to medicine. Our patients and community need not just generic physicians, but the distinctively best doctor each of us is capable of becoming.

The profession of medicine and the patients we care for will ultimately be better served not by a clone army, but a diverse group of medical professionals with distinctive passions and abilities. To some degree, we are passing through a furnace and being melted down and molded into physicians. But we are also growing and developing like biological organisms, each with a distinctive set of resources and opportunities. The heat of the melting pot makes us malleable, but it can also burn us or even consume us completely. Only by approaching four years of medical school with the best metaphors – not a melting pot but a mosaic or even a garden – will we truly flourish.

Leveraging Everyone's Perspe

An interview with Dr. Chemen Neal, MD

CHEMEN NEAL | PHOTO

By Eric Chen and Seungyup Sun

Eric Chen: To get started, could you tell us about your background?

Chemen Neal: I'm from San Diego, CA. I went to the University of Chicago for medical school, then did half of my residency at Loma Linda University in California, and then transferred to Indiana University to finish out my residency. Afterwards, I went out to private practice with OB/GYN for 3 years, but I ended up back at IU because I really like working with students and residents. I also enjoy impacting the medical system; my main focus is the gender, racial, and ethnic diversification of leadership in medicine.

EC: What made you interested in OB/GYN? How did you end up choosing to make that your career?

CN: Truthfully, I liked everything. I think the minority of students are those who really like something and know that's absolutely what they want to do. There are some students who like all the things and others who aren't sure where they fit in or what they like. I think I could have been happy being any kind of doctor, especially in fields where I'm solving problems, fixing things, or diagnosing something. I could probably have done a lot of specialties. OB/GYN appealed to me because there's a lot of variety and you get to do cool surgeries.

My advice is that if you fall in love with something you should do that no matter what because you can always adjust it to your lifestyle and make it whatever you want it to be. If you like multiple fields, then I think other considerations should percolate to the top of your list. Are there people here who are like me? Does my personality type align? If it matters to you, does this make a lot of money? Does this have a good lifestyle? So spend time being a student of yourself and learning what's important to you. If you can trust, and follow that, you will end up where you're supposed to be.

EC: You mentioned that one of your academic focuses is the diversification of medicine. What inspired you to focus on that issue?

CN: I'm a big culture junkie and also find personal fulfilment to be really interesting and important to me. So when I started practicing medicine, I reached out to people in my class to see how they were doing and I was really astonished at how many people were lukewarm about their jobs. It struck me as a tragedy because we had spent so much time training

ective: Increasing DEI at IUSM

and had given up so much to be physicians. It was not what I expected. I dug more into this issue and I realized that it wasn't just my class or the people that I knew, but that it was really an epidemic among physicians. I was surprised to learn how many physicians leave medicine. And many of those who leave are women and underrepresented people - and I thought, "that's terrible." There's already all this representation inequity and I thought, 'gosh, and these people are leaving more? We need every single one of them.' I think every person is so important and I hated that some people weren't making it in the space that they wanted to be in. I had to do something about that, so that started this whole academic interest and journey for me. I've been trying to make a difference in my space.

EC: What did you do to help you make a difference in that space?

CN: I pursued a fellowship in the Office of Faculty Affairs and worked on a project focused on the retention of women and underrepresented minorities in medicine. I got to geek out and learn all about these issues, and I ultimately created a program called the Essentials of Leadership. At IU, we do a great job of helping faculty once they decide what they want to do academically. We help them get promoted and be successful in that area. However, what I learned was that often people of color don't feel that their values are aligned with their institution's, which was a reason why they ultimately left. The same is true for women. An academic career is often sold as one where you can be whatever you want and do whatever you're passionate about. But that doesn't always apply to everybody. There are also other issues to navigate like pay inequities, getting looked over, and so on. So I wanted to create a program that could show people of color and women that they can align their values with their institutions' wherever they are.

Later on, I got coached by a physician coach who changed the way I thought about myself in 30 minutes. It was an amazing experience and I thought to myself that I needed to be able to do that. I got certified as an executive coach and started coaching students, residents, and whoever else I could. It was then when I really began to understand what I think my purpose is, which is to help people reach their full potential so they can make an impact wherever they are.

After I did all that, there was also a need for a program for the underrepresented students at the School of Medicine to provide specialized support to them so they could have a sense of belonging and self-efficacy. URIM students often voice that they don't feel supported or that they don't have a sense of belonging. Dr. Wallach and the educational team have been interested in these issues for a long time. They found an opportunity to bring me in, and now I'm creating a longitudinal cohort program for minoritized students. It starts as a month-long summer pre-matriculation program that prepares students for Human Structure and MCT, as well as all these aspects around creating your own sense of belonging and how to align yourself with your medical school/institution wherever you are. There are additional phases throughout the four years of medical school, as well as other programs I'm working on.

In addition to that, we're creating programs for any of our students who maybe aren't performing as well as they want in their first year or for Step 1. Again, I'm focusing on helping everybody reach their full potential, so I'm making sure everybody in the school has what they need. My role as the Director of Holistic Student Success and Advocacy is a perfect fit for all of these objectives.

EC: For students interested in any of those programs, how can they get in touch with you?

CN: Email is the best way to reach me. I do have a personal website called WhiteCoatProject.com where I can be contacted. As time goes on, I plan to have reached all the underrepresented students at IUSM. I try to personally reach out to everyone in the first year class; so within the next three years, I will have talked to everybody at least one time. We're hoping to increase awareness about my role and what other resources students can access beyond me.

EC: Can you tell us more about your work as the co-chair of the Diversity Council? What kind of work has the council done so far?

CN: I co-chair the council with Dr. Sylk Soto, who is amazing. We wanted the Diversity Council to become an advisory council so that institutional leaders could vet things with us. We started out by inviting leaders to hear about the things they were doing. But now this year, leaders bring multiple initiatives and issues to the attention of the council. Last month, we met with Dennis Murphy and Dave Ingram to talk about the Dr. Susan Moore case, the findings, and what was going to be changed. So now we're a voice of the faculty for all things diversity, equity, and inclusion. Sometimes we also see things where we need to be different. One of our previous

faculty members did a study with the students looking at all of the spaces at IUSM and cataloguing the pictures on the wall. Thanks to the study, we were able to advocate for two paintings to be commissioned and put up on the walls: one of an African-American physician and one of a woman physician.

One of the members also noticed that the dedication of Chihuly's sculpture in the Med-Sci building was dedicated to James Watson, who was a very vocal racist and sexist. We wrote a letter to the dean and asked that it be repurposed and dedicated to somebody else. They agreed and changed it. We also try to take on one project per year. This past year our project was about faculty of color and leadership. We found that the school actually puts in a significant amount of money into funding leadership programming for faculty of color but for some reason, it's not translating into actual changes in the diversity of our leadership. So we were then able to present to the school and say, "Look at all these people who are interested in these positions and how much you are investing in these people, but you're not seeing that return on investment."

EC: For the past year, most medical schools and institutions have been trying to address and increase diversity. Have you noticed anything at IUSM that's been different from other places?

CN: I'm in a consortium with the AMA and we talk about this with institutions from all over the country. It's interesting because IUSM is actually a little ahead of the curve. We have faculty development programming that specifically targets underrepresented faculty and other initiatives. Regarding our mistreatment reporting, there are some schools that I think are maybe a little ahead of us in the way that they're able to be transparent with their mistreatment reporting. Some places are creative in how they are transparent. However, the structure of our mistreatment system is actually ahead of a number of places and I think our openness and attention we're putting on DEI issues shows a lot of progress. I definitely think there's always more that we could be doing but I hope we maintain the momentum we have right now.

EC: Is there anything IUSM or the diversity council has in the pipeline for the future that excites you?

CN: I'm excited about all the initiatives that are taking place right now. The hospital systems now have a new Associate Dean for Health Equity Research for the School of Medicine and Chief Health Equity Officer for IUH, Dr. Tucker Edmonds, who is amazing. I'm excited about the relationships the Diversity Council is building with the leadership of the medical school and the hospitals. This year, we saw growth in our membership too; there's more leaders interested in being on the council and I'm excited to see it become a voice. I can't wait to see where it goes.

EC: Have there been any challenges or barriers that you've experienced along the way?

CN: For sure. One of the things that has always attracted me to academia is that it kind of is a little bit of a bubble and there's a lot of emphasis on trying to make everybody get along. And so it's definitely surprising sometimes when people don't agree with the work that we do. Some aren't interested in it and sometimes actively fight against it, so that surprises me at times. But if you look outside of academia, it's not that unusual. Not everybody wants to do this work and talk about racism, sexism, how we can move forward and be different. Some people feel like it's not true, that it's not American. That's definitely out there and you have to navigate that in a thoughtful and creative manner. Often you have to have lots of evidence and spend lots of money that doesn't need to be spent in order to make things happen.

EC: For the underrepresented students at our school, do you have any advice for them?

CN: There are lots of resources and you're not alone. There are many people who care about the success of our underrepresented students because they understand how special they are and how hard it is to get to where they are considering the circumstances of our society. If you're having a hard time or you're not feeling included, please reach out.

EC: Why is it important to you to increase diversity in gender, ethnicity, and cultural experience, especially in medicine?

CN: Society is a long, infinite game. In order to not have our society and civilization crumble, we have numerous complex problems to solve going forward. We can't solve those problems if we're only leveraging a small portion of the people on our planet to solve complex problems. We need everybody to be able to do that. We need to be able to leverage the creativity, the passion, the curiosity, the reason and logic of everyone on the planet. The only way we can allow people to be their full selves and to contribute to these complex problems is if there is equity and inclusion for these people to reach the point where they can give their input and make an impact. Just think of all of the people who have been looked over and ignored; we're not hearing what they have to say and have to contribute. That is not only a tragedy, but it just won't work. We're not going to make it without all of us. We have to dismantle all the things that are preventing us from leveraging all the minds of the people we have.

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Learning by Doing: Local Stories from SARS-CoV-2 Pandemic Vaccination Planning

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Abstract

Aim: Attempts to end the COVID-19 pandemic focus on rapid manufacture, procurement, and distribution of the SARS-CoV-2 vaccine to states. However, little work has been reported regarding local implementation and planning for providing vaccinations—despite the critical role state and local implementation strategies have played in previous mass vaccination campaigns as well as early mitigation of the COVID-19 pandemic. We therefore assessed state and local efforts of SARS-CoV-2 vaccine planning in Indiana. Subject and Methods: Four semi-structured interviews were conducted with representatives of the Indiana Department of Health and three Indiana county health departments in the earliest stages of the COVID-19 pandemic: between July and August of 2020. Results: Common themes extracted from the interviews identified several strategies based on published evidence and previous local experience, including early advanced planning with stakeholders, flexibility, leveraging strategic partners, and demographic and geographic surveillance of vaccine uptake. Conclusion: While there is no one-size fits-all approach for a successful vaccination campaign, there are evidence-based approaches that should be co-developed and shared among local health departments. This study adds important local narratives of a vital, yet disproportionately under-studied area of vaccine delivery: traversing "the last mile" before vaccine administration. Further qualitative and quantitative studies directed at local practices during the COVID-19 pandemic are critical to developing best practices in, and lessons learned from, community immunization.

Background

The U.S. Department of Health and Human Services' pandemic plan for mass vaccination resulted in high variability in vaccination coverage from state-to-state.[1] The federal government was the sole vaccine purchaser and distributor to states.[2] Delegating vaccine administration to the states with knowledge of their assets and barriers to mass vaccinations theoretically results in a more fair and coordinated approach through local control. Yet the model depends on existing state, local, and tribal supply chains for vaccine distribution and administration that are often labor-intensive and lack robustness. The federal 41-member Advisory Committee on Immunization Practices (ACIP) established the ACIP COVID-19 Vaccine Workgroup in April 2020 to develop recommendations regarding the COVID-19 vaccine including stock maintenance and protocols for equity in allocation and distribution.[3]

While centralized guidance and access to sufficient vaccine supply are critical, successful implementation relies considerably on state and local infrastructure, coordination, and planning.[4,5] Findings from recent predictive modeling suggests implementation factors of pace and coverage may correlate with vaccination program success more than vaccine efficacy determined in clinical trials.[6] Similarly, failures to meet vaccination targets often lie at the implementation-level, the "last mile," which calls for increasing need to focus on practical steps to facilitate vaccine access and efficient delivery to strategically targeted groups.

The U.S. federal government invested heavily in Operation Warp Speed which resulted in the development and approval of two SARS-CoV-2 vaccines in less than a year.[7] This presented states with an unprecedented challenge: state and county health departments had to rapidly develop approaches to vaccinating more than 300 million Americans, many of whom were reticent to be vaccinated.[7-9] Local health departments (LHDs) had to therefore rely on past experience, published knowledge, and local expertise to develop their mass vaccination campaigns. Indiana, for example, follows a decentralized, "home-rule"

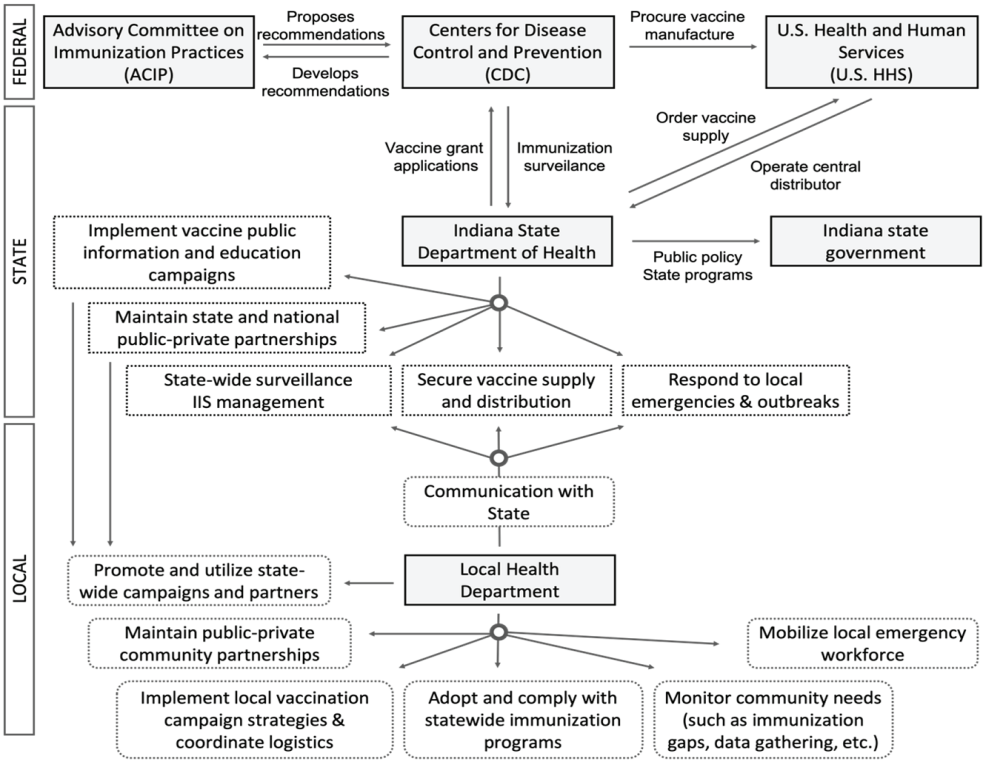

Fig. 1 Indiana follows a de-centralized mode of governance classified as "home-rule." The Indiana Department of Health manages state and federal responsibilities in addition to acting as a supportive role to LHDs. The implementation of vaccination campaigns is guided by IDOH and state policies; however, most of the logistics and successful implementation depends on robust LHD investment and coordination.

governance[10] approach to immunization in alignment with the federal HHS pandemic vaccination plan.[11] As illustrated in Figure 1, the Indiana Department of Health (IDOH) is the central distributor of vaccine while much of the burden of implementation and achieving broad coverage lies with regional, local, and tribal actors.

In this model, the state maintains a supportive role to LHDs, stepping in more actively during pandemics (such as the current SARS-CoV-2 situation). Local providers procure vaccine doses from the IDOH's Vaccine Ordering Management System (VOMS). In order to receive state and federal support, LHDs must maintain standards set forth by the CDC and ACIP. Indiana's governance offers a unique opportunity to study LHD vaccine efforts, as many assume greater responsibility for managing county-level programs and strategies can vary considerably.

The federal 2020-21 SARS-CoV-2 vaccination strategy focused on rapid manufacture, procurement, and distribution of SARS-CoV-2 vaccine to states. Little work has been reported regarding local vaccine planning and implementation—despite its critical role in successful vaccine uptake and coverage. To the authors' knowledge, this study in Indiana is the first which attempts to document state and local efforts to plan for mass SARS-CoV-2 vaccinations.

Methods

Four semi-structured interviews were conducted by both authors with representatives of the IDOH and three LHDs between July – August 2020. These LHDs were chosen for their demographic and geographic diversity within the state (LHD 1: mainly rural; LHD 2: mixed urban-rural with a modest-sized city and a major land grant university; and LHD 3: largely urban, with one of Indiana's largest cities). The IDOH interview was conducted using video teleconference software while the LHD interviews were conducted via telephone.

The interviews began with open-ended questions to gain context on general county vaccine distribution practices, and second, on preparation for SARS-CoV-2 community vaccination efforts. While the questions followed a generally consistent structure, each interviewee was encouraged to share information openly and naturally to obtain unique perspectives from various public health representatives across Indiana. This format was selected to capture local and state sentiments and perspectives during an unprecedented and rapidly changing pandemic landscape.

The IDOH interview was conducted on 24 July 2020 with the Deputy Director of Vaccine Access and Management and the Director of Field Operations. The interview with LHD 1 was conducted on 28 July 2020 with an Administrative Nursing Representative. The interview with LHD 2 was conducted on 31 July 2020 with the Emergency Preparedness Administrator. The interview with LHD 3 was conducted on 21 Aug 2020 with the Department Administrator.

Both authors independently reviewed the content of each interview, and key themes were extracted and synthesized. This study was determined by the Indiana University Human Research and Protection Program office not to require IRB review or approval, however consent was obtained from IDOH to publish these findings unedited, and the local health departments were deidentified.

Results

Advanced Planning

Advanced plans by IDOH, LHD 2 (mixed urban-rural), and LHD 3 (mainly urban) emphasized preparatory staff training, defining priority groups, communication strategies, funding, and building capacity. LHD 3 reported being well-practiced in vaccine delivery based on experience from previous infectious disease outbreaks (most recently with Hepatitis A, but also the 2009 H1N1 pandemic) and internally-conducted routine preparedness trainings. LHD 2 discussed how planning focused on identifying high-risk priority groups. For instance, drive-thru sites—at the time being operated by the state for SARS-CoV-2 testing—might not be used as initial vaccination sites if the initial target population was unlikely to have driver's licenses due to reasons like age or poverty. LHD 1, nested in a county mainly comprised of small towns, was facing many of the challenges of rural counties, such as having a small public health department and limited public transportation. Their advanced planning focused on increasing the number of vaccination sites and personnel for the county's 2020-21 SARS-CoV-2 and influenza vaccination campaigns.

Augmenting Vaccination Capacity

Both IDOH and the LHDs realized that additional personnel and infrastructure would be critical to quickly launch a vaccination campaign. One strategy invoked by the LHD 1 was an open-form "Walk-In Wednesday" at the LHD office where high-volume vaccination could occur without appointments. This strategy had proven effective during seasonal influenza epidemics, and the department planned to invoke it for SARS-CoV-2 vaccination. LHD 3 planned to partner with community clinics in order to distribute workload and increase capacity. Similarly, IDOH and LHD 2 planned to mobilize volunteers among the community and professional school students to rapidly increase capacity. Building capacity for mass vaccinations is hampered, however, by its increased cost. LHD 1 particularly focused on how its finances limited its ability to augment its annual vaccination and communication campaigns across its rural communities. For example, the department had recently acquired a single, mobile electronic sign to encourage vaccinations throughout the community instead of expensive TV advertisements or multiple billboards. In comparison, LHD 3 planned on leveraging existing resources for increased community reach such as donated TV airtime.

Flexibility

For local public health governance, remaining agile was a recurrent feature of local vaccine distribution strategies. Being able to quickly establish off-site testing and vaccination clinics and coordinate a diverse workforce to meet changing priority groups was deemed particularly important.

The IDOH cited one such strategy, used also by other states, called the "strike team." In this approach, Immunization Division staff are reassigned—and temporary staff hired—to create highly mobile teams equipped with vaccine and necessary supplies to implement mass vaccination in non-traditional locations. IDOH utilized this approach with great success during the influenza H1N1 pandemic and employed it when ramping up SARS-CoV-2 testing statewide with plans to transition to vaccination when an approved SARS-CoV-2 vaccine became available.[12] Similarly, LHD 2 planned to use "Go Packs" kits containing everything necessary for launching small vaccination drives on very short notice. LHD 3 cited a pre-established partnership with a privately-funded non-profit vaccination clinic as being critical for rapid coordination and flexibility during past vaccination campaigns. They expected this would allow for increased capacity and efficiency in vaccinating against SARS-CoV-2.

Strategic Partnerships

The IDOH and each LHD interviewed had multiple existing relationships with local public and private stakeholders and planned to leverage those relationships to maximize vaccine response and coverage when a SARS-CoV-2 vaccine became available.

One such partnership was between IDOH and individual statewide LHDs. During the H1N1 pandemic and smaller outbreaks of contagious diseases, IDOH leaned on local county expertise to identify the most relevant at-risk groups and to understand the best locations for vaccination clinics and the mobile clinics manned by IDOH strike teams. IDOH representatives expected minority racial, ethnic, and demographic groups may be at greater risk for low vaccination coverage. As such, the state planned to work with LHDs to identify community organizations such as churches and schools that serve minority populations. The IDOH also encourages creativity among LHDs. For example, some LHDs hold evening and Saturday clinics and use non-governmental locations such as churches and fire departments to vaccinate hard-to-reach populations.

While the IDOH and hospitals usually run vaccination sites independent of county efforts, several locally generated partnerships were identified. LHD 1 identified its local Fire Department (including

Emergency Medical Services) and the local school system as crucial community partnerships and intended to leverage them to enhance SARS-CoV-2 vaccinations by building upon well-established relationships and following IDOH guidance. Local pharmacies (e.g. CVS, Walmart, Walgreens) have been major sites of influenza vaccination that IDOH and LHDs intended to employ for SARS-CoV-2 vaccination due to their number of convenient locations and regular provision of vaccines such as influenza and pneumococcal. For LHD 3, a clinical partnership with a privately-funded non-profit vaccination clinic has been especially effective. For example, during SARS-CoV-2 testing, the clinic focused on child vaccinations, public service announcements, and clinical services to allow LHD clinic staff to prioritize SARS-CoV-2 contact tracing. During previous outbreaks or mass vaccination campaigns, LHD 3 and the non-profit split duties: the clinics vaccinated children while LHD 3 prioritized adults. Private entities such as pharmacies and hospital networks work in parallel to administer immunizations; however, the LHD 3 does not partner or coordinate with these private sector entities. The IDOH has in the past leveraged community events and popular businesses and travel intersections. During the 2009 H1N1 pandemic, strike teams collaborated with major Indiana airports, the Indianapolis Children's museum, and others to maximize impact and enhance vaccine coverage independent of specific counties.[12] Similar agreements have been made with grocery stores and gas stations to enhance patient convenience. In addition to increasing vaccine coverage and workforce, such partnerships were cited as particularly effective in reaching persons who distrust government or have outstanding civil fines and are likely to refuse vaccination. The IDOH worried that vaccine hesitancy might be a significant barrier for SARS-CoV-2 vaccine uptake. In Indiana, only 1-2% of people regularly refuse all vaccinations, but there was concern among public health officials that more people might choose not to receive a SARS-CoV-2 vaccination when it becomes available. Not insignificantly, Indiana has a relatively large Amish population who may be at risk for low coverage rates.[13]

Some Indiana counties are home to universities with medical professional schools (e.g. medicine, nursing, pharmacy), allowing fruitful relationships with student volunteers during pandemic vaccination campaigns. LHD 2 took advantage of having such schools within the county during a recent measles outbreak. The LHD assembled nursing and pharmacy professional students into "pods" to help administer MMR vaccinations. Similarly, IDOH provided nursing medical students in Marion County "just-in-time" training in collaboration to staff prior vaccination campaigns. For example, one such partnership partnered state nurses and medical staff with students from Indiana University's School of Medicine to vaccinate students at Indiana University-Purdue University Indianapolis during successful 2018-19 influenza vaccination campaigns.

Surveillance

A pillar to successful vaccination campaigns is structured self-assessment and reporting by LHDs. Indiana employs a robust Immunization Information System (IIS), the Children and Hoosiers Immunization Registry Program (CHIRP), to capture vaccine coverage data and identify both positive and negative deviants influencing county-level coverage rates. The CHIRP database provides metrics for much of the information surrounding vaccine administration. However, CHIRP does not require the entry of some data that are key to identifying populations at risk, such as race/ethnicity. These incomplete data result in large numbers of vaccinated persons having "unknown" race/ethnicity. However, for 2020-21 SARS-CoV-2 testing, the updated system requires the entry of complete demographic data, allowing for more reliable subgroup analysis of SARS-CoV-2 testing.

Interviewees from LHD 2 reported that surveillance was difficult, particularly for persons 18 and older. Vaccination rates were monitored through CHIRP which is only legally required to store vaccination data for vaccinated persons aged 17 and under; reporting to CHIRP is optional for adult patients. Accordingly, adult vaccination data go underreported.

IDOH and LHD officials stated that identifying and enumerating local at-risk populations is crucial for appropriately allocating limited vaccine doses. During a 2012 influenza vaccine shortage, LHD 1 worked to identify and locate its local at-risk populations and targeted early dosing to those over 65 years old, immunocompromised individuals, expectant mothers, and young children. The county could then identify low-coverage zones, such as mobile home communities, and take advantage of community partnerships to access these groups (e.g. working with mobile home landlords to promote and arrange transportation to nearby vaccination clinics).

Discussion

Early pandemic response relies on organizational heuristics, existing procedures, and available experience, often before higher regulatory authorities establish formal guidelines. As outcome data become available and priority groups are established, local actors are better able to define goals and recommendations. However, despite extensive planning, layered strategies, and careful monitoring, pandemics are inherently unpredictable situations and therefore require flexibility. At the state level in Indiana, flexibility in their planned pandemic response was evidenced by having cross-trained staff available to reassign from management and having multidisciplinary positions—programmatic to clinical—on their strike team. The strike team concept itself is inherently flexible and may be best employed at high-profile, high-traffic locations to support LHDs that lack mobile or off-site capabilities.[12] At all levels, health departments must be agile and ready to conform to situations that change daily. Such flexibility requires constant monitoring and reevaluation of current practices, as well as rapid communication with upstream and downstream stakeholders, with a commitment to making fundamental changes in approaches if necessary.

Strong, persistent community partnerships may be leveraged to reduce friction and facilitate establishing priorities and planning clinic activities. Such partnerships streamline state involvement at the local level and allow for effective targeting of high-risk groups. As such, state and local health departments should establish early communication with stakeholders to set priorities, identify high-risk groups, and generate unique plans to maximize vaccination opportunities. Many counties have unique populations with rural, ethnic, economic, and trust factors that may present as barriers to uptake or access. In these cases, community partnerships with trusted organizations and clear, accurate communication from LHDs will be crucial to obtaining adequate coverage rates in difficult-to-reach groups. Simple agreements such as allowing a strike team to occupy a section of a grocery store or gas station parking lot can be quite effective at enhancing vaccination coverage, likely due to patient convenience and the high traffic at these establishments compared to traditional public health offices. Partnerships with professional schools (i.e. medicine, pharmacy, and nursing) can provide unique training of future medical professionals in pandemic response while also mobilizing a significant workforce to enhance community vaccination efforts. These partnerships need not be coordinated at the state level alone; ongoing partnerships with health profession schools should be part of LHDs' plans for COVID-19 and future pandemics.

Enhanced, effective surveillance, data analysis, and reporting of vaccine community uptake and community coverage gaps appears particularly important yet often insufficient. County-level surveillance in Indiana is achieved through the use of state-sponsored surveillance tools such as VOMS and CHIRP; however, gaps in data gathering occur, e.g. when reporting demographic information or optional reporting to CHIRP for persons aged 18 years and over. Applying "hard-stops" (mandating field completion before advancing through the online form) is an effective strategy for improving data capture but is disruptive and annoying to those entering data, so it should be used with discretion. Barriers to crosstalk between electronic health records (EHRs) and IIS technologies may currently be a barrier to data capture and

management during a pandemic, but it is also a potential asset for future pandemics as a result of the 21st Century Cures Act[14] that mandates standards and interoperability of data in EHRs and insisting that health systems make EHR data available for other purposes, which should include public health surveillance.[15] For example, if local providers report vaccinations in their EHRs, those data should transfer automatically to the IIS system, supplementing state efforts to monitor in immunizations.

Strategic communication directly to the public to supply health information and education seems particularly effective in enhancing vaccine uptake. At the state-level, vaccine recommendations can be communicated through advertising campaigns and social media. At the county-level, communication strategies were more targeted and tailored. But there are significant barriers to effective communication. Misinformation and disinformation can be significant barriers to vaccine acceptance. Cost and variable ability among LHDs to implement adequate communication schemes hampered effective communication. Television advertisements, for instance, can be effective, but their high cost may make them unfeasible for some counties.

Cost can be a significant barrier to successful vaccination campaigns. Concerningly, the LHDs with greater financial barriers may also have greater need for resources. For instance, a low-population, rural LHD that might benefit the most from a mobile outreach would likely not have the financial resources to establish one. Moreover, costs can severely limit other aspects of vaccination campaigns such as adequate staffing, cold storage, and data gathering.

Indiana's "home-rule" governance allows for LHDs to be flexible to community-specific needs but also places significant burden on LHDs and introduces a high level of variability across the state. In response, public health officials and their strategic partners may collaborate between counties to identify successful practices and achieve synergies to reduce duplication of services and achieve economies-of-scale. For example, a rapid, statewide public health communication platform may allow LHDs to have greater crosstalk and facilitate sharing of best practices. Currently, much of the LHD crosstalk appears to operate via hearsay with successes reported after the fact. Establishing statewide collaborative partnerships among LHDs may help increase workflow among county vaccination efforts. Strategic, long-term partnerships with professional schools could greatly increase the mobilization of vaccination efforts. This may be best achieved if the IDOH developed a Core educational module which professional schools could adopt and modify into the professional school curriculum as 'just-in-time' training. State health departments should continue to encourage hard-stops and effective data gathering at the LHD level. Resource-sharing across counties could also be beneficial, particularly for rural counties.

Our study has limitations. We interviewed one midwestern state and three of its county health departments. While many of the opportunities and constraints we identified likely exist in other states, there will clearly be differences between states and counties. Moreover, these data were recorded in the middle of the COVID-19 pandemic and before the availability of SARS-CoV-2 vaccines. Therefore, the approaches and obstacles anticipated were subject to change as the pandemic evolved and vaccination programs progressed.

Ultimately, this study is the first attempt to document state and local efforts of SARS-CoV-2 vaccine planning. The semi-structured interview approach generated organic narratives, which document local voices during a rapidly evolving pandemic. This is aligned in topic—yet distinct in perspective—from previous, retrospective work conducted on previous mass vaccination campaigns.[16,17] Recent literature has emphasized the crucial role of local implementation in a successful pandemic vaccine response,[4] some suggesting that its importance may rival that of endpoints like vaccine efficacy.[6]

Future work should include expanded capture of local health department voices to facilitate knowledge sharing and highlight high-achieving strategies to inform late-stage SARS-CoV-2 response and future vaccination campaigns. As a growing body of literature supports optimizing local vaccine plan implementation, better characterization of what constitutes high-quality interplay among LHDs and between state and local health departments is warranted.

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Giant MCA Aneurysm: A Pediatric Case Report

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Abstract

Pediatric cerebral aneurysms comprise anywhere from 0.5-5% of the prevalence of aneurysms in the general population. Giant aneurysms, defined by an aneursysmal size of over 2.5cm, are even less prevalent. Presentation of these aneurysms can vary from increased intracranial pressure, cranial nerve impairment, nausea and vomiting, or mass effect. In this article, we present a patient with a unique constellation of symptoms that presented to the emergency department with a pediatric giant aneurysm and non-specific mass effect symptoms that had a broad etiology and multiple prior workups based on geographical location and other factors that masked the true etiology.

Introduction

Middle cerebral artery (MCA) aneurysms are a form of cerebral aneurysms and account for around 14-43% of all cerebral aneurysms (Yang). Giant aneurysms are described as any aneurysm over 2.5 cm in diameter and typically deriving from brain trauma, connective tissue disorders or infections (2018). While aneurysms are one of the most common vascular anomalies of the central nervous system, they are far less common in children than in adults, with a reported prevalence ranging from 0.5 to 5 percent of the total prevalence of intracranial aneurysms in the general population. Typically pediatric patients with giant MCA aneurysms commonly present with an acute subarachnoid hemorrhage (Shih). Symptoms include acute onset of severe headache, lethargy, tense anterior fontanelles indicating increased intracranial pressure, nausea, vomiting, papilledema, double vision, speech disturbance, hemiparesis or hemiplegia (2018). Unusual symptom presentations in patients with no family history, no comorbidities, or atypical symptoms that would suggest potential for an aneurysm can be difficult to diagnose without imaging. In this case study, we review an 11 year old previously healthy male who presented to the Emergency Department with left side hemiparesis secondary to a giant MCA aneurym and resultant infarction of the basal ganglia.

Case Presentation

This 11-year-old male presented to the emergency department via ambulance with left leg pain which began two days prior and progressed to inability to move the left arm and left facial droop. Two days prior to presentation to the ED, EMS was called when he awakened with left leg pain and difficulty moving. He was reportedly very anxious and woke from sleep hyperventilating. Paramedics believed his symptoms were due to a panic attack and the decision was made to keep him at home. That same day he was seen in the urgent care setting with slight left facial droop, left arm and left leg tenderness in elbow and wrist. Physical exam reportedly revealed full range of motion and strength. Urgent care providers were suspicious of a tick-borne illness, and he was discharged with doxycycline and oral corticosteroids with blood tests for Rocky Mountain Spotted fever and Lyme disease sent. The day of presentation to the ED, the patient returned to urgent care with persistent symptoms and a new complaint of two brief episodes of double vision, each lasting "a few" minutes. The first episode of diplopia occurred the day prior and the second the same morning as presentation to the ED. The second urgent care exam was significant for findings of significant weakness in the left arm and leg, uncoordinated gait and continued slight left facial droop. The patient was then sent directly to our emergency department by ambulance. Upon presentation to the emergency department, he describes tingling from left elbow to left wrist. There was no history of similar symptoms in the past. Review of systems was negative for fever, headache, visual changes, confusion, neck pain, right sided arm or leg weakness, rash, shortness of breath, abdominal pain, nausea, vomiting, diarrhea or trauma. This patient's past medical history was significant only for attention deficit-hyperactivity disorder, treated with 20mg amphetamine-dextroamphetamine and clonidine daily. Other medications include fexofenadine-pseudoephedrine twice daily for allergies and trazodone 50mg at bedtime. At the time of presentation to our emergency department, vital signs were unremarkable and physical examination revealed left facial droop, right uvular deviation with palate elevation, left arm 1/5 strength, 0/5 left hand grip, 3/5 strength in all muscle groups of the left lower extremity. Speech was clear, and he was alert and oriented with appropriate behavior. An MRI of the head with and without contrast revealed a well-circumscribed extra-axial 3.5X2.7X2.2cm homogeneously enhancing T2 hypointense mass in the right Sylvian fissure. Further mass effect was noted on the right temporal lobe and distal segments of the right MCA. A 2.5X1.9cm area of restricted diffusion was noted in the right basal ganglia with T2 hyperintense layering of fluid in the posterior aspect of the right basal ganglia. A 5mm midline shift was seen to the left. MRI without contrast of the spine was unremarkable at all levels. CBC, CMP and U/A were unremarkable except for low bilirubin (0.2

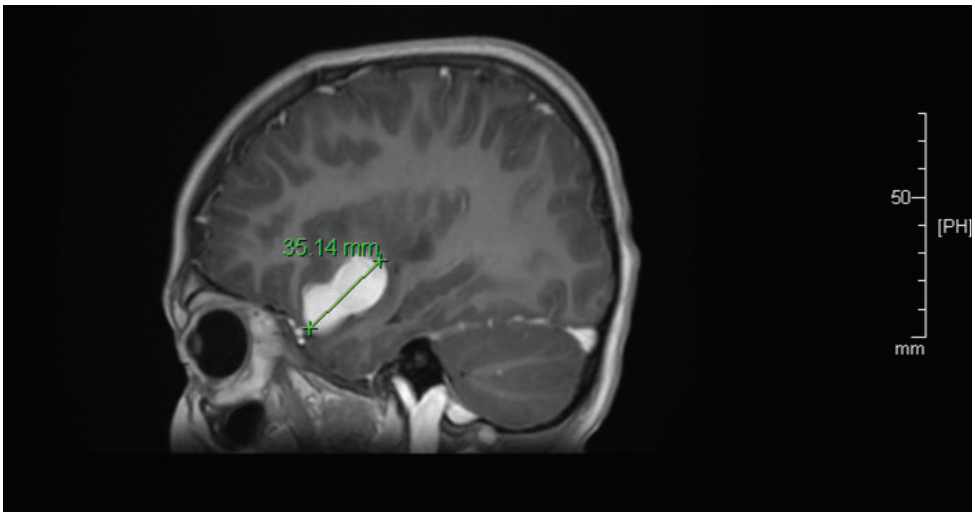

Fig. One: Sagittal view of the brain displaying a 35.14 mm mass.

with reference range 0.3-1.2 mg/dL) and elevated neutrophils (61.4% with reference range 23.0-53.0%). Laboratory specimens for Rocky Mountain Spotted fever and Lyme disease had been collected, but were not resulted during the evaluation in our emergency department. Due to the significant MRI findings it was decided that the patient would benefit from transfer to a tertiary care center with pediatric neurosurgical capabilities. At the tertiary center, the patient was administered aspirin 300mg, clopidogrel 300mg, verapamil 0.5mg/ml intra-arterial, and alteplase 1mg. The giant aneurysm was treated with extensive endovascular coiling.

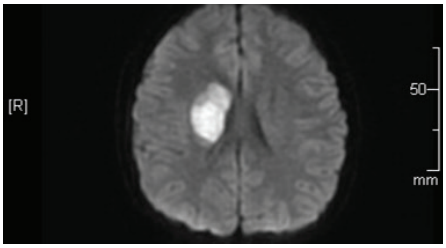

Fig. Two: Coronal view of the brain depicting large mass in the right hemisphere.

Discussion

Particularly remarkable about this patient's presentation was the large, hypointense intracranial mass, initially interpreted as radiologically similar to an extra-axial meningioma, was indeed an giant MCA aneurysm with the ultimate size measured at 3.5X3.3X2.4cm. This originated from the distal M1 segment, at the level of the M2 bifurcation. This was a fusiform aneurysm, with a narrow neck. The mass effect was also resulting in ischemic insult to the perforate arteries supplying the basal ganglia, particularly the lateral lenticulostriate branches, consistent with symptoms described in the patient's initial complaint. "Giant" aneurysms are described as anything over 2.5cm in diameter, and are frequently associated with brain trauma, connective tissue disorders or infections (2018). Recent developments have discovered the pathogenesis of giant intracranial aneurysms; which can be thought of as a vessel wall proliferation induced by inflammatory lipoxygenase activity (Krings). While our patient had no history of trauma or connective tissue disorders, and inflammation measured with ESR was within normal limits; infectious etiologies could be a potential cause in this patient due to the elevated neutrophil count. Currently, there are no studies documenting the incidence of pediatric giant aneurysms; but the current adult estimation is between 0.6-1.4 per 1000c (Paivi). These giant aneurysms are sometimes mistaken for brain tumors, especially when located in a typical tumor location, and mass effect can often be seen as the first clinical sign; as was demonstrated with 18.2% of the cohort with Sharma et al., and 46% of the cohort with Kakarla et al. (Sharma and Kakarla). This patient's aneurysm was located in the typical place for an extra-axial meningioma which is midline, in the area of the Sylvian fissure. This mass effect was indeed compressing the postcentral gyrus both on the cranial surface of the brain and the temporal surface, which could explain the slowly progressive motor dysfunction of the upper and lower extremities of the left side. The aneurysm compressed the perforating arteries feeding the basal ganglia sometime between initial presentation to urgent care and our emergency department, causing the array of symptoms indicating the basal ganglia was infarcted by day two.

This patient's initial complaint of left leg pain and left arm pain with tingling for two days prior to any advanced findings is exceedingly rare. Typical clinical presentation varies, from lethargy, tense anterior fontanelles indicating increased intracranial pressure (in infants), headaches, nausea, vomiting, papilledema, double vision, hemiparesis or hemiplegia all being common findings (Crowley). Seizures and increased intracranial pressure were present in 25% and 90% of giant aneurysms respectively, but all of these presentations should raise the index of suspicion for mass effects of an aneurysm (Levy). For our patient, clinical indication of a child in the midwestern US with tingling pain radiating from elbow to wrist, in addition to painful left leg that awakened him from sleeping and facial nerve paralysis causing facial droop suggested a differential diagnosis with tick-associated infection at the top of the list. When taken in combination of the one day delayed presentation of double vision, the facial droop could have masqueraded the intracranial findings as it is a commonality between diagnoses, but further advancement of ischemic changes to the basal ganglia upon presentation to our emergency department were the first definitive diagnostic symptoms of the intracranial mass effect this aneurysm demonstrated. Furthermore, this patient had the overall symptom progression from pain to full ischemic symptoms over the course of two days; indicating that the initial pain being experienced was not the basal ganglia being infarcted, but was an atypical presentation of central gyri compression. Supporting this is the fact that the patient's motor symptoms progressively worsened over the course of those two days, as compression worsened including temporal lobe compression affecting the upper extremity ipsilaterally.

By the time our patient arrived at the emergency department, the presentation was that of an intracranial infarct or mass with acute neurologic findings. However, when appreciating the patient history and progressive two-day pain and concern of Rocky Mountain Spotted fever or Lyme disease with pending results, it can be much less definitive of a diagnosis to make. With a prevalence estimated between 0.5-5% of all aneurysms in the general population, this giant aneurysm would not be at the top of any practitioner's differential, however after an initial workup it should come to the forefront (Shih). Clinical imaging studies such as MRI with angiography can definitively diagnose this condition with a sensitivity of 89% if the aneurysm is greater than 3mm as occurred in our patient (Okahara). This was accomplished with both an MRI and an MRA of the brain, and transfer of care to a tertiary hospital with pediatric neurosurgical capabilities was initiated. Currently, endovascular coiling from a neurosurgical trained provider is warranted as the most reliable means and the best overall strategy for preventing fatal complications of acute hemorrhagic or ischemic complications, especially with cases of aneurysmal formation, but no comparison has been made between coiling and clipping aneurysms at this time (Thompson).

Learning Points

This patient presentation was a constellation of symptoms that can masquerade as a variety of diagnoses depending on the location geographically, past history, family history and age of the patient. While presenting with symptoms indicative of tick-borne illness, history and timing implicate a mass or aneurysmal etiology. Giant aneurysms are increasingly rare in the pediatric population, and exceedingly rare in the population as a whole. However, aneurysmal complications like mass effect must be included as a diagnosis that must not be missed; saving the life of our patient.

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Practical Considerations for Mass SARS-CoV-2 Pandemic Vaccination: A Narrative Review

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Abstract

Vaccine development against SARS-CoV-2 has dominated the literature during the 2019-21 COVID-19 pandemic, with minimal reporting regarding efficacious local implementation of vaccine campaigns—despite its critical role in vaccine uptake. This narrative review identifies practices to consider for local SARS-CoV-2 and future pandemic vaccination campaigns. We searched PubMed and the CDC's Immunization Information Systems database and identified 941 articles, selecting 18 for review based on local implementation relevance. We extracted strategies applicable to state and local SARS-CoV-2 vaccination efforts. Considerations included: establishing well-defined priority groups and partnerships; advanced planning emphasizing communication; surveillance and evaluation; flexibility; and overcoming cost-related limitations. National guidelines, such as those developed by the U.S. Health and Human Services, are necessary but insufficient for high coverage rates, as they depend on variable local supply chains and community strategies. Local Health Departments should recognize prior successful approaches to plan more coordinated, targeted, and successful SARS-CoV-2 vaccination.

Background

Early in the 2019-21 COVID-19 pandemic, the rapid development of an efficacious, safe vaccine was a primary strategy for reducing transmission, disease burden, and mortality. While much focus has been placed on the development of vaccine candidates, there has been minimal reporting to date regarding expeditious local distribution and administration of such a vaccine.

The federal Advisory Committee on Immunization Practices (ACIP) established the ACIP COVID-19 Vaccine Workgroup in April 2020. The ACIP was charged with developing recommendations for supply chain and stock maintenance and protocols for equity in allocation and distribution.[1] While ACIP guidance on vaccine recommendations is critical for targeting who to vaccinate, guidelines alone are insufficient as successful vaccine coverage relies heavily on state and local infrastructure, coordination, planning, and implementation.[2,3] Failures to meet vaccination targets often lie at the implementation level (i.e. "the last mile") which calls for an increasing need to focus on the practical steps state and local health departments (LHDs) can take to facilitate efficient delivery to strategically targeted groups.

The 2009 H1N1 pandemic illustrated how high variability in vaccination coverage from state to state can occur despite clear guidelines and centralized strategy.[4] The federal government was the sole H1N1 vaccine purchaser and distributor to states.[5] While delegating vaccine administration to the states with knowledge of their assets and barriers to mass vaccinations theoretically results in a more fair and coordinated approach through local control, it is highly dependent on existing labor-intensive and robust state, local, and tribal supply chains and infrastructure and strategies for vaccine distribution and administration. Thus, one would expect vaccination coverage to vary considerably by state, which is what occurred in the H1N1 pandemic[6] and occurred in the early SARS-CoV-2 vaccination campaign.[7]

Achieving sufficient vaccination coverage to reach herd immunity (estimated to be at least 55-82%)[8] is further encumbered by vaccine reticence: national surveys show that 10-27% of US adults—and up to 44% of Black Americans—would not get a SARS-CoV-2 vaccine, if such a vaccine were available, due to concerns of vaccine safety, mistrust, and misperceptions about immunity.[8-10] A unique barrier to SARS-CoV-2 vaccine uptake may be the significant misinformation and disinformation campaigns regarding the COVID-19 pandemic circulating in news and social media.[11,12]

Efforts have begun to document the complex landscape of vaccine delivery and the vast array of implementation practices.[13] This is supplemented by recent attempts to identify best practices from past mass vaccination efforts,[14] together highlighting the critical need for an evidence base that local and state health departments can source from. This work adds to recently published articles which identify a growing need to prepare for rapid implementation of mass pandemic vaccination campaigns by presenting such documented strategies.[1,9,13,14]

Methods

We compiled literature related to the 2009 Influenza A Virus, H1N1, as this campaign was the largest emergency mass vaccination attempt in U.S. history prior to the 2019-21 COVID-19 pandemic. We searched English language articles in the National Library of Medicine's PubMed MESH database on 14 July 2020 without date restrictions. The following Medical Subject Heading (MeSH) terms resulted in 170 articles: "Immunization Programs/methods"[MeSH] OR "Immunization Programs/organization and administration"[MeSH] OR "Immunization Programs/standards"[MeSH] OR "Immunization Programs/statistics and numerical data"[MeSH] OR "Immunization Programs/supply and distribution"[MeSH] AND "Influenza A Virus, H1N1 Subtype"[MeSH]. Of these, we included two articles that were relevant for improving state and local vaccine distribution and excluded 168 articles based on title and abstract that analyzed basic science related to influenza vaccines, basic data about regional incidence rates, as well as commentary pieces and other analyses unrelated to vaccine distribution.[15,16] The search was rerun on 08 March 2021 and returned 172 results. The additional two results were screened and one was selected for inclusion.[17] We then broadened our search to consider other routine, mass vaccination programs (such as seasonal influenza) which identified 4 additional articles published between 2009-2019 pertaining to vaccination implementation strategies or features.[2,18-20] We further identified 769 publications from the Center for Disease Control and Prevention (CDC) Immunization Information Systems database[21] and, screening by title for those related to vaccine delivery and implementation, selected 11 articles for review.[22-31] We extracted recurring artifacts from 18 articles and attempted to synthesize these into common themes.

Results

WELL-DEFINED PRIORITY GROUPS

A systematic review of studies describing H1N1, seasonal influenza, DPT3, and other U.S. immunization campaigns reported that early identification of priority groups was a common feature of the most successful campaigns.[20] Priority groups routinely included those at increased risk of morbidity and mortality due to age or comorbid

conditions, as well as those with poor access to health care or significant vaccine reticence. Successful outreach activities targeting priority groups included personalized communication and maximizing ease of access to vaccines. A qualitative study by a LHD found that vaccination clinics during the H1N1 pandemic were most successful when they clearly defined high priority groups prior to implementing strategic plans or mobilizing clinic resources.[15]

ADVANCED PLANNING

Advanced planning of vaccination campaigns is a prerequisite for optimizing vaccine delivery. In addition to defining priority groups, effective vaccination strategies included establishing convenient locations and schedules and intentional planning for hard-to-reach communities (e.g. using well-known local facilities).[20] Effective advanced planning included reliable supply chain management of vaccines to prevent shortages[20] and prevent misallocated supply (e.g. sending bulk vaccine orders to rural providers and causing wastage).[16] Planning for and obtaining resources for sufficient staffing, supplies, and related resources occurred among the more high-performing public vaccination clinics during the H1N1 pandemic.[15] Recruiting health care providers and having standard operating procedures and standing vaccination orders for clinical staff to perform vaccinations were also useful strategies for increasing vaccinations.[19] In addition to funding, several additional barriers to success were identified, including delays in staff hiring and high staff turnover, lack of on-site vaccine storage space, and lower-than-expected vaccine acceptance as barriers to acceptable vaccination rates.[27]

COLLABORATIVE PARTNERSHIPS

Early collaboration with community partners and stakeholders was also effective in enhancing vaccination rates. A review conducted by Singh et al. found that high performing LHDs engaged stakeholders (such as high-priority patients and related community organizations) in shared planning to produce effective vaccination campaigns.[20] Public-private partnerships were leveraged to provide vaccines at popular contact points for the target populations, such as a local department store. Other effective approaches included: implementing multimodal communication strategies (e.g. TV, radio, billboards, flyers), holding vaccine clinics at familiar buildings (shelters, community centers), and adjusting vaccine clinic hours to accommodate working patients and families.[20] A recent study invoked a partnership with a private insurance provider to predict vaccine supply needs and identify active SARS-CoV-2 vaccinator capacity in a Texas county.[17] Additionally, LHDs with existing community partners reported fewer challenges getting stakeholders to agree on priorities and had more streamlined clinic planning processes during the H1N1 pandemic.[15] LHDs also reported useful partnerships with professional schools that supplied volunteers following the rapid introduction of "just-in-time" training into their curricula.[15] Interestingly, 64% of 61 immunization program managers surveyed by Seib et al. after the H1N1 pandemic felt that their relationships with local partners were strengthened by their shared planning and implementation experiences.[16]

COMMUNICATION

The application of effective communication strategies and feedback loops was frequently implicated in successful implementation of vaccination campaigns at national, state, and local levels. With respect to influenza vaccination rates, political and policy commitment to practical measures (such as communication and reimbursement) through direct connections with patients was important for reaching national vaccine uptake goals.[2,3] Extensive advertisement and public informational campaigns are also an effective strategy to increase vaccination uptake, although it is difficult to objectively measure their impact.[18] In positive deviance studies, tenacious communication was a widely shared characteristic of high-performing LHDs. Some high performers employed prompted messages, default communication, or motivational interviewing to overcome patient resistance and encourage uptake.[20] Many successful LHDs during the H1N1 pandemic utilized call centers early to provide information about the pandemic and the availability and effectiveness of the H1N1 vaccine. A few LHDs further designed public information strategies using social media such as Facebook and Twitter to disseminate health and logistical information to the public.[15] Recent suggestions emphasize the increased importance of social media as a leveraged asset for low cost and powerful public health messaging.[32] The most effective campaigns employed a variety of media to disseminate information and improve immunization efforts.[20] For instance, one study found that an intervention using Human Papillomavirus (HPV) fact sheets, a parent education website, pictures of diseases caused by HPV, a decision aid for HPV vaccination, and communication training for health care providers improved vaccination rates by up to 11%.[29] Similarly, one group increased year-over-year vaccination rates by 33% by implementing face-to-face and telephonic communication training in motivational interviewing for pharmacy staff in a supermarket chain pharmacy.[33] To be most effective, message content should be deliberate and tailored to specific target groups. Messengers should be diverse and include members of the target population to build trust and increase vaccine acceptance.[15,20] Enhancing communication amongst staff, stakeholders, and partners through established feedback loops, frequent team-oriented meetings, and team huddles are also reported with high-performing LHDs.[20]

The use of Centralized-Reminder/Recall (C-R/R) was an effective evidence-based practice for improving immunization coverage.[19,34] Common modalities include postcards/letters, auto-dialer telephone calls, emails, and text messages.[23] Although evidence-based and common practice, C-R/R initiatives were difficult to evaluate and separate from other co-interventions, and results were somewhat mixed.[22,23,26] Most studies suggested that the telephone may be the least effective modality; however, it may be made more effective as an opt-in service or as supplement to other modalities.[26] Another study concluded that person-locator services in addition to Immunization Information Systems (IIS) provided more accurate contact data, which may improve C-R/R efficacy and reduce cost.[25]

SURVEILLANCE

Effective monitoring and surveillance strategies were shown to facilitate rapid identification of "hot-spots" (higher prevalence of disease, gaps in coverage, vaccine refusers, resistance, or barriers to access) to better target additional resources and messaging,[20] especially toward vulnerable and high-risk populations.[18] Use of Geographic Information Systems (tools that measure incidence data by geographical distribution) have shown promising results in identifying high-risk target populations to target vaccine messaging, delivery, and supply to areas in proportion to the population in need.[29] Another study demonstrated that a variety of data sources could be linked to improve vaccination rates among adolescents through the geographic distribution of known risk factors such as demographics (e.g. age, household size), low household income, lack of health insurance, non-adherence to other vaccination guidelines, lack of healthcare access, and visiting providers who do not regularly document vaccinations into immunization registries.[30]

Fragmented immunization records and low surveillance of community coverage have been reported as significant barriers to vaccine uptake.[31] A number of studies reported that routine and complete entry of vaccination data into a local IIS was a key strategy for improved community vaccination rates by identifying places and populations where vaccine uptake was suboptimal.[19] Other studies reported IIS were useful for supplying data to other effective approaches, such as C-R/R initiatives.[23,24]

PROGRAMMATIC FLEXIBILITY

Amongst high performing LHDs during the H1N1 pandemic, flexibility was important for successful vaccination campaigns.[15] Quickly adapting existing plans for vaccination sites, staffing, and decision-making to local exigencies was necessary to accommodate the changing needs of target populations. When presented with a theoretical future pandemic following the H1N1 pandemic, the most frequently cited improvement immunization program managers recommended was tailoring their program to the specific pandemic event as it unfolded (i.e. considering evolving virulence, vaccine production rates, and public demand for vaccination).[16]

COST COMPONENT

Steps to lower out-of-pocket costs, maintain quick reimbursement procedures, and apply financial incentives were reported to enhance vaccination programs' success. One study of annual influenza vaccination rates for 201 WHO Member States from 2004-15 demonstrated that stronger political commitments to influenza control and more comprehensive low-cost vaccination policies were directly correlated with greater vaccine coverage.[2] Effective policies included a robust reimbursement system—alongside clear recommendations and wide-spread communication activities.[2,3] Another study of Hepatitis B vaccinations in high-risk populations found that reducing out-of-pocket costs was a common and effective implementation strategy for local vaccination sites achieving broad coverage.[19] As expected, a review conducted in Europe reported that providing free vaccines greatly increased vaccination rates.[18] Interestingly, they also noted that financial incentives for general practitioners were effective in increasing vaccine uptake.[18] Financial incentives can be targeted to providers (to incentivize greater administration) or to patients (to incentivize compliance). However, application of financial incentives could undermine on-going public campaigns aimed to muster excitement as payments may imply an action is undesirable.[35]

Recommendations

While there is no one-size fits-all approach for a successful vaccination campaign, there are general characteristics that are common to successful ones. Table 1 presents key artifacts from the literature and related recommendations.

Table 1: Recommendations for SARS-CoV-2 vaccine planners extracted from literature-derived strategies.

STRATEGY	RECOMMENDATION
Maintain Flexibility	
Daily monitoring and procedural adjustments according to the situation allow for rapid mobilization and effective use of short-term opportunities.	Steps to establish regular update/adjustment meetings with staff and key stakeholders may improve adaptive response.
Cross-trained staff (managerial and clinical) can allow for dynamic and rapid reassignment.	Steps to hire and train staff in clinical pandemic response in addition to health department programmatic tasks may improve rapidity of response and facilitate local relationships.
Establish Strategic Partnerships	
Strategic partnerships can be leveraged to supply staffing needs.	Collaborations with professional schools may allow for commensal benefit for obtaining volunteer workforce and student professional training.
Strategic partnerships can allow for improved reach, particularly for vulnerable communities.	Steps to partner with organizations (like fire departments, community centers, shelters) can increase access and cultural sensitivity of vaccine operations.
Enhance Surveillance	
More complete data gathering can improve efficiency and coverage of vaccine on both state and local levels.	Steps to expand IIS usage and establish data feedback loops may increase responsiveness and efficiency.
Local, hard-to-reach communities seem to be best accessed by an intimate, trusted understanding of these groups.	Steps to increase the diversity and community experience of vaccine planners may improve equitable coverage and access.
Improve Communication	
Regular communication and collaboration with stakeholders are essential.	Steps to establish formal communication, team meetings, and strategy may prove useful for both state and LHDs.
Low-cost tools like Centralized-Reminder/Recall systems may be supportive.	Steps to implement communication tools with the public may improve vaccine uptake.
Cost and workforce capacity may limit ability for LHDs to implement communication strategies.	Steps to achieve communication synergies may improve vaccine campaigns (such as state-run television advertisements and LHDs focusing on lower-cost strategies).
Lower Costs	
Out-of-pocket costs for the SARS-CoV-2 vaccine will likely not be applicable.	Steps to further incentivize target populations may include financial incentives, but these may imply being vaccinated is not desirable.
Costs are often a significant barrier for LHDs to operate successful vaccination campaigns.	Steps to engage in resource-sharing or expanding state-wide financial support may allow certain LHDs to greatly improve vaccination efforts.

Discussion

The COVID-19 pandemic presented states with a crisis of unprecedented size, complexity, and urgency. The U.S. federal government's Operation Warp Speed resulted in the development and approval of two SARS-CoV-2 vaccines in less than a year.[36] State and county health departments were charged with rapidly developing approaches to vaccinating more than 300 million Americans, many of whom were reticent to be vaccinated.[36] LHDs had to therefore rely heavily on lessons learned during previous vaccination campaigns, locally available expertise, published literature, and organizational heuristics to develop local strategies for mass vaccination.

Advanced planning early in a pandemic is the most important factor in efficient and effective vaccination campaigns. The development of national guidelines are critical for establishing a general base upon which LHDs can build local strategies. However, developing national guidelines relies on outcomes data of ongoing vaccination programs; a reality which may complicate guideline-driven advanced planning by LHDs in rapidly changing landscapes, as with the SARS-CoV-2 pandemic.[37] Therefore, active data capture and analysis with rapid-cycle response and implementation is key. This is especially important where education, poverty, and minority statuses are found to be associated with poor outcomes of COVID-19. Identifying these high-risk populations and carefully applying ethical principles with cultural competence becomes supremely important in prioritization schema at all levels. Such frameworks have been proposed by ACIP and others.[38]

As guidelines emerged and recommendations were made from early pandemic outcomes data, flexibility became paramount in LHD response. Indeed, Klaiman et al. found that flexibility was a key differentiating factor for the highest-performing LHDs.[15] The ability to establish off-site testing and vaccination clinics were essential features for effective campaigns. That said, variability in funding, staffing, capabilities, and approaches result in varying success of such campaigns. At all levels, health departments must be agile and ready to respond to daily-changing situations. Such flexibility requires constant monitoring and reevaluation of current practices as well as rapid communication with upstream and downstream stakeholders, with a commitment to making fundamental changes in approaches if necessary.

Engaging local partners, both during and between pandemics, can provide LHDs with avenues to deliver testing or vaccination in more trusted and convenient ways. Partnerships with professional schools can provide a flexible workforce, and need not be coordinated at the state level alone.[20]

Surveillance, data analysis, and reporting of vaccine community uptake and community coverage gaps are particularly important yet often insufficient. Creating easily accessible and user-friendly IIS is necessary to empower regular, "real-time" evaluations of programs, delivery, and the rapid identification of coverage gaps caused by vaccine refusers, resistance, or barriers to access.

Establishing clear, multimodal, bidirectional, and targeted communication is critical to effective vaccination campaigns at both state and local levels. Reciprocally, communication from local to federal levels with new outcomes data will likely influence living guidelines in the evolving pandemic landscape.[37] Communication channels among LHDs, health care providers, and community partners should be established early and accessed frequently. Additional communication training at contact points during pandemics may be effective, with foci on prompted messages (e.g. providers asking about vaccinations during every patient visit, regardless of reason), default language (i.e. "I see you are due for the flu shot—when is a good time to schedule the appointment?"), and technical strategies (e.g. Motivational Interviewing).[20]

The use of C-R/R systems is an evidence-based best practice for improving immunization coverage despite difficulty in isolating the impact of such programs. Effective C-R/R strategies appear to be multimodal (postcards, telephonic auto-dialers, text messaging), are "opt-in," and have accurate contact information. This is particularly relevant for populations with high address turnover.

Fortunately, SARS-CoV-2 vaccines are offered at no-cost to patients, so a reimbursement system or voucher program is irrelevant. Nonetheless, cost considerations and financial incentives will be important for future pandemic responses particularly for high-risk, harder-to-reach groups, targeting both patients and their healthcare providers. Operational costs also must be considered for factors such as adequate staffing, vaccine cold storage, and data gathering. Indeed, creative use of volunteers, especially health profession students, can offer critical relief from strained budgetary limitations or maintaining agile paid personnel.

This review has limitations. The pool of primary literature aimed at implementation of mass vaccination remains limited. While the narrative format yielded a diverse set of articles, later systematic methodology may strengthen these considerations.

Conclusions

Our literature review describes the evidence-base for strategic decision-making for vaccination strategies in the 2019-21 COVID-19 pandemic. Approaches should include well-defined priority groups, advanced planning, collaborative partnerships, enhanced multimodal communication, rapid and complete data capture and analysis, flexibility and navigating cost-related barriers. Continued attempts to document how LHDs respond to pandemic vaccination are critical to inform national, state, and local plans for managing future pandemics.

Acknowledgements

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IMPRS

INDIANA MEDICAL STUDENT PROGRAM FOR RESEARCH AND SCHOLARSHIP

The following works represent a selection of the student research that took place at the 2020 IMPRS summer internship program—a collaboration of Indiana University School of Medicine and The Indiana CTSI—including finalists who were selected to give oral presentations to a panel of judges.

IMPRS Award Recipient

Pilot Study to Investigate Home Potassium Testing in Heart Failure

Nwaneri F, Jakupco N, Mirro M

Background and Hypothesis: Heart failure (HF) is one of the leading causes of death in the United States. Normal K+ range is 3.5 to 5 mEq/L. Low potassium levels are associated with fatal dysrhythmias, and elevated potassium levels result in slow cardiac rhythms and asystole. Current venipuncture methods used for potassium testing are complicated with hemolysis, which create false K+ results. Our study objective is assessing the effectiveness of an at home device that would enable HF patients to test potassium levels frequently to avoid any complications as it relates to dyskalemia. We hypothesize that by utilizing a home testing solution, patients can develop a home HF management strategy to improve health outcomes.

Experimental Design/Project Methods: Patients diagnosed with HF will be recruited from Parkview Physicians Group – Cardiology. A venipuncture and a finger stick sample will be collected simultaneously, and their serum potassium levels will be analyzed. Venipuncture blood will be analyzed by ion-selective electrode (ISE) and flame photometry analyses. Finger stick blood will be analyzed by a novel Blaire Biomedical device. Surveys about the device will be given to both patients and clinicians. Linear regressions comparing the Blaire Biomedical results to both the ISE and flame photometry results will be created.

Francis Ikechukwu Nwaneri (he/him/his) is a third year medical student currently undecided on his choice of specialty.

What is your most important takeaway from your research?

"The collaborative effort in our research team was very important, everyone on the team worked tirelessly together to ensure we met all of our goals."

Results: The r-values for the regressions will be analyzed. An r-value close to 1 would indicate that the results are directly correlated and clinically equivalent. Results of the surveys will be used to gauge interest in the device.

Conclusion and Potential Impact: This study will establish a more efficient way for HF patients to measure K+ levels, to ensure it stays in the narrow range of 3.5 to 5 mEq/L. This device will assist in reducing potassium imbalance complications, which will translate to a decrease in mortality in HF patients as it relates to dyskalemia.

IMPRS Award Recipient

Assessing Follow-up Care Compliance in Children Hospitalized for Traumatic Brain Injuries

Bozell H, Vetor A, Raymond J, Hochstetler A, Bell TM

Background and Hypothesis: There is limited information regarding healthcare utilization and outcomes in children hospitalized for traumatic brain injury (TBI). Nearly 50% of adults hospitalized for trauma do not attend follow-up appointments, although completion of post-discharge care is associated with improved outcomes and decreased likelihood of subsequent emergency department (ED) visits. The Regestrief Institute Indiana Network for Patient Care (INPC) is a regional health information exchange (HIE) with health record data. This includes inpatient, outpatient, and ED visits, as well as imaging and lab data. The objective of this study is to use HIE data to assess long-term healthcare utilization, complications, and sequelae of pediatric patients hospitalized for TBI to see if follow-up compliance can identify patients at risk for post-TBI complications, including unplanned care, as well as long-term secondary health conditions.

Methods: 387 patients treated at a pediatric level 1 trauma center in Indiana admitted for TBI were identified using trauma registry data. EHR data in the INPC on patients for two years post-discharge were analyzed. Associations between compliance with follow-up care instructions given at discharge/subsequent medical visits and longitudinal utilization/outcomes were examined using Fisher's exact test.

Results: After reviewing patient records, we found that 60.7% of patients received all follow-up care and 8.5% of patients received partial follow-up care, leaving 25.1% of patients receiving no follow up care and 5.7% of patients lost to follow-up after discharge. 12% of patients went to the ER for an injury-related issue and 6.2% of patients were readmitted. 19.4% of individuals experienced complications from injury while 12.4% of individuals had suspected sequela. Factors influencing recovery included race, age, insurance, injury severity, ICU admission, and ventilator usage.

Implications and Importance: Using HIE data can identify factors of hospitalized children vulnerable to not achieving optimal recovery and determine what care is critical to improving long-term health and quality of life outcomes.

Hannah Bozell is a third year medical student who is currently undecided but is interested in primary care.

What is your most important takeaway from your research?

"The IMPRS summer program allowed me to combine my interests in medicine with other interests regarding social justice and patient advocacy. With my research alongside Dr. Teresa Bell, I was able to investigate the outcomes of children with traumatic brain injuries and variables that impacted a patient's ability to attend follow-up appointments. The vantage point of follow-up care abidance following traumatic injury was not something I have thought much about. I learned a lot regarding all different types of follow-up care and the importance of abidance after traumatic injury. Through my results, I saw firsthand how different health disparities can affect a patient's health outcome. I also learned the difficulties surrounding follow-up care abidance in children involved with Child Protective Services. These results sparked future research questions regarding how variables such as clinicians per capita and income levels affect follow-up care abidance.

As a researcher, I've also gained new skills and confidence. I was able to create a research question through the help of my mentor and the IMPRS class sessions assigned throughout the summer. I also learned statistical analyses regarding qualitative data, and how to analyze transcriptions of qualitative interviews. My knowledge of statistics grew exponentially with this experience as well as the help of IMPRS class sessions.

IMPRS overall gave me a new vantage point into how clinical research is another way to advocate for individuals affected by health disparities. I am continuing my research with my mentor to learn more and shed a better light on these issues to improve the quality of life and healthcare for underserved populations."

IMPRS Award Recipient

Role of PAR1 in Food Allergies

Garcia J, Buelow L, Cook-Mills J

Jennifer Garcia is a third year medical student interested in internal medicine, pediatrics, and anesthesia.

What is your most important takeaway from your research?

"During my project, I was able to learn more about the intricacies of studying pathways and mechanisms to able to advance the treatment and therapies of something such as food allergies. I realized my desire to incorporate research into my future career."

Background and Hypothesis: The prevalence of food allergies continues to rise. In a mouse model, food allergy to peanuts develops in flaky tail mice with skin barrier mutations and exposure to peanut (PNE) and Alternaria Alternata (fungal allergen, Alt) on the skin. In the skin, keratinocytes respond to proteases in allergens through protease activating receptor 1 (PAR1). Blocking PAR1 decreased the severity of viral induced inflammation in mice. Whether PAR1 has a major role in food allergies has not been investigated. We tested the hypothesis that blocking PAR1 would halt the development of food allergy to peanuts in neonatal mice.

Project Methods: In our studies, pups were injected intradermally (i.d.) with a PAR1 antagonist and then treated with PNE/Alt. In another group, pups received i.d. injections of a PAR1 agonist and then treated with PNE only. Control groups received allergens only. Pups were treated and skin sensitized 5 times every 3-4 days. Forty-eight hours after the last treatment, pups were challenged with PNE through oral gavage, and temperatures were recorded every 15-30 minutes for 3 hours. Skin, ileum, and jejunum samples were collected and used for qPCR to determine the expression of inflammatory mediators. Plasma serum was used for analysis of anti-PNE specific antibodies by ELISA.

Results: PAR1 antagonist blocked anaphylaxis in allergic mice sensitized with PNE and Alt. PAR1 agonist is sufficient to induce anaphylaxis in mice sensitized with PNE only.

Conclusion and Potential Impact: This study demonstrates that PAR1 is involved in the development of food allergies, where blocking the receptor blocked food allergies in neonatal mice. The signaling mechanisms and activators of PAR1 need further studies, using PAR1 deficient mice. This novel pathway may lead to therapies to stop the development of food allergies.

IMPRS Award Recipient

Decreased Brain Volume in Infants with Prenatal Opioid Exposure

Dietrich J, Guckien Z, Haas DM, Sadhasivam S, Radhakrishnan R

Background/Objective: Previous small studies have shown that prenatal opioid-exposed infants and older children display decreased cerebral, cerebellar, or subcortical brain volumes. However, these studies are plagued by suboptimal reference standards or were unable to correct for the influence of other environmental factors in older children. Therefore, our goal was to study differences in brain volume of prenatal opioid-exposed infants when compared to a geographically matched population. We hypothesized that there would be a significant decrease in total brain volume of the prenatal opioid-exposed infants in comparison to the non-opioid exposed control infants. Secondarily, we evaluated whether supratentorial or infratentorial brain volumes were significantly different between prenatal opioid exposed and opioid non-exposed infants.

Methods: This was an IRB approved prospective study of mothers and infants with prenatal opioid exposure and controls without prenatal opioid exposure. All recruited infants underwent MRI scans of the brain before they reached a corrected age of 2 months. For this project, the T1-weighted MRI images were analyzed using Infant FreeSurfer and segmented into regions of interest. The segmentations were manually checked and edited. An ANOVA analysis was performed to compare the extracted cerebellar and total brain volume datasets. We corrected for sex and corrected gestational age at MRI scan.

Results: 42 infants were included in the study, 21 with prenatal opioid exposure and 21 control infants. There was a significant difference in the mean gestational age of prenatal opioid-exposed infants (38.28 w ±2.13) compared to control infants (39.42 w ±0.72). On quantitative MRI brain volume analysis, the prenatal opioid-exposed infants had a significantly reduced total brain, supratentorial, and cerebellar volumes compared to the non-opioid exposed control infants. Besides the brain volume reductions, there were no macro-structural abnormalities on visual inspection of the images.

Conclusion: In human infants, prenatal opioid exposure is associated with significantly smaller global brain, supratentorial, and cerebellar volumes compared to non-opioid exposed controls. Long-term clinical and developmental implications of these MRI changes in opioid exposed children need to be further studied.

Jonathan Dietrich is a third year medical student currently interested in Neuroradiology.

What is your most important takeaway from your research experience?

"My research showed decreases in the brain volume of prenatal opioid-exposed infants when compared to a geographically matched population. Detailed findings of significant brain volume loss would be an important step for the field towards understanding the effect of opioids on prenatal brain development and its downstream behavioral consequences. My results lay the groundwork for further scientific and public health research programs on prenatal and pediatric health as it intersects with the opioid epidemic."

IMPRS Award Recipient

scRNA-Seq Identifies IL-1 Responsive Cell Subsets in the Skin Injury-induced Inflammatory Response

Harpold K, Zhou HM, Slominski RM, Seymour LJ, Bell MC, Dave P, Atumonye J, Wright III W, Dawes A, Griesenauer B, Paczesny S, Kaplan MH, Spandau DF, Liu Y, Xuei X, Gao H, Hoki A, Turner MJ

Inflammation is an integral aspect of skin wound healing; however, the mechanisms that regulate inflammatory cascades in this context are not well defined. To better understand how skin inflammation impacts wound healing, we developed an ex vivo skin culture system to model key aspects of the inflammatory phase of wound healing. In this model, a defined set of proinflammatory cytokines and chemokines, mirroring those produced in wounds in vivo, are produced when mouse or human skin biopsies are cultured ex vivo. We refer to this pattern of cytokine and chemokine induction as the skin injury-induced inflammatory response. Previous studies in our laboratory demonstrated this response is initiated by the cytokine, interleukin 1 alpha (IL-1α). To understand the cellular sources and targets of IL-1α during the skin injury-induced inflammatory response, skin biopsies from mouse tail skin were cultured ex vivo for 8 hours followed by processing for single cell RNA sequencing (scRNAseq). Using bioinformatic software R and the package Seurat, analysis of scRNAseq data from this experiment identified 22 distinct cell population clusters. While no populations exhibited significant expression of Il1a transcripts, multiple cell populations expressed Il1r1 transcripts, which encodes the ligand-specific subunit of the IL-1 receptor. Notably, fibroblast, endothelial cell and stromal cell clusters were characterized by expression of Il1r1 and the skin injury-induced inflammatory response transcripts Il6, Cxcl1 and/or Csf3. Furthermore, Reactome Pathway Analysis suggested the Il-1 signaling axis was activated in these cell populations. This information provides a basis for future studies to understand how IL-1 signaling in fibroblasts, endothelial cells and stromal cells impacts wound healing in vivo, which could in turn lead to novel therapeutic approaches to clinically-relevant outcomes.

Kayla Harpold (she/her/hers) is a third year medical student who is currently undecided, but loved doing research in dermatology, and is keeping her options open.

What is your most important takeaway from your research experience?

"Even though COVID messed up the original plans, because it was online, I learned a new skill (bioinformatics in R software) I wouldn't have had it been in person. Also, Dr. Turner was wonderful to work with and really took the time to guide me during IMPRS and further my understanding both in his research and also in the field of dermatology as a whole. Science doesn't solve anything without quality people behind it."

IMPRS Award Recipient

Novel Participatory Methodologies for Identifying Motivations of Minority Women to Participate in a Breast Cancer Clinical Trial

Evans M, Ridley-Merriweather KE

Background: The Komen Tissue Bank (KTB), a biorepository that stores healthy breast tissue for use as controls in breast cancer (BC) research, has a notable deficiency in tissue donations from racial and ethnic minority women. Though studies have documented similar disparities in many clinical trials, the reasons why minority women agree or decline to participate in clinical trials remain largely unknown. This study used two novel participatory communication methodologies with minimal researcher intervention to explore potential motivations for minority women (Latinas, Asian Americans, and Black women) to donate breast tissue to the KTB.

Methods: Two novel methodologies rooted in Grounded Practical Theory and Grounded Theory were used to study the attitudes of non-donors toward tissue donation and the reasons donors choose to donate tissue to the KTB, respectively. The non-donors (Latinas, n=14; Asian Americans, n=17) participated in interactive focus groups, and donors (Black, n=20) participated in open-ended interviews, all of which were then transcribed and coded to identify common motivations for donating breast tissue.

Results: The interactive methodology of both the focus groups and interviews yielded rich data that may not have arisen in a traditional question-driven format. Though the manifestation differed between minority groups, three common factors influencing the decision to donate breast tissue were present in all groups: altruistic tendencies, cultural norms, and personal connection to BC. Non-donors also expressed their need for more information before making the decision to donate.

Conclusion and Potential Impact: Common factors that influence the decision to donate tissue were identified using these two novel interactive methodologies, though the expression differed between minority groups. The information gleaned from this study will inform future communication efforts by the KTB and other clinical trial researchers, with the ultimate goal of distributing targeted recruitment materials to increase the representation of minority women in clinical trials.

Developing a Minimally Invasive Cell-Based Model to Predict Response to Major Trauma

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Background

The physiologic response to injury is heavily influenced by the immune system. The complexities of the immunologic response to injury are becoming increasingly understood as researchers have leveraged computational methods that allow temporal and spatial coordination of immune mediator orchestration to be quantified. Recently, early differences in immunologic orchestration have been shown to stratify individual tolerance to injury. Specifically, there are subsets of trauma patients that are either sensitive or tolerant to hemorrhage that demonstrated notably different early immunologic orchestration of mediators from clusters of cytokines that are primarily tissue protective or pro/anti-inflammatory. These differentiating networks of mediators formed and dissipated over the initial 72 hours after injury clearly demonstrating that the immunologic response to injury is an acute dynamic event that has pathomechanistic relevance to outcomes after injury. Additionally, it is distinctly possible that individualized differences in immune response may determine tolerance/sensitivity to injury.

The differential immunologic response to trauma represents an opportunity to discover specific factors that may be predictive of a patients' response to traumatic injury and subsequent hemorrhagic shock. Accordingly, we have embarked on a line of experimentation to explore potential precision approaches based on individual immunologic response to injury. Here we report our initial experimental findings in conceptual model development with the ultimate goal of developing minimally invasive/non-injurious testing that will accurately identify individual tolerance to hemorrhage and injury. In this experiment, an in-vitro cell-based assay was designed to mimic traumatic injury. Specifically, we tested the immunologic response in murine splenocytes to a simulated hypoxic injury, a simulated mechanical injury and a simulated open wounding injury. The development of a reliable cell-based model will allow investigation to determine correspondence and relevance between cell-based responses to non-traumatic injury and in vivo immunologic response to trauma, with the overall goal of developing a reliable test to predict response to traumatic injury in humans.

Kayla Gates (she/her/hers) is a third year medical student currently interested in orthopedic surgery because she is drawn towards the idea of seeing immediate improved quality of life for patients. "I think being able to directly increase functionality for patients would be extremely rewarding. incredible learning experience." "My most important take away from this research experience is an appreciation for how different body systems can be so intricately linked. I've enjoyed studying the connections between the immune system and the musculoskeletal system, and I've gained a broader understanding of the inflammatory response to trauma."

Rebecca Nunge is a third year medical student who is currently undecided in her field of interest. "It has been a very thought-provoking and valuable experience to participate in a research project with such an interesting research question about the connection between trauma and immunologic responses. I have enjoyed working on a multidisciplinary team and learning from the mentors we have on this project."

Methods

In-vitro cellular responses of murine splenocytes are reflective of peripheral blood cell responses and were used for pilot experiments. Splenocytes from C57BL/6 (B6) BALB/c or CH3/HeJ strains mice were used with stimuli that mimic traumatic injury using chemical (hypoxia or sepsis) or mechanical (shear stress) stimuli that might from an open wounding type of injury. Hypoxia was simulated by subjecting cell cultures to hydrogen peroxide. Sepsis was simulated by

subjecting cells to lipopolysaccharide (LPS). Some culture conditions included several individual cytokines associated with acute inflammation and external pathogens (interleukin (IL)-6, IL-1β, IL-33), the damage molecule high mobility group box protein (HMGB)-1, or combinations of LPS and the cytokines. Following treatment, cDNA was prepared and used for qPCR amplification of TNFα, HIF1α, and BAX to assess inflammation, hypoxia, and apoptosis, respectively. Multiplex analysis of IL-21, IL-4, IL-22, IL-5, and IL-10 expression was performed from culture supernatant collected at 24 hours after stimulation. Flow cytometry was performed to assess proliferation of immune cells following treatment. ELISA was conducted to quantify production of the cytokine IL-9 that occurred following splenocyte stimulation.

Results

Analysis of C57BL/6 splenocyte viability show that any combination of cytokines or LPS did not impact cell survival, while hydrogen peroxide reduced survival significantly in each treatment group. From the qPCR data, LPS generated a 4x increase in TNFα expression relative to control, while cytokine treatment yielded no expression changes. Treatment with LPS + cytokines closely resembled the LPS treatment group. LPS treatment reduced expression of HIF1α, while hydrogen peroxide increased expression of HIF1α. The addition of cytokines reduced expression of HIF1α in groups that were treated with both hydrogen peroxide and cytokines. ELISA analysis of the proinflammatory cytokine IL-9 indicated increased production of IL-9 following treatment with LPS + cytokines.

In the second experiment, the model was applied to three different strains of mice in order to gauge differences in the immune response to the same cellular stress. Multiplex analysis showed no significant changes in IL-4 or IL-21 expression in any of the strains. C3H mice showed no response to LPS, which was expected due to LPS resistance in these strains. In the B6 and BALB mice, IL-10 was induced by LPS treatment. BALB mice also showed increased expression of IL-5 and IL-22 in response to mechanical stress, while the other strains showed no response. IL-10 expression was not induced by mechanical injury in any strain. Flow cytometry analysis was used to assess immune cell response to stimuli. Both B6 and C3H mice showed increased percentages of CD4 and CD8 cells in response to mechanical stimulus, LPS, and LPS + cytokine treatment relative to control. Macrophage levels were more elevated in B6 mice in response to mechanical stimulus, whereas levels decreased in the C3H mice.

Discussion

The overall goal of this line of investigation is to develop minimally invasive and non-injurious testing that can be used to determine individual tolerance/sensitivity to trauma and hemorrhage. These pilot studies were used to determine how immune cells can be isolated and stimulated to mimic injury. Splenocytes were used as they encompass a broad cross-section of white blood cells. Clear inter-strain differences were evident between the B6, BALB and C3H mice. Hypoxia stimuli consistently resulted in roughly a 50% loss of cell viability and accordingly may not be a viable strategy. The greatest effects were encountered with LPS +/- addition of stimulating cytokines. We measured changes in five of six cytokines in B6 mice and four of six BALB mice involving reparative cytokines (IL-21 and 22), anti-inflammatory cytokines (IL-10) and in type 2 cytokines (IL-4 and IL-5). Accordingly, these strains and stimulation methods will be expanded to determine effects on production on a broader panel of cytokines. In addition, computational methods will be leveraged on the next experiment to determine in-vitro effects on immunologic mediator orchestration to account for time-dependent mediator networks and spatial networks of mediators.

Moving forward, these experiments will be repeated to reproduce our findings and improve our ability to distinguish between varying immune responses. Results will then be paired with studies examining the responses to traumatic injury among these and other strains. The overall goal of this project is to accurately predict the response to an in-vivo injury using an in-vitro non traumatic stimulus. Findings from this project will enable the development of a clinical test that accurately predicts immunologic response to trauma and stratify individual tolerance to hemorrhage and injury.

IMPRS Award Recipient

Can Cognitive Behavioral Therapy (CBT) Intervention in Patients Diagnosed with Stage 3/4 Gastric Cancer Increase Patients' Acceptance of Palliative Care Earlier in the Cancer Continuum?

Sharma R, McCollom J

Background and Hypothesis: Palliative care, though designed improve quality of life in patients diagnosed with a grave illness, is widely stigmatized as an "end of life" service. Cancer diagnosis has been known to cause mental stress on patients; the added stigmatization of palliative care with death is a barrier to care, especially in gastric cancer patients whose delay in treatment can result in poor cancer prognosis and outcomes. Cognitive Behavior Therapy (CBT) intervention is promising in this case, yet, understudied in palliative oncology. Successful CBT intervention can combat guilt, denial and stigma, leading to more positive outlook on life and palliative care. We hypothesize that CBT intervention will increase stage 3/4 gastric cancer patients' acceptance to start palliative care early in their cancer treatment by decreasing associated stigma.

Experimental Design and Results: Study will be an interventional, unblinded, randomized clinical trial with an experimental and control group. A CBT video intervention will be used, preceded and followed by a pre-/post session questionnaire generated from IU's RedCap. Full intervention will have 4 sessions, with experimental groups divided into those receiving <2, 3 or full 4 sessions. All individuals age 18+ with a recent stage 3/4 gastric cancer diagnosis, who have the ability to provide consent/ comprehend the CBT video will be illegible to participate in the study. A spearman's correlation will be used to test significance of CBT. A negative trend is predicted between CBT intervention and palliative care stigma; as the number of CBT sessions increase, palliative care stigma should decrease accordingly.

Potential Impact: CBT's effectiveness in alleviating stigma faced by patients with advanced gastric cancer can suggest more psychosocial training for physicians to move away from disease centered approach to one that implements ways that eradicate social barriers to care.

Rhea Sharma is a third year medical student currently interested in alleviating suffering caused by cancer, especially as part of end-of-life care. "Cancer has always been an emotional

subject for me, as I remember watching my grandfather pass away with cancer in the refugee camps of Nepal where I was born. The cancer had completely overtaken him. As his body rotted away in the camps, I remember myself as a little girl, about age 6, asking, "how can I help?" Years later, when given an opportunity to pursue a research project through IMPRS, I decided to put my interest in paper with a project designed to investigate ways to extend life and provide care in the palliative care setting for those with late-stage cancer. During the summer research experience, I learned that for any contribution we want to make, getting started is of most significance. This was especially important this past summer due to COVID restrictions where in-person clinical research was limited, and many of us had to find creative ways to bring forth our project into action. As it turned out, my research was limited to being a proposal, however, it brought me immense joy to formulate a plan to alleviate suffering in an area that is of great significance to me, and I'm looking forward to making a larger study from this proposal in the future."

IMPRS Award Recipient

Using Late Supplemental Oxygen to Prevent Retinopathy of Prematurity Progression In Premature Infants: a Retrospective Study

Minturn R, Koch MB, Anderson E, Kua KL, Haider K

Background/Objective: Retinopathy of Prematurity (ROP) is a leading cause of childhood blindness. It affects 15,000 surviving US preterm infants annually, with 1,400 infants developing severe ROP and 500 infants developing legal blindness. The pathogenesis of ROP involves 2 phases. During phase 1, the immature retinal vascularization is obliterated due to hyperoxia. During phase 2 (>4 weeks postnatally), abnormal neovascularization occurs due to hypoxia, sometimes requiring surgical intervention. We retrospectively evaluated the impact of late supplemental oxygen (>4 weeks postnatally) on ROP progression in infants born <28 weeks.

Methods: Preterm infants <28 weeks with >stage 2 ROP admitted to the Riley Hospital for Children Neonatal Intensive Care Unit (NICU) from 7/2017- 12/2019 were included. Nine patients treated with supplemental oxygen therapy were compared to a control cohort managed by a standard protocol after the diagnosis of stage 2 ROP. The primary outcome was the need for surgical intervention with either laser or bevacizumab treatment. Continuous data was analyzed using unpaired t-test, and categorical data was analyzed using fishers exact test.

Results: There was no statistical difference in regard to clinical variables contributing to risk of severe ROP (sex, race, birthweight necrotizing enterocolitis, bronchopulmonary dysplasia or length of stay) between the two study cohorts. There was a statistically significant decrease in need for treatments (laser or bevacizumab) in patients receiving supplemental oxygen (control: 35/83 patients treated, late O2: 0/9 patients treated, p=0.012).

Conclusion and Implications: Supplemental oxygen therapy seems to have a protective effect on the development of treatable ROP (type I). Limiting surgical intervention (laser or bevacizumab) would directly benefit the babies by decreasing the need for sedation and any inherent risks of surgery. This initial data suggests the need for future studies with a higher sample size to validate the efficacy of late supplemental O2 in ROP.

Robert Minturn is a third year medical student currently undecided on specialty choice. "This project provided me the benefit of exposing me to several pediatric fields including neonatology and pediatric ophthalmology. I am grateful that through this project I gained a solid base of knowledge and mentors to reach out to in the future, however, the true impact this research could have for future premature babies was what I enjoyed the most. I look forward to continuing this research and seeing where the data takes us."

IMPRS Award Recipient

Femoral Stem Subsidence in Aseptic Hip Revision Using Modular Tapered, Fluted Titanium Stems

Baldwin TJ, Deckard ER, Buller LT, Meneghini RM

Introduction: Tapered, fluted titanium (TFT) femoral stems have become the gold standard in revision total hip arthroplasty (rTHA). However, there is a paucity of data on TFT stem subsidence rates following aseptic rTHA. Subsidence can lead to instability, loosening, leg length discrepancy, and gait impairment and subsequent repeat revision surgery. This study evaluated the incidence and predictors of subsidence in aseptic rTHA performed with TFT stems.

Methods: 113 TFT femoral stems of four designs implanted between 2011 and 2020 at a single center were retrospectively reviewed. Stem subsidence was measured on digital radiographs taken immediately after surgery and at 4-weeks, 1-year, and subsequent follow-up clinic visits. Patient characteristics, risk factors for subsidence, revision etiology, and implant characteristics were extracted from the electronic medical record.

Results: 102 aseptic rTHAs were analyzed. 54% were female with mean age and BMI of 67 years and 31 kg/m2, respectively. As expected, 79% of stems subsided between the immediate postoperative and 4-week follow-up period. Further, 65% of stems subsided between 4-weeks and 1-year postoperatively, and 66% of stems subsided between 1-year and latest follow-up (>12 months postop). At all follow-up intervals, the amount of subsidence was minimal (<3mm) for the majority of cases (range 64% to 95%). In multivariate analysis, use of an extended trochanteric osteotomy (ETO) was predictive of minimal subsidence (<3mm) between 4-weeks and latest follow-up (odds-ratio 8.75, p=0.051).

Conclusion: The incidence of significant TFT stem subsidence was relatively low in this cohort. The use of an ETO may minimize subsidence over the lifetime of TFT stems, potentially due to optimal visualization of the cortical diaphyseal dimension and interference stem fit. Further research is warranted with more cases to identify specific risk factors for subsidence of TFT femoral stems.

Thomas Baldwin is a third year medical student currently interested in orthopedics. "The research I conducted last summer during IMPRS 2020 opened my eyes to how clinical research truly impacts clinical decisions. It was rewarding to see how my colleagues were genuinely invested in the outcomes of my project and how that information could contribute to the field of orthopedics. Personally, my eyes were opened to the details and nuances a clinician must be able to synthesize and apply in order to make the best decision for their patient."

Editorial

A Dual Disaster: COVID-19 and Increasing Rates of Intimate Partner Violence

by Jara Crawford

Since December 2019, COVID-19 has presented the worst pandemic that the world has seen in decades. Beyond the obvious physical health consequences, the pandemic has also had devastating impacts on other aspects of life, such as finances, education, and mental health. One of the more sinister ramifications of this virus has been an increase in rates of intimate partner violence (IPV) around the world.[1]

This increase has been for several reasons related to the far-reaching effects of the pandemic. Previous research has shown that when families spend more time together, IPV incidences increase.[2] Due to the stay-at-home orders enacted around the world, many families have been spending far more time together than they previously did.[3] The numerous quarantine orders have thus left many people vulnerable to abusive people within their own homes.

In addition to this, social isolation has been a consequence of stay-at-home orders. Social isolation is a tactic that abusers often use to gain control of their victims.[4] The increase of social isolation with the advent of widespread quarantining has left many people without access to resources and relationships they may have previously used as respite from the violence they face at home.

Another factor that has been strongly linked to IPV is poverty. Past research has found that rates of IPV increase as the income of a family decreases.[5] It has been estimated that approximately 49 million people globally will be plunged into extreme poverty due to the economic impacts of COVID-19.[6] This increase in poverty has undoubtedly fueled an increase in IPV incidences across the world.

Because of the increased time with potential abusers, increased social isolation, and extreme economic consequences of COVID-19 lockdowns, the increase in IPV rates was not unpredictable. Since future pandemics are inevitable, it is important to understand the factors that led to this increase so that future pandemic responses alleviate these factors in order to protect the most vulnerable members of the population.

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Medical Advocacy is such a SNaHP!

by Nirupama Devanathan

In no uncertain terms, 2020 brought collective suffering. COVID-19 fractured communities that were already fragile, scattering shards that cut the very fabric of our society, leading to the demise of small business, or perpetually overworking the under protected essential service workers, healthcare workers, and educators.

The public turned to scientists and physicians, hoping that medical knowledge and evidence-based approaches that inform the beneficence of a therapeutic intervention could become the salve that would begin to heal the US and the world. Indeed, civic engagement affirms the role of physicians in informing the attainment of positive health outcomes in all of our neighborhoods.

But political participation can be challenging, when the vortex of political polarization distorts each and every position as co-opting into the argument of "my team" versus "your team," reducing physicians to defend political ideology over the virtues of a given policy position.

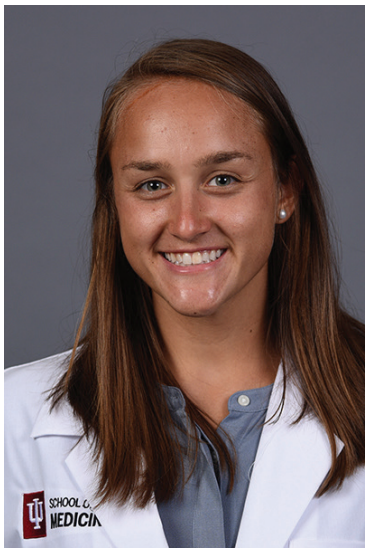
So how do physicians in-training even begin engaging with public policy? Nirupama Devanathan sat down with Maddie Birch and Joey Ballard, the newly-elected Presidents of Students for a National Health Program (SNaHP), to take a deep dive on civic engagement, policymaking, and advocacy in medicine.

Note: Interview edited for brevity and clarity.

ND: Can you tell me a little about SNaHP? What motivated you to join this organization and run for office?

MB: SNaHP is a student branch for Students for a National Healthcare Program. Our goal is to advocate for policies that promote universal healthcare in a non-partisan manner. The main goal of being a physician is to help our patients. But sometimes, that is not possible a system that actively harms our patients, which is one of the ways that I can help.

JB: My early interests align with the mission of this organization. Throughout my time at Wabash College, I worked at a Montgomery County Free clinic. Even before joining SNaHP, I have been thinking systemically about the healthcare system and why we might even need free clinics in the first place. In fact, SNaHP's mission serves to address healthcare disparities that we've discussed throughout this year in our classes, like Foundations of Clinical Practice (FCP I). Every issue is exacerbated by lack of access, and a single payer system would help us address so many of these disparities in a meaningful way.



Madeline Birch, MS2

ND: What does civic engagement mean to you? How might your experiences in this organization impact your work with patients in the future?

Joey Ballard, MS2

MB: Civic engagement is finding ways in which a future healthcare provider can contribute to society. One thing we have been doing in SNaHP is promoting voter registration outreach programs along with patient panels and physician advocacy panels. Additionally, we partnered with Student National Medical Association (SNMA) to host the Black History Month Speaker series. All these programs have been important to me, because being part of SNaHP will help me better advocate for my patients in the future, which is vital to me—and I hope it will help me be a better physician!

JB: I'd also add that civic engagement and advocacy does not look like one thing for everyone! Some of those advocacy panels were a really great thing to show the diversity of ways to get involved in advocacy. It could be at the local level

focusing on mutual aid and policy advocacy, all the way up to the national level. It is important for students to see that those options exist and know that they are needed at all levels of policymaking.

ND: Is civic engagement exclusive to policy then?

JB: The advocacy work of this organization began in the 1980s and was not exclusive to policy. Advocacy work is also part of civic engagement, to help in getting closer to the goal through many strategies and making people aware.

ND: How would you address a colleague or a patient who may be "on the other side of the aisle" from a particular policy you are proposing? What type of dialogue do you think is needed?

MB: I've had a little experience with talking to my family members about universal healthcare. It is better to address concerns by listening to their concerns and understand the reasons why they may be opposed. With a colleague, it is also important to understand their fears and wonder if they believe it [universal healthcare] could harm their patients. In fact, Dr. Ed Weisbart had a panel about how to engage with the policy position of universal healthcare with those who may value fiscal conservatism, through emphasizing the financial implications of the plan to allow participation from both sides. For a patient, I would explain how a specific policy may affect them and their families. I believe that healthcare is a human right, and as future physicians, we want to do the best for our patients.

JB: It is important to keep these discussions focused on the policy and not focused on the identity politics or polarization. Framing policies as what aligns with our missions as physicians can be important. Especially with a colleague, we want to call back on the oath that we have taken and examine if what we are advocating for is truly aligned with the best needs of our patients.

ND: Knowing that many medical students may be uncomfortable with policy, how might your organization, SNaHP, offer collaborative approaches?

JB: The biggest issue with getting involved is knowing where to start, and that's where our programs in the past have been helpful, to help show the avenues you can go down. We believe connecting with mentors is important so students can see role models, but it is also critical that the organization itself gets students motivated, so that we can build off each other's energy and enthusiasm and address some of that hesitation.

MB: A lot of students are wary of getting involved in things like advocacy, because they think they are not knowledgeable enough. You don't have to be the biggest advocate in the world to be involved or engaged. Also, we put on events that are not related to the specific policy that we advocate for (universal healthcare). We want to help get SNaHP out there and show that we care about a broad range of initiatives that ultimately seek to improve our patients' lives. We want to welcome people of all political alignments and allow students to feel more comfortable to get their feet wet.

ND: What is the biggest challenge or barrier you personally have faced in becoming civically engaged?

MB: It is very overwhelming to know where to look and what to do to get involved, and on top of that, assessing what am I actually qualified for and capable of doing. Sometimes I fear not knowing enough, that I am not capable, or that I do not know enough to be advocating in this way.

With it being COVID times, everything is still virtual, and it is hard to know what I can be involved with that is safe. It has also made it harder to know that as things get better, how to transition to finding places to have hands-on experience with local organizations, whether that be advocating at the state house or meeting with other organizations. In general, COVID I think has sort of limited the amount of knowledge I have about ways to get involved from an in-person standpoint.

JB: I have to agree with everything Maddie has said. One of the things I have been thinking about to address some of the challenges of knowing where to start is connecting the SnaHP group to get more involved with Indiana's Physicians for a National Healthcare Program chapter, as they are based in Bloomington. Having a chapter in our state is very fortunate, and they will be a valuable resource with which to connect.

ND: How might you respond to someone who tells you to "stay in your lane?" Do you think physicians have an obligation to participate in policy that may impact their patients indirectly?

MB: This is absolutely our lane. One thing that we will see as future physicians is how the healthcare system may harm our patients. The people who make these policies don't necessarily have that insight of seeing the effects of their policies. Their only experience might be as a patient. I wish physicians were more involved in the making of policy, as advocacy is not exclusively about the funding of healthcare but also laws that are made about healthcare. As physicians, we are obligated to help our patients, and this cannot coexist with complacency.

JB: This kind of stuff is our lane, even if historically it hasn't been thought of it that way. While we are obligated to follow whatever policies that are made, we also have the obligation to shape the policies that are put into place. I do think that physicians have a unique position to have experience with

medical knowledge and connect that with our patients based on our understanding of the system.

MB: For example, we saw this recently with a bill that was sent to Governor Holcomb's desk that was widely condemned by OB/GYN groups across the state that would have promoted "reversing" medically induced abortions, a policy that was not based on scientific evidence – which is infuriating in my opinion. That day, around 1 pm, one of our members had sent a letter to Gov Holcomb to not sign this piece of legislation, but we only had until 3 pm before our signatures were due. We had to come up with a way to solicit signatures without running the risk of modifications on the original Google document, and had to come up with a quick form. While we were able to get 60-70 additional signatures, it was chaotic to make sure everything was formatted correctly and avoid duplicated signatures.

JB: That whole experience underscores the need for us to be informed throughout the process and again, why policy is our lane. I hadn't known anything about this bill until that day, when everything had to be sent out. These last-minute experiences add to the time demands we have as medical students and physicians which underscores the fact that we need to be involved and intervene before our advocacy on bills gets to that breaking point.

MB: And how do you monitor what is being proposed? That is why we need to become even more involved in the legislative process!

ND: Have you had to do any type of "unlearning" or confront any of your own personal biases in policy?

MB: Rather than an unlearning process, for me it has been a learning process. I grew up in a rural community and have spent significant time learning about universal healthcare and how it will benefit this country.

JB: For me, it is the need to focus on policy itself and not get bogged down by identity politics to be able to work across the political spectrum. This is something I think I am trying to work through and be conscious about so that we can focus on getting our policy goals accomplished which is necessary in working across the country with different compositions of legislators. I also feel that this applies to our relationship with our future patients, who are going to have all sorts of opinions and values.

ND: How might medical students solicit feedback from community members whom the policies would impact the most?

MB: The premise of elected officials is that they represent their population. In a perfect world we would be able to provide more feedback to elected officials. It is hard because our actual patient interaction is limited because of COVID, but one thing we have done is that we had a patient panel where we discussed insulin prices. We want to have open discussions to know what they would like to see done. It is frustrating because most people do not know what is being done from the legislative branch that can help or harm them. There is a lack of transparency between the government and the population—we need a "SparksNotes" version of bills so that people can get involved and find out what these bills are about.

JB: Everything we talked about underscores the need for that and policy change more broadly. As physicians, these changes are not something we can do ourselves, our voices can't (and shouldn't!) be the only ones. That points to needing community members and other medical professions represented in these policy discussions.

MB: Our chapter is limited because we are a group through the medical school, but not sure if there are other similar organizations within the nursing, physician assistant schools. We talk a lot about having an interdisciplinary approach, that would be a concrete example of doing that. That would be a stronger front than what we can do alone. How do you find that information? If you don't know anyone personally doing this kind of work, it can be hard to get involved. But, this has been one organization where I feel comfortable asking questions. We know that we aren't all experts and that is okay to say we don't know this.

IMPRS Award Finalist

Improving Post-Stroke Outcomes in Ischemic Stroke Animal Models Using C3a Monoclonal Antibody Treatment

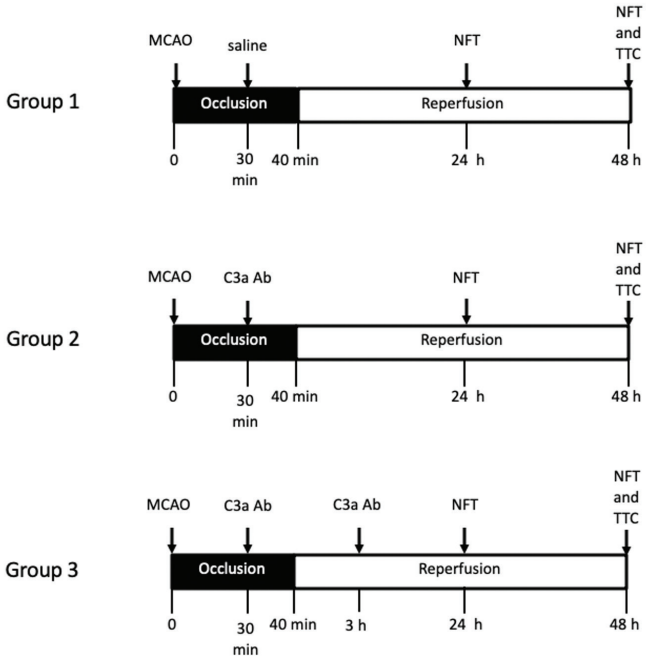
Failinger D, Yen JH

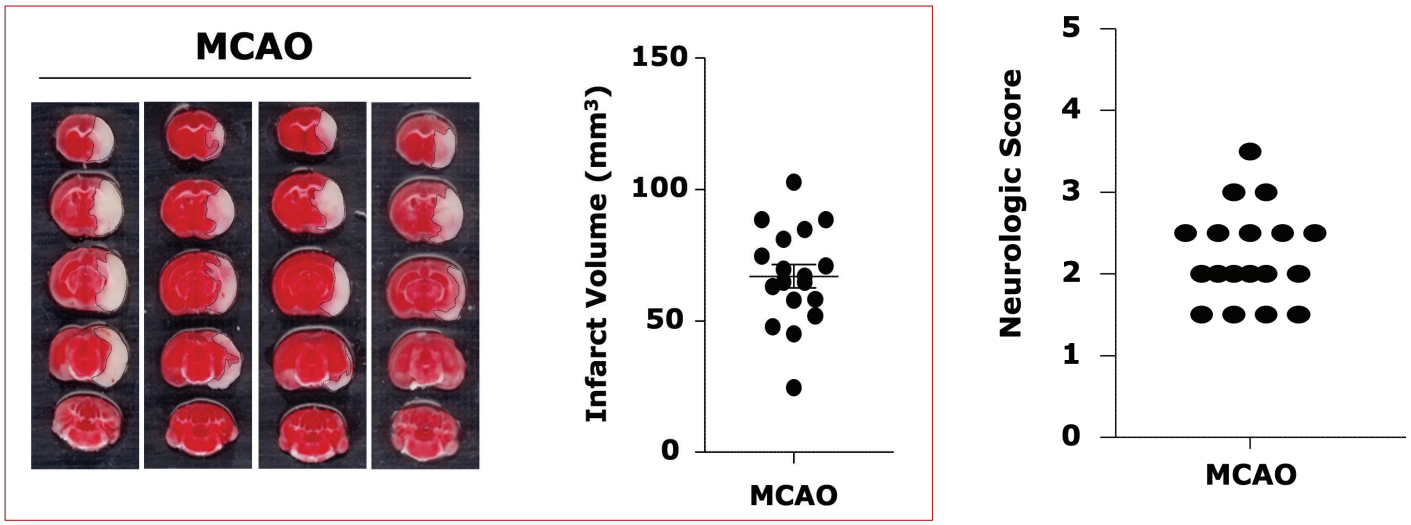
Background: Stroke is one of the leading causes of death in the world and a majority of strokes cases are ischemic stroke. Ischemia causes tissue damage by preventing nutrient delivery, but damage is also caused by inflammation after reperfusion. The complement pathway is active during reperfusion. Our study focuses on the effects of C3a component inhibition during post stroke inflammation.

Material and Methods: A total of 30 C57BL/6 mice will be randomly divided into 3 groups (n=10/group) and subjected to a 40-minute middle cerebral artery occlusion (MCAO). The control group will receive a vehicle (saline, Group 1) and two experiment groups will receive 5 ml/kg IV injections of neutralizing C3a monoclonal antibody. The first experimental group (Group 2) will receive the injection 30 minutes after the start of occlusion and the second experimental group (Group 3) will receive two injections at 30 minutes and 3h after the start of occlusion. All groups will be subject to neurological function tests at 24h and 48h. Additionally, at 48h post-injury animals will be sacrificed and the ischemic brains harvested, followed by Triphenyl tetrazolium Chloride (TTC) staining to determine infarct volume.

Results: The infarct volumes and neurological function scores for the experimental groups are expected to have statistically smaller values and improved neurological deficient compared to the vehicle group. Group 3 mice are expected to have smaller values and lower scores compared to Group 2.

Discussion: C3a plays an important role in recruitment of inflammatory cells such as macrophages/microglia and neutrophils, which can cause brain tissue injury and neuron cell death. Limiting the presence of C3a component by monoclonal antibody is expected to limit recruitment and lessen post-ischemic inflammation damage. Future studies may test combinations of complement pathway inhibition to optimize the depression of post-stroke inflammation and as well as preventing susceptibility to post-stroke infection.





IMPRS Award Finalists

The Role of the Integrated Stress Response and the Actin Cytoskeleton during Wound Healing

Aukerman E, Diaz MB, Wek RC, Spandau DF

Background and Hypothesis: Chronic cutaneous wounds are a serious health concern afflicting millions of people. One of the primary factors preventing the closure of chronic wounds is the inability of keratinocytes to migrate across the wound bed. Epidermal keratinocytes migrate in a cohesive manner known as the keratinocyte collective cell migration (KCCM). Our lab has demonstrated that the integrated stress response (ISR) plays a key role in the KCCM. The ISR is initiated by stress-sensitive kinases, such as GCN2, and results in decreased global protein synthesis while preferentially increasing the translation of mRNAs encoding cytoprotective proteins. Wound repair also relies on the actin cytoskeleton, but the crosstalk between actin and the ISR is not well established. We hypothesize that the interaction between the ISR and the actin cytoskeleton is critical for KCCM during wound healing.

Methods: Cutaneous wound healing was approximated in vitro using the KCCM-dependent scratch assay. Wild-type (WT) and GCN2-deleted (KO) keratinocytes were grown on coverslips, differentiated, scratched, and harvested at different times post-wounding. F-actin and vimentin (VIM) expression was monitored over time using fluorescent phalloidin-488 and immunofluorescence. In addition, WT keratinocytes were treated with actin-depolymerizing drugs and induction of the ISR was measured using immunoblots.

Results: Depolymerization of F-actin was observed along the leading edge of both wounded WT and GCN2-KO keratinocytes immediately following wounding. WT keratinocytes upregulated VIM expression at the leading edge whereas VIM expression remained unchanged in the GCN2-KO keratinocytes. Treatment with latrunculin B and cytochalasin D, which both result in actin depolymerization, induced GCN2 phosphorylation in the differentiated WT keratinocytes.

Conclusion and Potential Impact: F-actin depolymerization elicits a GCN2-mediated induction of the ISR. GCN2 and the ISR are critical components of the cutaneous wound repair process and their crosstalk with the actin cytoskeleton may serve as a novel therapeutic target in the treatment of chronic wounds.

Verbal Fluency, Speech-Language, and Neurocognitive Outcomes in Youth with Cochlear Implants

Hasnain F, Pisoni D, Kronenberger W

Background: Cochlear implants (CIs) restore some hearing to deaf children, although some language domains such as verbal fluency (VF) are at risk for delay. VF, the ability to efficiently retrieve words from the mental lexicon, is critically important for learning, reasoning, and memory. In this study we used a novel assessment paradigm to understand how VF develops in youth with CIs and to investigate associations between VF, speech-language, and neurocognitive functioning. We hypothesized that phonemic VF (retrieving words based on sounds) would show greater delays than semantic VF (retrieving words within category) and that VF would relate to spoken language and memory outcomes.

Methods: 28 prelingually deaf, early-implanted (<4 years), long-term (≥7 years) child and adolescent users of CIs were compared with 33 age and nonverbal IQ-matched normal-hearing (NH) peers. VF measures were compared between CI and NH and were correlated with speech, language, and neurocognitive outcomes.

Results: Compared to NH peers, youth with CIs retrieved fewer words, had longer start latencies, and fewer word clusters in the phonemic VF test. Stronger phonemic VF in the CI sample was associated with better speech perception and language. Stronger VF in both samples was associated with better short-term/working memory and inhibition/concentration.

Conclusion: VF based on phonological (sound) characteristics of words is delayed in youth with CIs, whereas VF based on semantic meaning is relatively spared. Phonemic VF delays have downstream effects on speech perception and language in youth with CIs, whereas both types of VF are associated with verbal short-term/working memory and executive functioning.

Clinical Policy Impact and Implications: Study results indicate a need for assessment and intervention targeting VF (especially phonemic) in youth with CIs as a potential method for improving speech perception, language, verbal memory, and inhibition-concentration outcomes.

IMPRS Award Finalist

Myocardial Perfusion Reserve in Children with Friedreich Ataxia

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Abstract

Children with Friedreich's Ataxia (FA) are at risk of perioperative morbidity and mortality from severe unpredictable heart failure. There is currently no clear way of identifying patients at highest risk. We used myocardial perfusion reserve (MPR), an MRI technique used to assess the maximal myocardial blood flow above baseline, to help determine potential surgical risk in FA subjects. In total, seven children with genetically confirmed FA, ages 8 to 17 years, underwent MPR stress testing using regadenoson. Six of the seven demonstrated impaired endocardial perfusion during coronary hyperemia. The same six were also found to have evidence of ongoing myocardial damage as illustrated by cardiac troponin I leak (range 0.04 – 0.17 ng/mL, normal <0.03 ng/mL). None of the patients had a reduced ejection fraction (range 59 – 74%) or elevated insulin level (range 2.46 – 14.23 mCU/mL). This retrospective study shows that children with FA develop MPR defects early in the disease process. It also suggests MPR may be a sensitive tool to evaluate underlying cardiac compromise and could be of use in directing surgical management decisions in children with FA.

Introduction

Friedreich's Ataxia (FA) is an autosomal recessive disease affecting approximately 1:50,000 individuals, mostly Caucasian. Nearly all cases are caused by an expanded trinucleotide repeat (GAA) resulting in gene silencing and quantitative deficiency of the protein frataxin [1]. Frataxin is integral in the assembly of iron-sulfur clusters required for numerous mitochondrial matrix cofactors involved in oxidative phosphorylation [2]. It is the most common hereditary ataxia, but the heart is also severely affected and most patients with FA succumb to hypertrophic cardiomyopathy (HCM) during the third to fifth decade of life [3,4]. FA is also commonly associated with scoliosis. Surgical correction of this scoliosis has a heightened risk of unpredictable severe heart failure and death [5,6].

MPR is an MRI technique used to show the maximal possible increase in myocardial blood flow in response to exercise or pharmacologic stimuli. It is commonly used in the diagnosis and management of patients with known or suspected coronary heart disease [7]. MPR defects have recently been shown in adults with FA and correlated with increased left ventricular mass and signs of metabolic syndrome [8]. To date no one has used it in FA patients less than 18 years of age, nor has regadenoson been reported in this patient population. We used MPR in children with FA as part of a pre-surgical risk assessment and found that it was well tolerated by the patients. We found that children with FA had perfusion reserve defects early in life, and this data was useful to guide risk assessment for possible scoliosis surgery.

Methods

Study Population:

Patients under the age of 18 with genetically confirmed FA were evaluated as part of a pre-surgical risk assessment. Their records were retrospectively reviewed. All assessments were conducted at Riley Hospital for Children in Indianapolis, Indiana, USA. No patients had abnormal renal function (calculated glomerular filtration rate ≤30 mL/min/m^2) or contraindication to MRI. All patients had baseline demographic and clinical characteristics recorded. Prior to pharmacologic stress testing, all patients had baseline electrocardiogram and echocardiography studies. Serum labs collected prior to cardiac MRI included cardiac troponin I (cTnI), insulin, fasting blood glucose, and fasting lipid profile.

Echocardiography:

All patients underwent standard echocardiography using state-of-the-art machines as recommended by the American Society of Echocardiography [9]. M-mode images of the left ventricle (LV) were taken in the parasternal long axis and short-axis distal to the mitral valve leaflet tips after alignment of the cursor perpendicular to the LV wall. Measurements for the left ventricular posterior wall and interventricular septum were performed from the parasternal long-axis acoustic window with z-scores reported from the Pediatric Heart Network Database [10]. Interpretation of all echocardiograms was independently performed by pediatric cardiologists.

Relative wall thickness (RWT) was defined as two times the posterior wall thickness divided by the left ventricular end-diastolic internal diameter [11]. Left ventricular mass was indexed by dividing the body weight by the patient's height raised to the 2.7 power [12]. Thresholds for left ventricular mass index (LVMI) and RWT in children were consistent with 95% confidence intervals published by de Simeone et al. The limit for LVMI was set at 44 g/$m^{2.7}$ in males and 40g/$m^{2.7}$ in females. The limit for RWT was set at 0.39 for both sexes [12,13]. Eccentric hypertrophy was defined as normal RWT with increased LVMI while concentric remodeling was defined as increased RWT with normal LVMI, and concentric hypertrophy was defined as increased RWT with increased LVMI [14].

Cardiac Magnetic Resonance Imaging and Myocardial Perfusion Reserve:

All patients were imaged using a Siemens 1.5T Avanto scanner (Siemens Inc., Erlangen, Germany) at rest and during pharmacologic stress in accordance with ACC/AHA recommendations [15]. Patients were asked to abstain from caffeine for 24 hours prior to the procedure. A standard twelve-lead electrocardiogram was obtained prior to imaging, and continuous cardiac telemetry and pulse oximetry were monitored throughout the procedure. Three short axis and one four-chamber image were captured immediately following rapid intravenous administration of 0.075 mMol/kg gadolinium-based contrast reagent. To induce hyperemia, regadenoson at a dose of 10 mCg/kg capped at the adult dose of 0.4 mg was given over ten seconds followed by saline flush one minute prior to contrast. This dose is consistent with prior publications in pediatrics and pharmacokinetic modeling [16-18]. Resting images were completed prior to stress testing in case of intolerance to regadenoson and premature discontinuation of the exam. Blood pressure and heart rate were measured at baseline and every minute for 15 minutes after administration of the vasodilator regadenoson. Aminophylline was available in case of severe dyspnea or chest pain.

Clinical Lab values:

All clinical laboratory tests, including cardiac troponin I (cTnI), insulin levels, and lipid panels, were conducted at Riley Hospital for Children clinical laboratories.

Results

Baseline Characteristics and Demographic Data:

In this retrospective study, seven children 8 to 17 years of age underwent MPR scans (Table 1). Five of the seven were male and all were Caucasian. All had genetically confirmed GAA triplet expansions of the FRDA allele although one subject did not provide the medical records for this analysis. Their Body Mass Indexes (BMIs) ranged from 12.8 to 18.1 kg/m^2. Two of the seven were taking angiotensin-receptor blockers and one was taking a β-blocker, and one was taking a non-dihydropyridine calcium channel blocker. Trinucleotide repeat lengths on both alleles are included where available.

Table 1 Baseline Characteristics

	Patient #1	Patient #2	Patient #3	Patient #4	Patient #5	Patient #6	Patient #7
Age (yrs)	17	9	13	14	14	10	8
Race	White	White	White	White	White	White	White
Sex	F	M	M	F	M	M	M
Height (cm)	166	134.5	163	152	178	139	132
Weight (kg)	48	27	48	37	53	25	27
BMI (kg/m^2)	17.3	18.1	18.1	15.8	16.6	12.8	15.3
Cardiac Meds	Losartan	None	Atenolol	Losartan	None	None	Verapamil
GAA1/GAA2	486/953	900/1300	850/1200	800/1000	650/940	NA	1100/1300

Table 2 Echocardiography*

	Patient #1	Patient #2	Patient #3	Patient #4	Patient #5	Patient #6	Patient #7
Diastole							
RV	1.74 (-0.72)	1.61 (-0.50)	1.92 (-0.32)	1.38 (-01.50)	1.96 (-0.39)	1.57 (-0.60)	1.50 (-0.79)
IVS	1.26 (2.68)	1.38 (3.92)	1.16 (2.26)	1.30 (3.09)	0.99 (1.30)	1.72 (4.94)	1.44 (4.13)
LV	3.73 (-1.75)	2.93 (-3.25)	4.01 (-1.07)	3.13 (-3.20)	3.86 (-1.78)	3.03 (-2.92)	2.93 (-3.23)
LVPW	1.43 (4.05)	1.64 (5.74)	1.09 (2.62)	1.27 (3.76)	1.11 (2.46)	0.77 (1.76)	1.35 (4.73)
Systole							
IVS	1.75	1.90	1.36	1.63	1.33	1.83	1.76
LV	2.01	1.43	2.22	1.74	2.31	2.09	1.66
LVPW	2.16	2.14	1.31	1.62	1.82	1.32	1.54
LAD	3.00 (1.42)	2.45 (0.74)	3.04 (1.49)	2.64 (0.79)	NA	NA	2.32 (0.37)
Ao	2.19 (0.87)	1.90 (1.91)	1.77 (-0.07)	1.70 (-0.09)	2.33 (0.19)	1.83 (-0.01)	1.60 (0.23)
SF (%)	46.3	51.1	44.6	44.4	40	31.1	43.2
EF (%)	78	84	76	77	71	60	76
RWT	0.77	1.12	0.54	0.81	0.58	0.51	0.92

*All lengths measured in cm with z-scores in parentheses where available. RV: Right Ventricle; IVS: Interventricular Septum; LV: Left Ventricle; LVPW: Left Ventricular Posterior Wall; LAD: Left Anterior Descending coronary artery; Ao: Ascending Aorta; EF: Ejection Fraction; SF: Shortening Fraction; RWT: Relative Wall Thickness;

Echocardiography:

All patients had evidence of myocardial thickening on echocardiography (Table 2). Six of the seven patients had left ventricular posterior wall thickness more than two standard deviations greater than the mean when adjusted to body surface area for age, sex, race, and ethnicity. Similarly, all but one had an interventricular septum diameter greater than two standard deviations from the adjusted mean. Shortening fraction (SF) ranged from 31.1 to 51.1% and ejection fraction (EF) ranged from 60 to 84%. All patients had hypertrophic left ventricles as determined by RWT on echocardiography, ranging from 0.51 to 1.12.

Table 3 Cardiac MRI*

	Patient #1	Patient #2	Patient #3	Patient #4	Patient #5	Patient #6	Patient #7
Basal anteroseptum	NA	1.40	NA	1.24	1.20	1.40	1.37
Mid anteroseptum	1.36	1.40	1.09	1.51	0.80	1.60	1.32
Mid inferoseptum	1.31	1.40	1.30	1.73	1.10	1.30	0.85
Mid inferior wall	1.06	NA	1.08	NA	0.60	NA	NA
Mid inferolateral wall	NA	1.40	NA	NA	0.80	0.70	NA
Mid posterior wall	1.20	NA	0.96	NA	NA	NA	NA
Basal inferolateral wall	NA	1.30	NA	NA	1.10	0.60	NA
Basal posterior wall	NA	NA	NA	1.47	NA	NA	1.05
LVEDD at the base	3.97	2.9	4.60	3.04	NA	NA	3.96
RWT	0.60	0.89	0.42	0.97	0.43	0.45	0.53
LV mass	150.0	107.3	103.9	131.6	126.0	73.0	89.04
LVMI	38.2	62.7	28.0	42.2	26.6	30.0	42.1
LVEDV	80.0	59.7	95.4	53.0	110.0	70.0	59.5
LVEDVI	20.4	34.9	25.7	17.0	23.2	28.8	28.1
LVESV	21.0	22.9	34.4	21.6	39.0	29.0	16.9
LVESVI	5.3	13.4	9.3	6.9	8.2	11.9	8.0
LVEF (%)	74.0	61.7	64.0	59.3	64.0	59.0	71.5
LV Hypertrophy	CR	CH	CR	CH	CR	CR	CR

*All lengths reported in cm and volumes reported in mL. LV: Left ventricle; EDD: End-diastolic diameter; RWT: Relative wall thickness; MI: Mass index; EDV(I): End-diastolic volume (index); ESV(I): End-systolic volume (index); EF: Ejection fraction; CR: Concentric remodeling; CH: Concentric hypertrophy

Cardiac Magnetic Resonance Imaging:

All patients had measurable LV hypertrophy by RWT, ranging from 0.42 to 0.97 (Table 3). Two of seven also had severe LV hypertrophy by LVMI, and the range was 26.6 to 62.7 g/m$^{2.7}$. Thus, two of the seven met the previously defined criteria for concentric hypertrophy (CH) while the remainder were characterized as having concentric remodeling

(CR). No patient had a reduced left ventricular EF with values ranging from 59-74%. The remaining results are displayed in Table 3.

Figure 1 shows representative results from the MPR imaging in all seven subjects. Six of the seven children sampled were found to have a myocardial perfusion reserve defect. The only child who did not was Patient #3. The arrows in Figure 1 illustrate the region of hypoenhancement within the left ventricular endocardium following administration of the vasodilator regadenoson. Most commonly seen was a ring of hypoperfusion in the subendocardial region showing as a darkened area on contrast enhancement although some subjects, such as Patient #4, has more localized hypoperfusion involving the papillary muscles. A resting perfusion image from Patient #4 is included for reference.

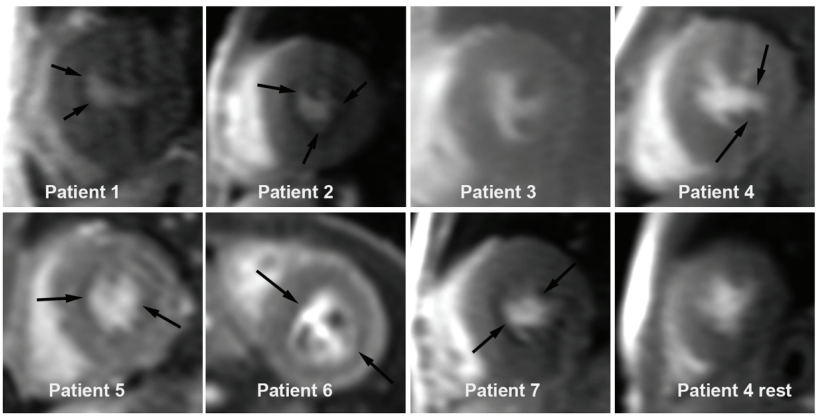

Figure 1. Myocardial Perfusion Reserve study on seven patients with Friedreich Ataxia. Left ventricle shown in cross-section after regadenoson infusion with gadolinium enhancement. Black arrows denote areas of hypoperfusion with regadenoson stress. Patient 4 rest demonstrates left ventricle prior to regadenoson stress.

Figure 2 illustrates the cardiovascular stress response of each child to the vasodilator regadenoson. Heart rates increased in all ranging from 15 to 82% above baseline. Conversely, systolic blood pressure fell from baseline in all subjects by 10 to 41%, and diastolic blood pressures fell from baseline 24 to 54%. Interestingly, the only patient who saw a larger percentage decrease from baseline in systolic blood pressure than diastolic blood pressure was Patient #3, the one without a detectable MPR defect. All patients tolerated the procedure with most reporting only mild to moderate shortness of breath and chest discomfort. Aminophylline was never needed.

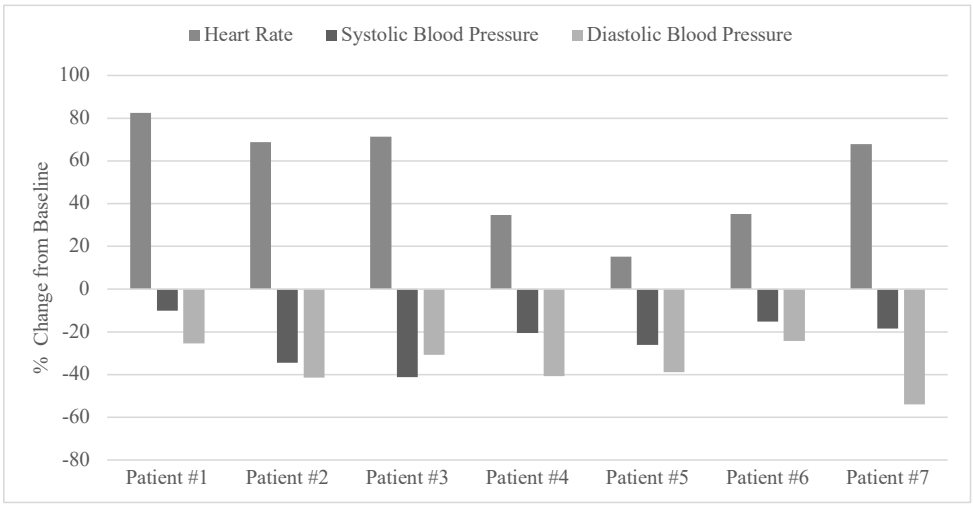

Figure 2. Cardiovascular Stress Response. Heart rate, systolic blood pressure, and diastolic blood pressure were measured in all seven subjects during administration of the vasodilator regadenoson. The percentage of change from baseline was plotted for all three parameters on the Y-axis.

Myocardial Injury and Metabolic Dysfunction:

All patients with a MPR defect also had evidence of ongoing myocardial injury as measured by cardiac troponin I (cTnI) leak greater than or equal to 0.03 ng/mL (Table 4). Similarly, the only patient without an MPR defect did not have evidence of myocardial injury as measured by cTnI. None of the patients sampled were found to have an elevated insulin level, elevated triglycerides, elevated BMI, or elevated blood pressure although four were on antihypertensive cardiac medications at baseline. Two patients had an elevated fasting blood glucose, and two patients had a low HDL.

Table 4 Heart Damage and Metabolic Dysfunction

	Patient #1	Patient #2	Patient #3	Patient #4	Patient #5	Patient #6	Patient #7
cTnI (ng/mL)	0.05	0.12	0.02	0.17	0.04	0.05	0.12
Insulin (mCU/mL)	5.06	3.35	14.23	6.25	7.13	NA	2.46
FBG (mg/dL)	77	84	89	84	104	115	85
HDL mg/dL)	44	46	42	44	41	55	52
LDL (mg/dL)	68	113	42	127	55	78	92
TG (mg/dL)	78	101	101	81	50	49	54
BP (mmHg)	108/71	119/58	107/62	107/59	126/77	105/62	103/65

cTnI: Cardiac Troponin I (normal <0.03ng/mL). FBG: Fasting Blood Glucose. HDL: High-Density Lipoprotein. LDL: Low-Density Lipoprotein. TG: Triglycerides. BP: Blood Pressure.

Discussion

To our knowledge, this retrospective study is the first to demonstrate the presence of MPR defects in children with FA. MPR stress testing as part of a comprehensive pre-surgical risk assessment found six of seven children had impaired myocardial perfusion after administration of the vasodilator regadenoson. These results suggest individuals with FA develop impaired myocardial blood flow as children. They also provide evidence for why these children may be at heightened risk of perioperative complications with stressful surgeries.

Approximately 70% of children with Friedreich's Ataxia (FA) develop scoliosis [5,6]. Many require surgery to maintain mobility and functional status. Surgery in children with FA, is associated with an increased risk of perioperative cardiovascular complications [5,6].Currently, left

ventricular ejection fraction (LVEF) is the most cited pre-operative assessment of cardiovascular risk [19]. However, reductions in LVEF typically occur very late in FA making it a poor marker of cardiac disease status in these patients [20].

We did not find concurrent presentation of MPR defects with elevation of LVMI or metabolic dysfunction in children. This correlation was previously described in adults with FA by Raman et al [8]. This suggests that MPR defects appear earlier in the FA disease process than either LV mass hypertrophy or metabolic dysfunction. These results also suggest the microvascular changes exposed by stress testing precede the development of cardiac hypertrophy and metabolic derangements. This has recently been discussed by Koeppen et al [21].

We did find evidence of myocardial damage in these children as illustrated by cTnI leak. This also indicates that chronic myocardial injury begins early in the disease. Cardiac troponin I leak correlated with the presence or absence of MPR defects in all patients although the sample size is too small to be statistically significant. Thus, in this small retrospective study, myocardial damage appears in concert with MPR defects and predates both severe LV mass hypertrophy and the development of metabolic dysfunction.

The remainder of the pre-surgical assessment was consistent with what has previously been described in children with FA. This includes preserved EF on both echocardiography and cMRI. All patients were found to have thickening of the left ventricular wall as measured by RWT consistent with either concentric remodeling or concentric hypertrophy.

We used regadenoson (Lexiscan®) to dilate the coronary vasculature and maximize coronary blood flow. To our knowledge, this is the first time regadenoson has been used in children with FA. Our experience was positive in that all patients achieved maximal increase in coronary blood flow, and the procedure was tolerated without significant complications.

Conclusion

This small retrospective study shows that MPR defects in FA begin earlier in life than previously suspected. Based on these findings, cMRI with MPR appears to be a sensitive indicator of underlying cardiac compromise and could help direct surgical management of children with FA. Strengths of this approach are that it is non-invasive, the FA subjects tolerated the vasodilator, regadenoson, very well, and informative data was obtained. Weakness of this study are that the subject numbers are small, there is no randomization, and the study is retrospective. However, these data support the rationale of a larger prospective trial to determine if MPR defects precede LV mass hypertrophy or metabolic dysfunction in children with FA.

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IMPRS Award Finalists

Reducing Death Anxiety: The Impact of Advanced Care Planning

Hollenbeck K, Gutwein T

Background/Objective: Death anxiety affects multiple areas of patients' physical and mental health. Reducing this phenomenon has the potential to improve quality of end of life (EOL). The effects of spirituality, age, self-esteem, biological sex, presence of symptoms and level of isolation have been previously studied. Advanced care planning (ACP) is a simple intervention which has known positive impacts on quality of EOL by decreasing healthcare costs and undesired hospitalizations; however, only 33% of the population has completed it. This study will examine the correlation between death anxiety and ACP. We hypothesize that there will be a statistically significant lower level of death anxiety in participants with ACP.

Methods: The study population will include patients presenting to the Parkview Regional Medical Center ED who are ≥65, with a sample size of 1,000. We will use a translated and adapted version of the 17 question Likert-type Scale of Death Anxiety, developed and validated by Cai et al. in 2017. It will be presented via REDCap and will include electronic signature of informed consent. Finally, we will include questions about ACP and advanced directives. Participants will also complete a basic demographic survey to account for confounding factors. Analysis will include a Mann-Whitney test, univariate and multivariate regressions.

Results: This project resulted in IRB submission drafts of a study protocol, informed consent, SDA survey and REDCap data collection tool. The researchers are seeking Parkview Health-IRB approval in Fall 2020, with an anticipated study start date of Spring 2021.

Impact: This project has the potential to improve quality of life by decreasing death anxiety and resulting negative stress reactions. Interventions for decreasing death anxiety have not been extensively studied, so directions for future research are broad and could include impacts of ACP in varying ages and contexts outside of the ED.

Osteology Modules for the Human Structure Course

Fiallo M, Parker K, Eckel C, Mas J

Background and Objective: The COVID-19 pandemic has created a need to deliver much content for the Human Structure (HS) course virtually. Because osteology is a fundamental component of human gross anatomy, the goal of this project was to create quality interactive osteology modules for HS that can be delivered online.

Project Methods: To ground our module development in best practices for teaching and learning human gross anatomy, we reviewed 100 articles from PubMed databases and selected 9 for discussion during weekly literature review meetings. Key search terms included: education research, computer-assisted instruction (CAI), technology-enhanced learning (TEL), clinically based anatomy, integrated learning, medical education, and more. We created the modules using Microsoft PowerPoint™ and EndNote X9™ for referencing purposes. Bone images were captured and edited with a Nikon USATM D850 DLSR camera and Adobe Photoshop, respectively. Additional images were obtained from IUSM online textbooks, miscellaneous websites, and the radiology database RadiopaediaTM. Each module includes pertinent clinical correlations, radiology, and post-module quizzes for students to assess their higher-order knowledge.

Results: We created 7 osteology modules using best practices for human gross anatomy teaching and learning: (1) Vertebral Column, (2) Thorax, (3) Shoulder Girdle & Brachium, (4) Elbow, Antebrachium, Hand, (5) Pelvic Girdle & Thigh, (6) Knee, Leg, Foot, (7) Cranium & Hyoid.

Conclusion and Potential Impact: Studies have demonstrated that CAI/TEL and radiological imaging work synergistically with traditional didactic methods to facilitate learning of human gross anatomy. Our modules will be used statewide in the HS course for first-year medical students as a CAI learning tool. Looking forward, we plan to use both qualitative and quantitative methods to determine if use of these modules results in better exam performance or aids in other aspects of the learning process.

IMPRS Award Finalist

Examining Multisystem Inflammatory Syndrome in Children (MIS-C) Amidst the SARS-CoV-2 Pandemic

Harris M, Datta D, Co K, Bhumbra S, John C

Background/Objective: Multisystem Inflammatory Syndrome in Children (MIS-C) is a novel and rare pediatric post-infectious complication associated with SARS-CoV-2 infection. First described in April 2020, our scope of understanding is limited but rapidly growing. Our objective was to construct a literature repository containing MIS-C patient data from available publications to serve as a curated collection of literature on the topic. This collection facilitates direct comparison of data from various sources, allowing for informed discussions of MIS-C.

Methods: A database search strategy was developed for locating primary literature on MIS-C available on PubMed, medRxiv, and bioRxiv databases. Literature searches were conducted from June 26, 2020 to July 10, 2020. Search results were tested against several criteria before inclusion in the repository. Intrinsic limitations for each publication were identified during quality review. Data from each source was organized in a standardized format for analysis.

Results: 26 publications met inclusion criteria, with 9 (35%) in pre-print status. 742 cases of probable or confirmed MIS-C were reported. Individuals ranged from 7 months to 20 years old and 58% were male. By SARS-CoV-2 PCR testing, 257/707 (36%) were positive while 485/597 (81%) were positive by SARS-CoV-2 serology testing. Common presenting symptoms included fever, one or more gastrointestinal symptoms, and rash. Laboratory testing varied, but elevated C-Reactive Protein was the most common finding (411/689, 60%), followed by elevated D-Dimer (214/470, 46%). Echocardiogram findings included coronary artery dilation in 38/414 (9%) and decreased ejection fraction in 177/330 (54%). Treatments offered included intravenous immunoglobulin (486/742, 65%), followed by steroids (376/742, 51%). 450/577 (78%) required ICU care. Patient outcomes were generally favorable, with 11 (1%) fatalities at the time of publication.

Conclusion/Impact: Our repository of MIS-C literature compiled patient reports to identify common clinical presentations and laboratory findings. Future literature reviews are necessary to elucidate mechanisms associated with MIS-C and establish diagnostic criteria.

Prescribe it Forward-Paving a Path Towards Mentorship for All

by Mitchell Gray

Aaron Gilani

Inspired by his own unique path into the field of medicine, Aaron Gilani developed and lead a team of students to start Prescribe it Forward. This innovative platform connects current premedical students from across the country to mentors willing to provide support to these future medical students. After completing his business degree while studying and applying to medical school, Gilani looked to apply his background in business to this nonprofit organization dedicated to mentorship in the medical field. Now a current fourth-year medical student at Indiana University, Gilani is pushing the limits in student-led mentorship and has connected over 2,100 premedical students with respective mentors.

The inception of Prescribe it Forward came to Gilani one evening while he was in the middle of studying for his USMLE Step 1 exam. "I wanted to think about something else other than my test. It was a great time for reflection, and I was able to sit down and think about what the first two years of medical school meant to me."

From these introspective moments, Gilani set out to answer one important question: "What are ways that I can help aspiring physicians gain access to the people and resources so they too, can one day become medical students."

But for many students, the journey to medical school is complicated by a lack of clear and relatable mentorship. Students who are underrepresented, have non-traditional backgrounds, those with financial difficulties or without access to advisors were exactly the students Gilani and his team were targeting. When Gilani first entered medical school, "[he] assumed that everyone had this journey of 'figuring it out.'" As a first-generation medical student, he sympathized with the challenges that other students faced as they worked to gain admittance to medical school.

"Of course, there are students who come from a lineage of medicine. But it's a lot harder to navigate this process when you don't know anyone in medicine. I was thinking, there are probably a lot of students who need this help. Where do they go to get it? And I couldn't come up with a clear answer for that."

In the beginning, Gilani was working to define the role that Prescribe it Forward would play in student mentorship. "I think early on, it was setting the vision. What is Prescribe it Forward and what isn't Prescribe it Forward... At the end of the day our goal is to create an environment where any student who wants to be a physician is someone we can help... I think it was important to have that focus because we could lose sight of that mission."

As the organization expanded, Gilani found himself adapting to new expectations. "Now that the vision is set, my goal is to ensure that we deliver on that vision and less so on the day-to-day tasks." When asked to discuss his methods of leading such an incredible group of students to achieve their goals, Gilani added, "I am a very 'lead from the front' type of person. I think to have other people feel like they are stakeholders in what you are doing, you have to show an equal effort and commitment to the task at hand. Once this project got really big, I had to learn that I am only one person. We are all medical students at the end of the day, and we will have to be a part of a team forever. So, you have to learn to trust your teammates and use their own strengths."

Surrounded by a team comprised of his peers, Gilani was able to create an environment where his teammates could dedicate themselves to one component of the organization. "Eric Galante, who graduated from IUSM this year, heads the Mentor Relations Committee. He was the one who spearheaded the idea for Mentor Representatives, which consists of 2-3 mentors at the medical schools with the most mentors. He created a pipeline to further recruit incoming students to our organization and answer any questions for the existing students. That was Eric's big project and I think he did an awesome job."

While Prescribe it Forward continues to make connections amongst students across the country, the team members still haven't lost track of the value of personalized mentorship. "We have all done mentoring before this, and even after starting this program, I still take on mentees because it's the core of what I do. We are 13 months (into the process) and have around 1,500 mentors across 150 medical schools around the country. We would love to have you as a part of our team. Any students interested in getting involved with mentorship or Prescribe it Forward can visit prescribeitforward.com."

Gold Humanism Honor Society

The following pages contain individual essays written by students of the Gold Humanism Honor Society, a national honor society that aims to highlight compassionate patient care and humanism within the field of medicine. Many students showcase narratives that highlight interactions with patients that taught them not only how to manage disease medically, but also important lessons about the human condition - how to treat all those who seek our help with empathy and understanding. We hope that the examples that follow inspire all those who read it to provide holistic care to all our patients.

Students were asked to respond to the following prompt:

Please describe a patient (or patient's family) experience you witnessed that inspired you or taught you an important lesson as a developing physician.

Aaron Gilani

As I approach the end of my third year of medical school, I have begun to reflect on all this journey has meant to me thus far. An experience with one of my patients and her family on the Cardiothoracic Surgery team at Riley is one that I will carry along with me for the rest of my medical career. I was introduced to a newborn who needed heart surgery, but I was also met by a family not originally from the United States whose eyes evoked fear and uncertainty about what this would mean for their newborn baby.

It brought me back to my parents coming to America with my 24-week-old brother, Aashish, who is also deaf and blind. They came to a new country without knowing anyone, what was wrong with their child, or any knowledge of American healthcare. Though my brother is older than me, meeting this family was everything I imagined that my own parents faced in 1988. As a medical student, I pondered about ways I could help them outside of things like checking on them often, providing updates, and giving that extra "is there anything else I can help answer?" just in case they were afraid to ask earlier.

I remember my parents telling me how they don't just remember the wonderful doctors/nurses my brother had, but how the entire team helped them feel comfortable: the information desk associate, the custodians, the parking garage team, etc. I felt coming face to face with the patient and her family was destiny in that I had an opportunity to help pay it forward for the care my brother received. It was my duty to ensure they were getting proper support from social work and were able to get to and from the hospital without difficulty. The best part of my interaction with the patient and her family was that I was able to later see them in clinic while on another rotation. Despite being the medical student, I feel as though they were able to confide in me and trust me to help take care of their daughter.

Aida Haddad

It is a sunny afternoon on the trauma service. While finishing notes, we are paged for my first level 1 trauma: a man on dual antiplatelet therapy had syncope and fell from standing at work; he has a posterior scalp laceration and possible loss of consciousness. We arrive at the trauma bay and don PPE. Once EMS arrives with the patient, the primary survey begins. I watch as the team asks John his name and learn that he has type II diabetes mellitus--that he had not eaten since last night because he almost missed the bus this morning, and breakfast wasn't an option. John is in a cervical collar, calmly answering questions while staring at the ceiling. His clothes are being cut off and physicians report findings while nurses secure peripheral IV access and take vitals. I get a warm blanket to make up for the layers of clothes he loses in the assessment. A normal head CT scan rules out hematoma; he is then returned to the trauma bay while providers finish documentation. Until this moment, I have been a peripheral observer of this patient encounter. Now that he is deemed stable, it's just John and me. I crane my face into his field of vision, saying, "Hi John. My name is Aida, and I'm a medical student. How are you doing?" John replies, "Hi," as his eyes form tears. His voice cracks, "God, how did I end up here today?" This moment embodies my most valuable clinical lesson to date--that as a physician, I will see some of my patients on their worst days. And when the dust settles, it will be within my power to provide comfort once John has a moment to realize that skipping breakfast wasn't the only thing that went wrong today. I take a breath, and then gently rest my hand on his shoulder, "I'm so sorry. What can I do for you? Who can I call for you?"

Alaina Turchi

An important lesson that I have learned is that patients are people who often need patience, especially from their medical team. I had one of my most impactful experiences during my pediatric clerkship. My patient had cystic fibrosis, which would land him in the hospital multiple times a year. One of the most important aspects of humanism that I learned did not come from understanding the challenges of low SES status, social barriers, or adolescent health, but from challenges in maintaining healthy relationships, especially the parent-child relationship.

Through my conversations with my patient's mother, I learned that she struggled deeply with how to be a parent/rule enforcer because it resulted in not always being well-liked and received by her child. This ultimately was the root of many pediatric hospital stays as she did not like enforcing medication adherence. Instead, she opted for what she believed was giving her son independence, by allowing him to be in charge of his medications. Giving her 12-year-old son the burden of organizing and administering his many medications not only led to hospitalizations but also extreme stress on his part. Due to the many hospitalizations, and CF exacerbations, our patient was not frequently attending school and had difficulty making friends as he was rarely present. This further intensified his mom's pressure to be a friend. They are the only two members of their household, and she feared of becoming estranged as many other family members had. I can recall her telling me that she felt as if her time with her child was limited and she didn't want to taint what little time she perceived she had with enforcing rules. I learned that something that our team had once perceived as irresponsible parenting, now had deeper meaning and created a further understanding of the emotional struggle this family faced.

Alejandro Enrique Bolivar Gorrin

During my Ophthalmology rotation, I saw a patient with a herpes zoster infection on her eye. She could not see anything on that side and was in an immense amount of pain due to the infection. She had also been diagnosed with end-stage bladder cancer and was given less than a year to live. Even though there was not much we could do for her vision, my attending decided to perform a small surgery so she could at least be comfortable during her last months of life. During pre-op, while my attending was signing paperwork, I approached the patient to ask how she was feeling. She said that she had been suffering enough and she did not want to suffer anymore. She told me how lonely she was and her fears of dying alone. I held her hand and listened. I told her that our goal was to make her as comfortable as possible and that she was in the best hands. While shedding a tear, she simply nodded and closed her eyes, squeezing my hand tighter. Once the surgery was over, I went back to check on her. After a quick post-op assessment, I asked what her plans were once discharged. She responded that she was just going to go home and watch TV. We chatted for a while about our favorite TV shows, bonding over our love for Jeopardy. Before I left, she held my hand and said, "thank you for being here with me." That statement absolutely broke my heart. I could feel her pain and, at the same time, her gratitude. As a medical student, I did little to help her in terms of the actual procedure, yet I was able to make an impact in other ways.

She reminded me why I decided to pursue medicine. The relationships and connections that are made through medicine are incredibly meaningful and everlasting. Sometimes the best medicine is given via sitting in a chair and listening quietly to the patient. The results of therapeutic interventions will vary, but our efforts and compassion are what patients remember the most.

Annie Stenftenagel

It's hard to be in 8th grade and still wet the bed. It's frustrating when you feel like you have tried everything-- water restriction, bed alarm, bladder training, etc-- and nothing seems to help. And then, a solution. A simple procedure, one the surgeon has performed hundreds, if not thousands of times. About a week of ice cream, applesauce, and rest and "voila!" problem solved. Of course they tell you about the complications, a laundry list raddled off with the assuring, "__side effect___ is very rare. I don't anticipate any of these issues with __patient name__." It's also natural as a parent to blame yourself with something goes wrong. "He didn't want the procedure..." she said, feeling as though her decision to proceed made her automatically guilty for the rare complication that followed. He's a typical 13-year-old, into football and video games. He is no longer a typical 13-year-old. Typical 13-year-olds don't have strokes. T has barely spoken since his surgery, first because of the pain and now likely because of the trauma. His mother hasn't left his side. T's post op pain led to dehydration, and the dehydration led to a cerebral sinus thrombosis, and the thrombus led to a large stroke. It's a nightmare situation for any parent, but Mom has remained strong and has been his advocate and voice throughout this scary time. At home she also has two other daughters who are unable to be with their brother due to the visitation restrictions. T is recovering, and Mom has begun looking to the future and has done perhaps the hardest part, asking for help. "What will be his new normal?", "Where do we go from here?", "I thought I would be able to afford Christmas gifts this year". There are a lot of unknowns for T and his mom right now, but they are learning to take life one day, one step, at a time.

Colton Junod

This patient story was an experience I had during my trauma surgery rotation at a community hospital. A young patient was brought in by EMS for a self-inflicted gunshot wound. The patient was found by their parents who quickly called for help. When EMS arrived with the patient, everyone in the resuscitation room knew the outcome was going to be very grim; however, everyone still sprung into action. After some interventions were performed, the parents quickly informed us that their child would want their organs donated. As a student, I was a little shocked they had already realized how unlikely a positive outcome would be without the medical team explaining the gravity of the situation to them. The patient was stabilized and transferred to the ICU.

While in the ICU, I had the extraordinary opportunity to be present for some of the most powerful and meaningful conversations. The parents, nurse, and physician all talked about the child's prognosis and the organ donation process. This was extremely emotional not only for the parents, but also the nurse and physician who had children around the same age as the patient. This interaction was the first time that I can recall seeing the medical team's emotions be a part of a patient case. Usually in medicine we attempt to be stoic and hide our emotions from the patient. However, in this case I could really feel that the patient's parents appreciated the involvement of the nurse and physician's emotional connection to their situation. It made the conversation meaningful and powerful during this tragic time.

I feel very fortunate to have witnessed this case and interaction because it is something I would have never learned from reading a textbook or during an OSCE. In the future I will be more apt to show emotion, empathy, and humanity during an unfortunate situation as the one I described. The humanism and love displayed by the medical team in this case will be something I never forget throughout the rest of my medical journey.

David Huston

"Douchebag."

Trailing behind, head bent and scribing away as I pushed a WOW down an ED hallway back to the bullpen, my doctor decreed what he made of a 22-year-old man with infective endocarditis and a homemade swastika tattoo on his thigh. At the moment I completely agreed, though I lacked the confidence to say it aloud.

His personal judgement didn't make it into my transcription, but I got the feeling the doctor's disdain had been communicated to the patient nonetheless. I often think back to this young guy. He had skipped his scheduled valve repair surgery. His blood pressure was high. His vegetations were large. He was frail. His UDS was nearly pan-positive. He had just jumped out of a second story window to evade someone. He was eating a large bag of Lay's. He was a mess.

However horrible his hate, however pathetic his situation, however little regard he had for himself and others, he was and is a child of God. A person worthy of respect, regardless of how little he dished it out. He needed compassion, not contempt. Help, not disregard. He had been and probably would be noncompliant with care. Results matter. But so does the way we get there. Life isn't just a destination, especially for someone with such a bumpy road.

It's often too easy to think down on others. It makes us feel superior. Makes us feel the power that comes with the judgment of deciding who is and isn't worthy of our compassion. It becomes a talking point, a source of superficial bonding with coworkers, creating an us-vs-them group mentality. Falling into this trap challenges our ideals, ultimately bringing us down too, taking the joy out of service.

I learned that it isn't always easy to be compassionate. I'm ashamed to admit, but for this patient and others, it takes effortful introspection to check my worst gut knee-jerk reflexes. Mindfulness to make the conscious decision to hang onto humility. And intentionality to connect and try to serve patients as best I can where they are, especially when they are tough to love.

Emma Eckrote

I have been incredibly fortunate to meet kind patients and devoted families on the wards. My most meaningful experiences came from my time with a bright and smiling first grader. She was a curious, outgoing girl hospitalized for a facial abscess. Her day of admission was my first day on the rotation, and we became fast pals. By day two of her stay, she was bored. No amount of art or music therapy could keep her entertained! I fell into the habit of popping up to her room for a few games of UNO each day after I finished my notes. I enjoyed listening to her tales of her siblings, parents, friends at school, and her imaginary pet dog, named Ivan, while she played Draw 4 card after Draw 4. She told me of her dreams to be an artist, or a ninja, or maybe a teacher, or possibly all three. Her mom always welcomed me in the afternoon too, and we spoke at length about her other 2 children at home, her close-knit Burmese family, and her concerns with the financial stressors of the 8-day hospital stay. I felt incredibly fortunate to be welcomed into their space each afternoon, invited into their lives, and trusted with such sensitive and important topics. At the end of her stay, I was gifted a colorful and elaborately folded Thank You drawing of the two of us playing Uno. Her mom thanked me for my time and willingness to get to know them as they were outside of the hospital, not just as a sick child and a worried mother. I keep this drawing framed on my desk as a reminder each evening as I study. The connections we make with our patients can be so meaningful if we take the time to know the person, rather than just the ailment. I now strive to know all my patients a bit better, taking time to ask about their families and hobbies and values, working to form a relationship beyond their diagnoses- taking time to treat the person.

Emma Ross

I never knew my first patient's name, never took her history, never saw her alive. I met her on the first day of anatomy lab during first year. In April of that year my best friend passed suddenly from hypertrophic cardiomyopathy. Four years earlier, my sister passed in a tragic car accident. I knew death way too well. I'd like to say I was strong. I wasn't.

I remember uncovering my patient for the first time, hands shaking, tears in my eyes. When I uncovered her, I was surprised to see how beautiful she was. She was only 40 and had died of metastatic breast cancer. I struggled all semester, picturing her as someone's best friend or sister, imagined others doing to my passed loved ones' bodies what I was expected to do to hers. I knew she chose this, but it didn't feel right. I had panic attacks every day.

After the memorial ceremony we had for the donors and their families, I was chatting with some classmates. A woman approached us; she asked if we knew who had her dad. She was proud of her father's sacrifice and wanted to know what we had learned from his body. That moment touched me deeply. Although this wasn't my patient's family, I like to think they were in that room with me that day. I know her family was proud of her sacrifice too, and grateful that the knowledge gained from her body would live on in the minds of future physicians. My time in anatomy lab inspired me to treat each patient with the utmost respect and admiration, showed me how beautifully complex and special the human body is, and fostered within me an even deeper love for medicine. I'm inspired by my patient's truly selfless act to give her body to the education of others. I will never stop trying to pay it forward as I work to heal all of my current and future patients.

Eric Aksu

At the Student Outreach Clinic, it is easy to despair at the long list of challenges facing any given patient. Mr. Cory (name has been changed) is one such patient. Mr. Cory often comes into the clinic intoxicated after having spent one or several nights sleeping in the open air. He receives medications and care at the clinic for several chronic conditions, though it is sometimes unclear to what extent the care we give is improving his wellbeing. Frequently, months will pass without seeing him until he comes for treatment of wounds or an infection that he incurred in his difficult day-to-day life. One of the first times I witnessed his care at the clinic, he was having a corn excised by one of the clinic team working that day. I can remember him moaning and crying out while the provider did their work slowly and carefully. After his feet were washed and bandaged, he put on a pair of dry socks, slipped into his broken shoes, tearfully thanked the person who had treated him, and was on his way. The provider addressed him attentively and put his hand on his shoulder as they spoke.

It is important, in my mind, to approach patient care with humility. Our patients spend most of their lives away from our care. Our power as individuals to affect their fortunes can be quite small. We can't neglect the important work of improving the world we and our patients live in; evidence has shown that time and resources spent in this regard can have a much larger effect than many of the things we attempt within the walls of clinics or hospitals. At the same time, in our short moments together, the care and attention we can give to our patients, even if it only addresses one small issue in a long list, can make a real difference in their existence. It is a real privilege to be invited by those we care for to serve in these small moments.

Ian Oechsle

During my first week of Psychiatry, I took a history for a new admit: a 36 year-old male with paranoid schizophrenia who was found wandering the streets of South Bend. I approached as he paced in the corner of the foyer and asked him to come speak with me. His speech was 50% incomprehensible and he would frequently become agitated from my clarifying questions. This began the journey of trying to decipher this man's life and parse out fact from fiction. But I persisted and spent three separate mornings with him. The social worker had informed me that this man was institutionalized after 6 years at state hospital and delusional--fixated on the belief that everyone wanted to "put him to sleep" and that nothing useful could come from his interview. Perhaps it is my youthful ignorance that pushes me to deny such a statement, but I entered the conversation cautious yet hopeful to understand who he was.

Our conversation seemed to go in circles for hours as I tried to get a sense of his past and overall perception of the world. He complained incessantly about "how useless" it was to talk about his life and how I could never help, but every time I would look at him square in the face and tell him, "in this moment I care for you because your life matters and you are unique as we all are." I often replay the conversation in my head because it is tough for me to never know whether anything I said was internalized. However, I vividly recall the look he gave me when I stretched out my hand to shake his--as though this small gesture was the first kindness he had received in his life, and his entire expression shifted for that moment. The lesson for me was simple but painfully important: no matter the popular opinion, the time, the situation, or the history, there is always an opportunity for a meaningful encounter with another in which there is a shared reminder of the unequivocal sacredness of human life.

Kate Harris

One morning on rounds with the cardiac surgery team, we visited Mr. M, who had just undergone his second open-heart surgery in the past decade. He had traveled from a different state and tearfully told the team he was feeling quite overwhelmed without his family here. The attending offered brief words of encouragement, but we quickly moved on to the next patient. I looked back at Mr. M – alone, his head hanging low. I felt for him. I glanced at his name on the list and thought, 'With a name like this, he has to be German.' I studied German in school, so I was attuned to German names. I vowed I would dust off my second language and visit him after rounds.

When rounds concluded, I went to his room and introduced myself. I told him I had taken German in school and could not help but notice his name. "Are you German, by chance?" I asked. His eyes suddenly brightened, and a large grin stretched across his face as he nodded. He proceeded to tell me he had been born in a small town in Germany but moved to the US when he was a young boy. He spoke about trips he had taken to visit family still living there. I shared that I had lived in Nuremberg for a month. We bantered in German and chuckled when the nurse gave us a confused look. Mr. M's demeanor had completely changed. And each morning thereafter, he would always greet me with a big smile and a "Guten Morgen," and share another memory or picture from Germany.

My interaction with Mr. M emphasized the importance of reaching out to patients, especially when they are feeling alone. A single conversation about life or travels can be enough to transport a patient's mind to a happier place. Taking a moment to visit with a patient can be enough to help them relax, smile, and feel less alone.

Luke Richardson

Mr. P was a patient of mine for the last week of my Psychiatry rotation at the VA. He was transferred here after his neighbor who helped out at home had noticed that Mr. P had become quite a bit more forgetful and paranoid in recent weeks. On his first day, he seemed hazy, confused, and unable to give much detail about what had been going on. He was very apologetic, thinking he had done something wrong and was in prison. We thought over the course of a few days he might regain some clarity and be able to tell us more.

He never did. Each day was like starting again, reacquainting myself with Mr. P and he with me, always very glad to have a new face to talk to. I noticed through our meandering conversations, however, that I began to understand Mr. P in a deeper, unarticulated way. He had an essence that had remained untouched - this was a good, kind man. When his thoughts fell out of order, he always anchored back to

the two things he loved most – his son's family and his dogs. He was always thankful, even when he wasn't sure what for. I looked forward to meeting him again each day.

Mr. P eventually left to live with his son's family while they looked for long-term care. I still think about Mr. P, and how, despite having lost so much of what he may have thought of as "himself", the truly valuable parts of his character remained intact. As a physician, husband, father, and friend, it is unlikely that I will be able to control much of the course my life will take. I may, like Mr. P., forget much about my life and the things I've done. However, I can choose kindness, patience, and compassion on a daily basis to cultivate a legacy that will outlast anything else I may achieve. Knowing Mr. P inspires me to remember that the things I do are of little value if they are not done in love.

Maria Khan

I once had a patient with a brain tumor that resulted in hypopituitarism. Her father was a single parent and felt that the mom's home was not a safe environment for his daughter. Because he worked contract jobs, he was not able to get FMLA when his daughter was admitted for days/weeks, resulting in him repeatedly losing his job. Because of his precarious financial situation, our teams had consulted social work who then called DCS. This process frustrated the dad a lot, who felt like when he "reached out for help" he was instead trapped and "almost had his daughter taken away." On the other side, the healthcare team was extremely distrustful of the father outside the room—they felt he was not recognizing the severity of his daughter's disease, not prioritizing his daughter's sickness, and not working with the team. However, in my time with this family, it was evident that the dad loved and took care of his daughter. Because of electrolyte abnormalities are difficult to comprehend and not immediately symptomatic, he was not always able to recognize when she was very sick and did not have access to transportation to readily bring her to the hospital.

As a medical student witnessing both sides of this, I learned how important it is to step into the family's shoes and understand the way medical process can appear to them. As physicians, it will be easy to assume that our priorities are paramount: the most evidence based treatment plan for our patient is the most important next step. But a patient/family who does not agree or fully understand our perception is not immediately an irresponsible parent or noncompliant; it is likely their complex lives outside hospital walls that make their priority list very different.

For this family, abnormal electrolytes can be a life-threatening emergency that is corrected with hospitalization. However, to provide long-term compassionate care, we must partner with the family and build mutual trust by understanding their unique life perspective and priorities. Only then can we bridge our priorities together to care for the patient's health and overall well being comprehensively.

McKenzie Barber

Walking into our patient's room on the labor and delivery floor behind my chief resident, I was holding my breath. We were going to talk to our patient and her partner about her induction of labor, which is usually an exciting discussion about how soon the parents will be meeting their new baby. In this case, our patient was being induced at 20 weeks after her anatomy ultrasound revealed her fetus had anencephaly. During my one week of labor and delivery, three of our patients gave birth to babies with anencephaly and each discussion was as heartbreaking as the last. Instead of nervous smiles on the faces of these patients and their partners, there were only downcast eyes and grief-stricken tears. There were many days during my OB/GYN rotation when I questioned if I would be strong enough to pursue a career filled with such difficult situations or if I would be able to compartmentalize the grief of one patient in order to celebrate with the next. However, as the week progressed, it became clear that great physicians are not those who separate themselves from their patients' hardships, rather they are the physicians who sit beside their patients during their most difficult days and feel privileged to do so.

As busy as our service was that week, my chief resident sat with each patient and allowed them as much time as they needed to express their feelings and ask questions. Throughout each delivery, she ensured they were always comfortable with the plan and felt like they were making the right decisions for their family.

Not only was this empathy and grace offered to our patients, it was also afforded to each team member assisting in the deliveries. We were each encouraged to take opportunities to care for our own mental wellbeing and process our own feelings about these deliveries. My chief resident truly emulated the type of physician leader I hope to become. As I look forward to a career in OB/GYN, I will strive to approach each patient and team member with the same empathy that was afforded to me.

Michael Harding

In November, I was working with the Palliative Care team at the VA hospital, COVID-19 cases were peaking, and strict visitation policies were weighing heavily on both families and providers alike. The Palliative Care team had discussed how the situation was providing additional barriers to care as numerous facilities were denying new patients and family visitation in the final days of a patient's life were being severely reduced. These experiences provided emotional strain and left all involved with too few choices at such a vulnerable time. The team would spend additional time working to coordinate with social work and sometimes using software on their own phone to videocall with patient's loved ones while in the patient's room. It struck me as an added component of patient care that I hadn't seen with such emphasis. They provided time for the patient and their family to visit for a bit before also discussing the patient's status. I learned how important it is for patients to have access to their social support, especially for those approaching the end of their life. This pandemic has highlighted the importance of social support circles and human interaction. I better understood the power of time spent in patient encounters. I was able to incorporate this in my subsequent clinical rotations where I could round on my patients and make sure to ask if they had been able to communicate and call their family since visitation was limited. I would work on arranging time for virtual visitation and socialization if they were unable to do so themselves. I hope to incorporate this practice into my future medical career. The patients were always grateful, and I learned a more holistic view of patient care and needs. I believe this approach to bedside doctoring emphasizes the multifaceted dimensions of patient health and provides a deeper bond with the patient and more opportunities to listen.

Mikayla Burrell

The most impactful experience to my development as a future physician thus far has been the month I spent on the heme-onc inpatient service. These patients helped me grow to further appreciate the undeniable value of taking the time to get to know each patient and their hopes, goals, and fears. I learned these lessons through the stark contrast between two different physicians (who I will refer to as Dr. A and Dr. B) and their treatment of the same patients.

During rounds with Dr. A, the entire team filed into the rooms of every single patient, and everyone sat down. We asked each patient, "What's on your mind today?" and "What are you worried about?" I learned more about what was happening with each patient, both medically and emotionally, during this time than I ever had before during rounds.

Dr. B treated his rounds very differently, which is best exemplified through a particular patient interaction. The team had just learned that this patient had an aggressive form of leukemia. Dr. B proceeded to walk into the room, stood behind the patient with his stethoscope ear tips already plugging both ears, placed the diaphragm on the patient's back, and said to the patient, "You have leukemia, and you start chemo today." Dr. B then turned around and walked out of the room, without so much as a glance into the eyes of the patient. This

"breaking of bad news" was gut-wrenching. The fear in the patient's eyes was unmistakable and one that I will never forget.

While this question is asking about a specific patient, I feel that my most authentic answer lies in the comparison of my patient interactions between these two physicians. I vowed to myself and my future patients that I would strive to be more like Dr. A. I decided that I would always take the time to sit down, look into the eyes of my patients, and honestly listen to them while providing any care— whether that be delivering bad news, discussing a complicated treatment regimen, or simply asking what is on their minds.

Natalie Campbell

I had the opportunity to take care of a 78-year-old female presenting with a "bump on [her] pelvic area that has been growing for quite some time" while rotating in a GYN clinic. I could sense right away she seemed emotional, so instead of running through my illness script, I asked how she was feeling in that moment. She took a second, sniffled, and started explaining that she was embarrassed for not getting her condition checked out sooner, as it was something she had been putting off for years. I could tell this was really weighing on her, so I told her that she should not be embarrassed for waiting, instead she should be proud that she was brave enough to come to this appointment. I told her she took the first step in showing up to the appointment, and together we can take the next steps in figuring out what is going on and how to manage it. She smiled at me and said that she would like that very much.

Through this interaction, I learned how important it is to listen to the patient, not just hear what they have to say, but take the time to learn what their concerns are beyond their medical condition. From my clinical experience thus far, I have realized that sometimes all a patient needs is someone to listen to them and empathize with their story. A patient being heard by a provider can sometimes be more valuable than a quick diagnosis and treatment plan. Reflecting on this experience, I now see that the art of medicine is not only applicable to management of medical conditions, but also the art of interpersonal skills to address human needs as well.

Sara Garcia-Dehbozorgi

It was my first week of inpatient medicine at the VA when I met Anne. Prior to meeting her, I read through notes to gain a better understanding of her social history and barriers to care. In her chart, she was identified as a male veteran who had a chronic history of loss to follow-up due to social and economic factors. I began to notice the discrepancies in language when others were referring to Anne; some documented her name as Anne while others used her legal name with the pronouns "he, him, his".

Upon entering her room, I was greeted by someone who was very skeptical of my presence and seemed hesitant to speak with me. After introducing myself, I asked her name and gender pronouns. Her face showed an immediate sense of relief when she heard those words. She then relaxed her posture and began to share her story. Her previous notes described a patient who was difficult to work with and who often rejected physician recommendations. When my team met with her, this was clearly a patient who lacked an ally in the healthcare field. Every morning I learned more about her and she shared fond memories of cooking as a chef in the army as well as the difficult memories of her history of domestic and verbal abuse from her ex-partner and father.

Anne shared with me the struggles she has faced as a member of the LGBTQ+ community with securing jobs and social support free of judgment. It was clear that her sexual and gender identity had affected her ability to properly address her healthcare needs. This patient experience highlights the importance of valuing a patient's identity when handling their care. By valuing a patient's identity and gaining their trust, a better relationship is made between physician and patient. To properly address the needs of the LGBTQ+ community and other underserved populations, we as leaders in the healthcare community need to advocate for our patients and it can start with a change as simple as valuing a patient's true identity.

Sarah Swiezy

My first week at Riley, we had three admissions for new-onset Type 1 Diabetes (T1DM). These kiddos get a standard two days of intensive diabetes classes. All three were 8-12yo, Caucasian, and had both mom and dad actively present.

My second week, I got an admission for T1DM. This kiddo was 11yo, Hispanic, and only mom was present at bedside. When I met them, mom and daughter were speaking English. I explained the plan for their stay and sent them to class with the diabetes educator.

Later, the educator called to express concerns. During class, mom politely refused to do insulin calculations; daughter was doing okay but would need support. Dad never showed for education. Mom left the hospital as soon as class was over, and did not plan to return until tomorrow morning, meaning she would miss practicing insulin calculations during lunch and dinner. We both felt frustrated: why don't these parents care about their daughters' lifelong diagnosis?

The next (last) day of education, still no dad. Mom again refused to do insulin math, and daughter was getting visibly frustrated. As a last effort to explain the importance of the in hospital education, I brought my Spanish-speaking colleague with me. As soon as he started speaking in Spanish, mom broke down. She was overwhelmed. English is not her first language, and she's never done math in English. She didn't want to bother us by asking for an interpreter. Dad works six days a week and his off-day is Sunday. Mom has five other young children and can't leave them alone for long.

Thankfully, it was lunch time; we stayed to help—in Spanish—with insulin calculations for the meal. Mom caught on immediately and did dinner calculations totally independently. We extended their stay one more day, until Sunday, so dad could also learn. When the family left, they were just—if not more—competent than any other family.

I learned 1) never assume someone else's situation, language preference, emotions, or capability and 2) leaning in to implicit biases without the whole story always leads to inadequate and insensitive patient care.

Sean Buehler

I had the privilege to help treat several of our clients from the Shalom Community Center while on clinical rotations, and each one further reinforces my belief that a physician who is involved in the community is better ready to serve the needs of their patients. One patient in particular, M, was a longtime guest of our day shelter who was admitted for severe cellulitis and sepsis. She became very ill and not able to communicate and was transferred to hospice where she passed peacefully. It rocked me to hear news of her passing, especially after she had just obtained housing for the first time. For years, she was treated poorly by practitioners because she was seen as a "frequent flyer" for her alcoholism. Apparently, she had been dealing with her infection for some time but had foregone a visit to the hospital because "no one ever helps (her) there" It pains me to think that had she received more compassionate care throughout the years, she may have caught her infection sooner and avoided an untimely death.

Her Husband, J, was also a longstanding member of our unhoused community – known and loved by many. He was unable to see M before her passing due to a short stint in prison, and it tore his heart apart. He was well-known to providers at the hospital and especially in the ED. On Christmas Eve of 2020, he was found dead on a park bench not two blocks from the hospital, frozen to death. According the reports, police officers performed a subpar well check on him that morning, overlooking obvious signs of hypothermia because J denied help, stating that he "gets treated bad at the ER". I was working a shift in the ED the day he passed, and overhead staff cracking jokes about his passing, like whether or not he and M were "in heaven or hell."

These experiences showed me that we need a revolution of compassion in medicine. We cannot understand the struggles of every

patient, and we need to treat everyone like we would our own family.

Shannon Jager

I don't know if he could see me. I don't know if he ever saw the goofy grimaces that I made to try to make him laugh, with his head nestled safely in the crook of my arm. Physiologically, I knew the odds were poor: his ammonia levels, severely elevated due to an uncontrolled metabolic disorder, had caused catastrophic cerebral edema and atrophied any cortical tissue that could process vision. I followed Oliver's case for three weeks during my time with the inpatient developmental pediatrics team. Someone had left him outside of a fire station after his birth, and he had spent the majority of his three-month lifetime in the hospital. He didn't have any visitors, so I made sure to spend my free moments with him: holding him and singing little songs to him. Every time he was ready to be discharged, his ammonia levels would spike, and he would have to stay. The team joked that he'd grown attached to me and didn't want to leave the hospital while I was there.

On November 16, I entered the inpatient team room at 6:45AM, like I always did. A resident, already seated in front of a computer, looked at me with kind eyes: "Oliver passed last night." I froze – the rest of the day passed within a hazy, drowning fog. Only once I was seated in the solitude of my car did fragmented sobs tumble forth, and I felt the heavy, visceral ache of loss. I called my best friend and attempted to articulate my thoughts. I was horrified by what little we had done for him, even though I knew there was nothing else medically that could have helped him. "You loved him, Shannon. You showed him love every day. That is not nothing."

Oliver taught me a profound lesson. Patients for whom nothing can be done medically can be easy to remove from the ever-lengthy to-do list. My experience with Oliver taught me that there is never 'nothing' to be done – you can always show love. You always have the opportunity to offer kind words, to sit in silence with someone who is grieving, or listen to those who are struggling. Oliver taught me that even when my medical knowledge cannot cure, my job is not over: I can always offer my compassion.
*Names have been changed for privacy

Taylor Zike

While rounding at Riley, I met a dreary young boy with a recent brain tumor resection. Seeing his despair, I got down to his level, introduced myself, and asked what he wanted to be when he grew up. With his innocent stare and gentle voice, he responded, "A scientist." After hearing this, I told him that I'd have an exciting scientific experiment for him the next day and that I'd be his scientific assistant. This is when I saw him smile for the first time, as he said, "cool," and gave me a fist bump.

That night, after having him choose a few experiments on Sciencebob.com, I scrambled to gather the scientific ingredients. The next day, I couldn't help but grin from ear-to-ear as I approached him with our ingredients. He was bopping up-and-down from his wheelchair, yelling, "My assistant is here with our experiments!" While incorporating the experiments into his Physical Therapy, having him stand and maintain balance when pouring/mixing ingredients, his joy and excitement were contagious. After the experiments, I asked him if he'd be interested in doing a "Science Show" for the whole team, including his family, and fellow Riley heroes. He ecstatically replied, "Yes, but I will need my assistant!" His response melted my heart, and I told him that I wouldn't miss it for the world.

Over the next few days, we prepared by performing as many experiments as we could manage and were even nicknamed: "The Mad Scientist" and "Lovely Assistant." His will-power, work ethic, and joy were truly inspirational and led to the most spectacular "Science Show" that I'll ever be a part of. Our team had so much fun. Witnessing his dramatic improvement and his pure joy, allowed for a life changing and unforgettable experience, while confirming my passion for medicine.

On his last day, after a surprise "VIP Science Show" by Rick Crosslin, it was time to say goodbye to my PIC (Partner In Creativity). I had to fight the tears, because I knew I was going to miss my little hero. To my relief, as he gave me one last big hug, he reassured me that he would be back to visit Riley one day and that he would need his assistant when he did.

Tianna Vander Missen

It was day 3 of his hospital admission for severe infection of a peritoneal dialysis site and he was faced with news that he would transition to outpatient hemodialysis. His care included more than five teams and he was utterly overwhelmed. Between the renal, infectious disease, internal medicine and other teams each telling him different plans, I could barely keep track of his care, let alone a very ill patient. To him, it felt like each team was operating on their own terms without a cohesive plan. One morning, during my pre-rounding, I sat in his room and just listened. He had many concerns and felt like he could not make decisions about his care; I answered as many questions as he had. By the end of the conversation, you could see the gratitude in his eyes. He told me "I feel like no one is keeping me in the loop". After hearing that, I did my best to ensure he was "in the loop."

As the medical student on his internal medicine team, I was in a unique position because I had more time than other staff and could coordinate with all teams. As each team made changes to his care, I made sure to relay him updates face-to-face, even if it meant taking several flights of stairs. After many encounters, he began to take control of his care, making decisions he could not possibly have made before. One day, I swung open his door and he jovially said "what good news do you have for me? You're the good news girl". I could not help but smile.

During his operation, I called his family to update them. They knew about my role in his care and thanked me for turning him into the captain of his stay. In these moments, I realized the importance of remembering the human behind the notes. These are not clinical vignettes we treat, but patients with fears, hopes, families, and the desire to be cared for. The care our patients receive completely transforms when we take time to meet our patients as humans.

Anonymous 1

Before I met CD, the physical exam was my awkward pre-rounding ritual; early in my third year, I was just finding my flow examining from head to toe. CD was a young man who was incarcerated and had active tuberculosis. He was thought to have new bacterial endocarditis likely transmitted through IV heroin use. CD was my first patient who was incarcerated and the first requiring me to don the omnipresent yellow gown and N95. I was only becoming accustomed to seeing patients in their hospital beds, so seeing his ankles in silver cuffs attached to the bed was admittedly disturbing. Left without my trusted MDCalc, I remembered that bacterial endocarditis could present with Roth spots, Janeway lesions, Osler nodes. But that was the textbook, not the man in front of me. CD was clearly uncomfortable: diaphoretic, feverish, unable to move his ankles, with goosebumps and dilated pupils as the first signs of withdrawal, repeating that he wanted to leave the hospital. After interviewing him, I started my head-to-toe ritual. As I examined his bare feet immobilized by cuffs, I palpated each toe one-by-one searching for the textbook signs. At his left fourth toe, CD withdrew in pain. I felt foolish sharing this finding on rounds, but my intern, senior resident, and attending all paused when I said this. I was only one to examine his left fourth toe that day. One day and MRI later, and my attending shared that I had caught osteomyelitis at an early stage, potentially sparing CD significant morbidity on top of his preexisting infections. This interaction prompted me to reflect on how the sanctity of the physical exam, as old school as it gets, should never be lost – especially for a patient subjected to multiple levels of societal stigma in being incarcerated, having a substance use disorder and an airborne infection, as well as being a person of color. CD was not a case in a textbook; he was a man who deserved equitable care from

which I am grateful to have learned a lesson in the earliest days of my career.

Anonymous 2

A recent interaction taught me an important lesson regarding a health care provider's role. I was working with a cardiologist and went to see a patient who is being treated for alcohol-induced cardiomyopathy. He is maximized on all heart failure medical therapy with only minimal improvement in his ejection fraction and symptoms. He continues to drink heavily and was adamant that he did not have intentions on stopping, even if alcohol-related complications ultimately ended his life.

Initially, I was struck by this and began thinking about how I could convince him that alcohol cessation would improve his life and his overall health. However, instead of jumping to that process, I chose to explore what his barriers to quitting were. He has chronic back pain and said that a few beers helped "calm his nerves." He also said "it's just a habit I'm not willing to give up." We discussed alternative options to manage his pain, reviewed the negative effects of alcohol on his health, the benefits of alcohol cessation, and programs available to help, but his mind remained unchanged. As a result, the conversation shifted from alcohol cessation to how we can best support him given his decision to continue drinking.

This support, of course includes sharing our medical expertise and recommendations, but also being understanding of the patients' circumstances, respecting their decisions, and not letting that interfere with your compassion towards them. I think in medicine, we tend to conceptualize healing as identifying problems (disease) and fixing them (treatment) to return to an ideal state of health. While this is an important part of what health care providers do, this patient reminded me that the provider's role is not limited to sharing knowledge and making recommendations. We also have the opportunity to be an ally for the patient through listening. In seeking to understand our patients better, we provide them with better care. As a physician, not only do we heal by caring for the patient, but also by caring about the patient.

Anonymous 3

When I was on service for pediatric plastic surgery, we had a teenage patient who had been through significant trauma from a car accident leading to multiple surgeries and lifelong debilitating injuries. The plastic surgery attending I was with was assessing her hand nerve injury. Instead of starting the conversation with talking about the patient's hand, he said to her "You have been going through a lot lately. How have you been doing with everything?" I could instantly see the patient's body language relax and she opened up to him about struggling with her injuries and rehabilitation. Although this had very little to directly deal with why she needed his services, the physician valued his patient enough to give her the time and space to discuss how she was feeling.

This was my first rotation and really shaped how I approach patients. During multiple rotations, I often would ask how people were doing with the COVID-19 pandemic and attempt to normalize struggling by conveying that many people are struggling during this difficult time. I have had multiple patients since then open up to me about what they are struggling with and can often deliver better care because of this. There are too many times in medicine that we cannot actually fix what ails our patients. However, we can often give them our time and always show kindness. Humanizing someone in dehumanizing times is the most important part of being a physician.

Anonymous 4

During my internal medicine rotation, we had a patient who was recently diagnosed with end-stage heart failure. Most of their last several months were spent in and out of hospitals, and the patient was struggling to perform many activities of daily living. Despite several weeks of medical management, nothing seemed to improve the patient's condition enough to allow for discharge home, and unfortunately, they did not qualify for a heart transplant. Although the patient understood the severity of their condition, they grew more and more frustrated at the fact that we would not discharge them home, and they also did not want to begin palliative measures.

It was not until we had a long discussion about the patient's goals that we were finally able to develop a plan to safely discharge the patient to palliative care. What was most important to the patient was spending time with family, and during the COVID-19 pandemic, no visitors were permitted in the hospital. Upon questioning the patient about their initial hesitation to begin palliative measures, they expressed worry that palliative care was simply comfort care during passing. We were able to counsel the patient that palliative care was in place to help them achieve their goals, such as seeing family, while still providing the maximum medical treatment to reduce their discomfort and lengthen the remainder of their life.

I am a little disappointed that I didn't try and have this conversation with the patient sooner. Even though I have been told throughout my medical education to establish a goal-directed partnership with patients, when it came to treating a patient in real practice, my excitement to be a part of the care team caused me to overlook this critical conversation. As I move forward, I hope to have these conversations regularly with patients. Starting conversations by focusing on non-negotiable items is a great way to begin understanding what motivates a patient, and I hope it will help me focus my care in a way that empowers them to achieve their goals and live a fulfilling remainder of their lives.

Anonymous 5

On my IM rotation, I was assigned a patient admitted for osteomyelitis, and as a medical student, one of my jobs was to call and update my patient's family every afternoon. For this patient, communication with his wife, Jo, was especially important because he had aphasia from a prior stroke. The first few days I called her, she was upset she wasn't allowed to visit because of COVID and did not like our treatment plans. She would scream at me, hang up on me, and question our decision making. She called every department in the hospital multiple times per day, and she was quickly labeled a difficult family member. Admittedly, I too, was frustrated with her after that first week, and I dreaded those phone calls. That weekend, I reflected on the situation, and I realized that her concerns truly were valid. She has been the primary caretaker for her husband since his stroke fifteen years ago. She knows how he communicates and knows when he is in pain. And now due to COVID, her husband is left ill with caregivers that just met him days ago, and her only communication with him and his physicians is through me each afternoon. I spent more time each day learning their story, listening to her concerns, and setting up a time each day for her and her husband to facetime. I built a relationship with Jo over the next week, and I advocated for them. As medical students, we have limitations when it comes to making treatment plans or putting in orders. But on that rotation, I became a better future physician. My relationship with that patient and Jo reminded me that while at first that phone call every afternoon seemed like a task assigned to me, to Jo it was the only thing connecting her to the updates on the most important person in her life. Now even during the hectic times, I stop and remember Jo and how her story taught me how important it is to step back each day and remember the humanism perspective of medicine.

Anonymous 6

It was 2:13am on the OB floor. A sudden ring of the intern's phone signaled an emergency. "We need to go, now", she said. We ran. We arrived in OB triage to find a woman screaming in agony. "The baby's coming!" she persisted. Without warning, she lowered her blood-soaked pants. The head of the infant was already out. In one movement, the intern threw herself to the floor, catching the falling baby. Lacking the medical knowledge to be much help, I started rubbing the patient's back to comfort her. After what seemed like hours, the peds team arrived and attempted to revive the baby. Intubate. CPR. No pulse. More CPR. After 45 minutes, the baby was pronounced. The nurses asked if I wanted to hold the baby. They said it would bring closure. Reluctantly, I reached out. I sat waiting outside the mom's room, cradling him in my arms. My attending whispered, "Holly, it's OK to be human." I lost it. The intern said the mom was ready. I attempted to compose myself, but she stopped me, "She wants to know you care". I went in and gently laid the baby on his mom's chest. We sat and cried together. I let her know that I saw her — that someone was there to share in her sadness and grief and shock. This experience taught me that underneath our white coats, we are humans first. It is such a privilege to share in the most vulnerable of moments with each other. I hope to always remember that each interaction with a patient has immense weight that has the potential to be remembered forever. I aspire to see patients as they truly are, and not just as a diagnosis.

Anonymous 7

On my pediatrics rotation, I remember an infant alone in a hospital room with a team of nurses, doctors, and specialists attempting to learn the cause of his jaundice. He was Black, and nobody on the team except for me shared that in common with him. The lack of etiology for his jaundice after multiple tests led some to suspect abuse, with his mother having missed an appointment after the baby's birth. In circumstances like these when a Black patient is accused or blamed in some way for their or their family's health, a certain solitude overtakes anyone sharing this common thread. In this case, our collective Blackness brought a wave of isolation over the mother, the baby, and me, each of us separate but strangely connected in this sense of unfortunate understanding. I wanted so dearly to encourage and believe and care for the new family, as I'd been treated this way. I knew what it's like to be misunderstood or accused much earlier in the differential diagnosis than our racial counterparts, even while it's described as protocol. And eventually, when I finally did meet the mother after her legal attempts to see her baby again, I tried to convince her to stay to both fight and receive assistance from the hospital that kept her child from her. The contradiction was too much to bear for me, as a 3rd party in this proceeding. But I remember my conversations with her, knowing my pain was nothing in comparison to her own, and how her eyes betrayed her discretion. When the team would speak with her, her gaze projected fury and deep sadness, as well as timid compliance. When we were alone, the sadness overtook us both, but her joy shone through as she was finally able to hold her baby again. Her son was eventually diagnosed with cystic fibrosis, which would ensure a close connection with the hospital system for the rest of his life. But I knew a certain trust had been broken, a guard newly constructed. In meeting this family and witnessing what happened to them, I reconfirmed that medicine and its claim to value humanism still only embraces an incomplete version of it. And unfortunately, some of the change needed can only be brought about by those who experience those insidious waves of isolation that crash down onto us. I wonder sometimes if one needs to experience the waves to be able to see and reach that unfortunate understanding or to even be willing to help still the waters.

Anonymous 8

The first time I met DS, he graciously allowed me to observe his physical therapy session. As he rolled his wheelchair through the winding halls of the hospital to the therapy gym, he was accompanied by his father, who offered repeatedly to push the chair so his son could preserve his strength. DS declined his father's offers; he was determined to make it on his own. When we arrived, he worked to gain skills most will never have to consider. He practiced transferring from wheelchair to bed. He learned to balance his front wheels off the ground to safely navigate over curbs. Afterwards, he rolled himself back to his room with sweat glistening on his forehead and determination engraved in his demeanor. He was exhausted, but he refused to be defeated.

DS is about the same age as me. We were both raised on the outskirts of the same city, and we both spent most of our youth playing sports. Weeks prior to meeting each other, he suffered a gunshot wound that severed his spinal cord. He was instantaneously and permanently robbed of his ability to use his legs. Meanwhile, I was rotating through my clerkships, fretting about exams from the comfort and safety of my home.

The tortuous path of medical education is riddled with obstacles complicating the altruistic mission that compels many to pursue this incredible vocation. Exams, evaluations, and research certainly provide opportunities for self-growth, but they also have a tendency to become the end rather than the means if we are not careful. The juxtaposition of this patient's tragedy next to my own academic preoccupations served as a powerful reminder of the true purpose of medical education. We are not here to build impressive resumes; we are here to acquire the knowledge to help other human beings. The grit exemplified by DS in the therapy gym will replay in my mind for years to come. Our patients are exerting incredible effort to overcome illness and personal tragedy, and we must work diligently to gain the skills necessary to assist by whatever means possible.

Indiana University Student Research Symposium

The following works were accepted for presentation at the Indiana University Student Research Symposium, which serves to highlight student research from all levels of experience in order to ignite interest and support for scientific inquiry in the IUSM medical community.

A 4-year-old Girl with Delayed Motor Milestones and a Renal Mass

Shah R, Mohamed D, Ramos-Platt LM, Grikscheit TC, Zhou, Kenneth

A 4-year-old Hispanic female presented with delayed ambulation at 3 years of age, inability to climb stairs, and frequent falls. Physical examination was notable for proximal muscle weakness of the lower extremities, mild distal muscle weakness of the upper extremities, muscle hypertrophy, elbow and ankle contractures. Serum creatine kinase at presentation was 1,499 units/liter. Pulmonary function tests revealed mild hyperinflation and reduced ventilatory muscle strength. An echocardiogram demonstrated normal cardiac anatomy with mild left ventricular hypokinesis (shortening fraction, 24.4%). Six months later, she presented with abdominal distension, acute onset right flank pain, vomiting, hypertension, and anemia. Computed tomography revealed a 9 x 9 x 7 cm mass arising from the inferior pole of the right kidney. The patient was admitted to a tertiary care children's hospital and evaluated by neurology, oncology, anesthesiology, pulmonology, cardiovascular surgery, pathology, and radiation oncology. Our multidisciplinary panel of experts will discuss the evaluation of the etiology for delayed motor development followed by diagnosis and collaborative clinical reasoning for the risk-adapted management of a renal mass.

Following the Track to an Unexpected Diagnosis: Phaeohyphomycosis

Mohammed A, Rahnama S

Presentation: A 77-year-old man with a history of diffuse large B-cell lymphoma (DLBCL) and 7 cycles of chemotherapy (CHOP) plus rituximab presented to the dermatology clinic with a nodule overlying the left 5th dorsal metacarpal phalangeal (MCP) joint of 2-3 months duration.
Assessment: On exam, he had a scaly rubbery pink-brown nodule to the left dorsal hand with some heme crust at the center of the lesion-this lesion was non-tender. At the left forearm there were a series of 3 rubbery pink-brown non-crusted papules, linearly arranged. He noted that they occurred around the time he participated in a home renovation. The biopsy of both locations showed pigmented hyphae. Skin tissue was cultured, and Exophiala jeanselmei was found.
Diagnosis: The patient was diagnosed with phaeohyphomycosis, caused by dematiaceous fungi which live worldwide in soil, trees, and decaying vegetation. Infection with such organisms can usually be traced to inoculation, from a source as simple as a splinter. Because phaeohyphomycosis often disseminates to many organs, cardiac and cerebral tissue can be involved, resulting in high mortality (case series report 80%) particularly if the central nervous system (CNS) is affected.
Management: Itraconazole at initial doses of 400 mg/day for at least 6 months is commonly used in treating this group of infections. Due to a potential interaction with an azole antifungal and the patient's amiodarone used for atrial fibrillation, oral terbinafine 250 mg daily was used. On follow-up, the patient noted that the lesions had increased in size and had become tender. Given his continued headaches and sinusitis, he received an MRI of the brain with contrast, which did not show CNS involvement. Terbinafine and amiodarone were discontinued, and the patient was started on voriconazole 200 mg twice a day. After 6 weeks of therapy, the tenderness decreased and the lesions flattened, and the patient did not have recurrence on follow-up.

Melasma and its Effects on the Quality of Life in Patients living in the United Kingdom

Osborne R, Nalluri R

Melasma is a skin disorder that causes discoloration of the face and arms. This disease occurs predominantly in people of color, most commonly women. Although the disease is clinically benign, severe discolorations of the skin can be both psychologically and socially damaging. In the United Kingdom however, the extent of this psychosocial damage has yet to be explored. The aim of this study is to assess the quality of life in melasma patients of color, in Manchester. This is a retrospective review of case notes of melasma patients who attended the dermatology department between August 2018 and August 2020. A total of 16 case notes of melasma patients ranging between the ages of 34 to 60 were studied. The patients completed two quality of life questionnaires, Dermatology Life Quality Index (DLQI) and Melasma Quality of Life Scale (MELASQoL); and Modified Melasma Area and Severity Index (mMASI) was completed by a single dermatologist to assess melasma severity. The mMASI score ranges between 0-24, with a higher score indicating higher disease severity. The DLQI score ranges between 0-30 and the MELASQoL score ranges between 0-70, with higher scores indicating poorer quality of life.
The overall mean mMASI score was 4.67 ± 2.86. The overall mean DLQI was 18.3 ± 8 and the overall mean MELASQOL was 62.6 ± 8.80. The results show that melasma has a significant negative impact on the quality of life in patients living in the UK. Patients struggled the most with appearance and social interactions. Issues with frustration and attractiveness were equally troubling to patients. In addition, the DLQI and MELASQOL scores from this study were higher than those from Australian, Brazilian and French studies. This suggests that melasma patients living in the UK may have a poorer quality of life than those living in other countries. These findings support the need for more aggressive forms of treatment for these patients, in order to improve their overall quality of life.

Effective Substance Abuse Treatment: Inpatient Bridges to Outpatient Care

Blaettner B, McKinzie A, Young A, Crawford J, Robles M

Women have been affected disproportionately by the opioid epidemic. From 1999 to 2017, overdose deaths in men increased by 225%, while those in women have increased by 270%. Research shows that women are more likely to be prescribed opioids, be diagnosed with chronic pain disorders, and experience negative outcomes associated with opioids. A 46-year-old female with a history of daily IV heroin and crack cocaine use presented with symptoms secondary to septic emboli. During her stay, she met with an addiction medicine physician to address her substance use disorder (SUD). She was discharged on a 7-day prescription of suboxone with referral to follow up in an outpatient addiction clinic within the week. She follows up at an addiction clinic bi-monthly and is now 3 years sober. Current strategies to address opioid addiction, such as social work consultation and referral to outpatient addiction management without inpatient treatment, have proven to be suboptimal. Research shows that initial inpatient pharmacological therapy with referral to outpatient addiction management increases rates of post-discharge abstinence and decreases rates of readmission related to opioid use disorder. With about a quarter of hospitalized patients having SUD, it is a necessity and priority to build a concise plan on starting inpatient treatment. Specifically, research indicates the effectiveness of starting inpatient buprenorphine with briding to outpatient services. Medications for SUD are under prescribed and most hospitals lack inpatient addiction services. Different models have been outlined for a multi-step approach on inpatient addiction consult services. These models include a universal screening approach for substance misuse, complete addiction history, withdrawal management, referrals and linkage to an outpatient center, and long-term medication titration. For optimal results, the clear choice is starting inpatient buprenorphine with bridging to outpatient services.

Early Allograft Dysfunction to Assess the Liver Function following Liver Transplantation

Bolujo I, Aref M, Ekser B

Background: Early allograft dysfunction (EAD) can be used as a tool to assess the function of the liver after transplantation. Currently, the most accepted EAD definition is: Total Bilirubin >10 mg/dL on post-operative day 7, INR >1.6 on post-operative day 7, ALT or AST ≥2000 IU/L within first 7 days. EAD is associated with mortality and morbidity after liver transplantation which leads to decreased recipient survival rates. It is, in fact, considered as an early sign of an eventual graft loss.
Methods: We have performed a literature review to understand what risk factors increase the risk of EAD, including donor and recipient demographics as well as recipients' MELD (Model for End Stage Liver Disease) scores, which predicts patients' disease severity. We also compared the incidence of EAD between our center and the literature.
Results: We found that the incidence of EAD was between 23-40% (Table 2). It is higher when livers from donation after circulatory death (DCD) donors were used, as expected due to increased ischemia reperfusion injury.

Reference (year)	Number of patients	Incidence of EAD
Ekser et al (2019) (IUSM)	n = 2008	29%
Olthoff et al (2010)	n = 300	23%
Wadei et al (2015)	n = 1325	27%
Lee et al (2014)	n = 205	39.5% (DCD donors)

Risk factors that can result in an increased occurrence of EAD were; (i) donor age, (ii) liver stenosis, (iii) expanding criteria for donor livers, such as DCD (iv) prolonged warm ischemia time (WIT), and (v) cold ischemia time (CIT). Histologically, hepatocellular damage that is shown as coagulative necrosis can be seen immediately after reperfusion.
Conclusions: During our literature review, potential strategies have been discovered to help prevent EAD including pharmacological treatment using glucose, antioxidants, anti-inflammatories, and apoptotic drugs. Although none of them significantly prevented the occurrence of EAD, it was clear that there are many tools that can be used to attempt to prevent EAD in order to offer a better outcome in patients undergoing liver transplantation.

The Role of Body Mass Index on Perioperative Medical Complications and Outcomes Following Primary Total Knee Arthroplasty

Bosler A, Deckard E, Ziemba-Davis M, Buller L, Meneghini R

Background and Hypothesis: Obesity is associated with increased medical complications and septic revision following total knee arthroplasty (TKA). This study examined the relative influence of body mass index (BMI) on outcomes following TKA in an arthroplasty program with specialized perioperative medical care.
Experimental Design or Project Methods: 284 consecutive primary TKAs performed by one surgeon between 2019 and 2020 were retrospectively reviewed. Outcomes including (1) inpatient and 90-day medical complications (cardiac, renal, respiratory, venous thromboembolism, cerebrovascular accident, joint infection, sepsis, and death), (2) 90-day emergency department visits and hospital readmissions, and (3) 90-day reoperations on the index joint were evaluated in relation to BMI.
Results: There were no differences in the proportions of obese (BMI ≥ 35 kg/m2) and non-obese (BMI< 35 kg/m2) patients with any of the assessed complications ($p \geq 0.160$) during the index stay or after discharge. All complications were related to renal, respiratory, or cardiac issues or joint infection. The five reoperations of the index joint were performed for infection or arthrofibrosis as the underlying

cause.
Conclusion: We observed a similar distribution of perioperative medical complications following primary TKA regardless of BMI. Findings suggest that evidence-based multidisciplinary perioperative care coordination can optimize outcomes in obese patients.

Early identification of personality and substance use disorders in improving outcomes of mood disorders in the transgender population

Campbell N, Stevens K, Fulton K, Raza M

Case Description: A 29 y/o male-to-female (MTF) transgender patient with a past medical history of schizoaffective bipolar type, gender dysphoria, and obsessive-compulsive disorder, presented to the emergency department for suicidal ideation. Patient had nine prior hospitalizations related to suicidal ideation and a significant social history of daily marijuana use. Clinical Significance/ Conclusion: Mood disorders and suicidal ideation is a detrimental combination in the general public, and even more so in the transgender population. In the US, the prevalence of mood disorders is approximately 46% in the transgender population versus 9% in the cisgender population. Several studies have shown the positive relationship of psychiatric disorders and suicide ideation. Among transgender populations, female-to-male individuals have the highest rates of suicidal ideation at 50.8% and male to female at 29.9%. Previous research demonstrates a path from stigma to sickness: transgender individuals are at greater risk of discrimination, unemployment and underemployment, poverty, harassment, abuse and violence. These factors contribute to worsened states of emotional and social well-being coupled with increased risk-taking behaviors. Combined with inadequate healthcare due to neglected sexual health, research draws connections between stigma and sickness. It is important for health care providers to recognize personality and substance use disorders in the transgender population. Whether male to female or female to male, women are suffering with mental illness that can lead to suicidal ideation. As undertreatment may contribute in provoking suicidal ideation in patients with mood disorders, early identification of these comorbid conditions could lead to better care and outcomes for transgender patients.

Rapid Resolution of Megestrol Acetate Associated Adrenal Insufficiency

Steele E, Afshari S, Swapnil K

Introduction: Megestrol acetate (MA) is a synthetic progestin commonly used for appetite stimulation. Several case reports have associated use of MA with adrenal insufficiency (AI) through suppression of the hypothalamic-pituitary-adrenal axis. To our knowledge, our case is the first to establish a timeline of onset and resolution of AI associated with MA.

Case: We present a 52-year-old female with a past medical history significant for hypothyroidism, systemic lupus erythematosus, Raynaud's, chronic diarrhea, anemia, and reflex sympathetic dystrophy. She was admitted for small bowel obstruction requiring exploratory laparotomy with lysis of a single adhesion. She developed hypoglycemia blood glucose ranging from 55-60mg/dL on hospital day 24, after starting nocturnal nasogastric tube feedings. She had poor appetite, weight loss, and intermittent nausea. She did not have a history of exogenous steroids. Physical exam was unremarkable aside from cachectic-appearing body habitus with a BMI of 17. Vital signs were stable. Her TSH, renal function, and liver studies were normal. Serum cortisol was checked on hospital day 27 and was very low, 1.1 mCg/dL (normal range, 5-25 mCg/dL). Endocrine was consulted for evaluation of hypoglycemia and adrenal insufficiency (AI). She had an adequate cortisol response to a 250 mcg cosyntropin stimulation. However, baseline ACTH was inappropriately normal, given her very low serum cortisol, suggesting secondary AI. Upon detailed chart review, we noted that she was started on megestrol acetate (MA) 20 mg PO daily on hospital day 20 for appetite stimulation. We suspected megestrol acetate to be the cause of her secondary AI and hypoglycemia. Within three days after discontinuation of MA, the patient's hypoglycemia resolved and serum cortisol returned to normal.
Discussion: Megestrol acetate is a synthetic progestin frequently used as appetite stimulant. MA is known to have glucocorticoid properties with affinity for glucocorticoid receptors. There are several case reports associating MA with AI which is a potentially life-threatening condition. The mechanism is thought to be suppression of the HPA axis. AI has been noted with doses of 400-600 mg however exact dose and timeline has never been described. Our case is unique where she developed AI after a relatively very low dose of 20 mg daily for only 1 week. Within three days following identification of the possibility of MA as the inducing agent and subsequent discontinuation, the patient's AI resolved. This rapid recovery is remarkable and gives important insight about possible impact of dose and duration in resolution of AI associated with MA. MA is frequently used as an appetite stimulant and it is very important to be aware of potentially life threatening side effects of AI. A timeline for development of MA induced AI and resolution has not been shown in previous case reports; ours is the first case to outline the dose and timeline for recovery, although further research is needed to confirm

The Effects of Multiple Exposure Ethanol on Barrier Tightness and Passive Permeability in a Human Stem Cell Derived Blood-Brain Barrier Model

Stoffel RD, Bell KT, Canfield SG

Background and Hypothesis: Numerous animal studies have shown the negative aspects of ethanol at sustained concentrations as well as the intense depressive effects of multiple ethanol exposures on the central nervous system. Chronic ethanol use as a possible contributor to early onset neurocognitive decline has been indicated. A portion of these studies have implicated that ethanol exposure induces blood-brain barrier (BBB) impairment; however, these effects are not completely understood. In humans the BBB serves as a protective barrier that restricts the passage of nutrients, metabolites, and pathogens into the central nervous system from the blood and is essential in protecting the brain tissue from harmful substances. We hypothesize that multiple doses of pathologically-relevant ethanol will cause decreased BBB tightness and increase passive permeability.
Experimental Design: In this study, we utilized brain microvascular endothelial cells (BMECs) derived from human induced pluripotent stem cells (iPSCs) to assess the effects ethanol has on barrier tightness and passive permeability through the BBB. BMECs were treated with multiple exposures of 50mM ethanol and transendothelial electrical resistance and sodium fluorescein permeabilities were measured. Trolox, a free radical scavenger, was used to identify if ethanol-induced barrier damage could be salvaged by reducing its oxidative impact.
Results: Upon multiple exposure treatment with ethanol, iPSC-derived BMECs displayed diminished transendothelial electrical resistance and elevated sodium fluorescein permeability when compared to non-treated BMECs. Additionally, BMECs that were treated simultaneously with Trolox and ethanol had reduced barrier damage compared to ethanol treatment alone.
Conclusion and Potential Impact: From these results, we conclude that multiple ethanol exposure-induced barrier damage in iPSC-derived BMECs, is in part due to elevated oxidative stress. Disruption of the BBB can potentiate a number of negative effects on the brain parenchyma and can lead to earlier onset neurocognitive decline. Alcohol's impact on the BBB must be studied to ensure we limit these effects.

A cases series of COVID-19 in pregnancy outcomes

Swiezy S, Eckert N, Campbell M

Introduction: COVID-19 has been the largest public health crisis of our lifetime. Much of the morbidity and mortality caused by COVID-19 has been due to lack of adequate research and understanding of the virus. In the absence of data for COVID-19, scientists have used evidence collected during other coronavirus outbreaks, including SARS and MERS, to forecast outcomes in different populations. Both of these coronavirus outbreaks were preferentially fatal in pregnant women, suggesting that COVID-19 may also have grave consequences for gravid women and their fetuses. Given that molecular studies have confirmed that COVID-19 enters cells through the ACE-2 receptor, which is also present on human placental cells, there is potential for COVID-19-induced abnormalities in the interface between mom and baby, leading to maternal-fetal morbidity or mortality. To date, several case series have demonstrated adverse perinatal outcomes in COVID-19-positive pregnant women, including placental abnormalities and pre-term birth; however, these studies have been limited in scale and scope. More data is needed to fully understand the implications of COVID-19 infection in pregnancy so that evidence-based treatment recommendations can be made to OB/GYNs caring for COVID+ patients.
Methods: We reviewed the charts of all of the pregnant women presenting for routine obstetric care to the UAP OB/GYN offices of Dr. Thomas Yeagley and Dr. Kathleen Coutinho in Terre Haute, IN between November 2020 and February 2021, which represented the main case spike for Terre Haute. We used the "chart search" function as well as prenatal visit records and labor and delivery notes to identify 34 women who were pregnant at the time of COVID-19 infection. Inclusion criteria was as follows: pregnant women with 1) a COVID positive test or 2) symptoms and a household contact (e.g. husband) with a COVID positive test. Patients were excluded if the date of COVID positive test for self or household contact was unable to be determined within an accurate two-week time frame. Data were inputted into a Qualtrics survey, developed by the study authors, for ease of viewing the results.
Results/Conclusions: Data input is ongoing. We are currently waiting for ~25% of the patients in our sample to deliver in the next 4-6 weeks in order to evaluate any perinatal or post-partum complications that occur due to COVID-19 infection. We plan to stratify our data by the trimester of pregnancy during which COVID-19 was acquired. Limitations of our study include small sample size and review of patients from only two OB/GYNs. A thorough review of our data will provide meaningful insight into the association between COVID-19 and pregnancy so that best practices can be developed and implemented for the care of these patients.

Barriers to Care and Missed Appointments in an IUSM Student-Run Free Clinic

Swiezy S, Eckrote E, Ratcliffe B, Black M, Danek R, Reyes E

Introduction: Missed primary care appointments represent a potential cause for negative health outcomes in patients. As student clinicians, we have a responsibility to make sure patients with missed appointments are consistently and efficiently contacted for two purposes: 1) to reschedule

appointments to facilitate access to needed care and 2) to assess the structural barriers that cause our patients to miss their appointments and experience delays in preventive assessment, treatment, and diagnosis. Mollie Wheat Memorial Clinic (MWMC) has been serving the Wabash Valley for six years now, and we are at a critical juncture to undertake a study to evaluate the reasons that we continue to have a high rate of no-show patients at our clinic, and, to use this data to implement solutions for the barriers to care experienced by our unique patient population.
Methods: MWMC is open every other Saturday from 8a-noon. Patients who presented for a scheduled appointment ("show") or presented as a walk-in ("walk-in") on clinic dates from March-May were surveyed for demographic information as well as barriers to care, including transportation, housing, insurance status, health literacy, and clinic hours availability. Patients who were a no-show ("no-show") for their scheduled appointment, over the same period, were contacted via phone to understand the reasons for the missed appointment and how this could/could not have been prevented by MWMC. No-show patients were subsequently emailed a copy of the same survey given to patients at the clinic. Comparison of "show"/"walk-in" vs. "no-show" groups was undertaken to understand the differences in economic, social, and structural barriers that allowed some patients to present for and others to miss their appointments.
Results: Data collection is ongoing in this project. Thus far, we have gathered a sample of "show"/"walk-in" patients (n = 24) and "no show" patients (n = 3). Preliminary data analysis reveals several barriers to care faced by our patients. Many of our patients (25%) answered that they do not have access to their own car for reliable transportation, and several (20.8%) regularly rely on someone else for their transportation to and from work, school, appointments, and the grocery store. Half (50%) of our patients reported that they are more than 20 minutes from our clinic, with some traveling an hour by care to utilize our free services. The majority of our patients (62.5%) reported having no insurance, with over half (53.3%) of the uninsured group citing "because it is too expensive" as the reason for being uninsured. A significant portion of our patients are unemployed (29.2%). Additionally, several of our patients (25%) answered that they have gone without food because they could not afford it, and some (12.5%) reported being evicted from their homes because they were unable to make rent. Most of our patients (70.8%) reported that they do not have a family doctor. Qualitative data through speaking with our no-show patients on the phone revealed a number of the same barriers preventing them from making it to their scheduled healthcare appointments, with the most common barrier being transportation to and from the clinic.
Conclusions: Preliminary data suggests that several structural barriers to accessing care at our clinic affect our patients, including transportation, proximity to free healthcare, and SES, among others. Subsequent to our study, we plan to propose solutions to our MWMC executive board aimed at addressing these issues for our patients and, thereby, decreasing the rate of missed appointments at our clinic. We plan to continue tracking rates of missed appointments after the implementation of the proposed solutions in order to evaluate their efficacy.

Power-Optimizing Repair for Distal Biceps Tendon Rupture: Stronger and Safer

Tadevich JT, Bhagat ND, Lim BH, Gao J, Chen WW, Merrell GA

Purpose: Many approaches have been described to accomplish tendon reattachment to the radial tuberosity in distal biceps tendon rupture with significant success, but each is associated with potential post-operative complications, including posterior interosseous nerve (PIN) injury. At present there is no consensus best approach to the repair. The purpose of this study was to evaluate supination strength and drill exit point distance from the PIN in a power-optimizing distal biceps repair and compare findings to those of a traditional anterior approach endobutton repair.
Methods: Cadaveric arms were dissected to allow for distal biceps tendon excision from its anatomic footprint. Each arm was repaired twice, first with a power-optimizing repair utilizing an anterior single-incision approach with an ulnar drilling angle and biceps tendon radial tuberosity wraparound anatomic footprint attachment, then with a traditional anterior endobutton repair. Following each repair, the arm was mounted in a custom-built testing apparatus and supination torque was measured from three orientations. The PIN was then located posteriorly and the distance to each repair exit hole was measured.
Results: Five cadaveric arms, each with both repairs, were included in the study. The power-optimizing repair generated 82%, 22%, and 13% greater supination torque on average than the traditional anterior endobutton repair from 45° supination, neutral, and 45° pronation orientations respectively. The power-optimizing repair produced drill hole exit points farther from the PIN (23 mm) than the traditional anterior endobutton repair (14 mm) on average.
Conclusions: A power-optimizing repair provides significantly greater supination torque and produces a drill hole exit point significantly farther from the PIN as compared to a traditional anterior endobutton approach.

Lost in Translation: A Case of Acute Abdomen in Pregnancy

Pandita P, Marks CE, Hand BL, Chimhanda M

Case Description: A Hispanic 29-year-old G7P4 at 25 weeks' gestation presented to triage with stabbing midline upper abdominal pain, nausea, and vomiting. History was limited by a language barrier and an interpreter was used. The patient had a BMI of 46, and upon presentation had stable vital signs and was afebrile. Labs showed mild leukocytosis, and lipase and urinalysis were negative. Gastrointestinal cocktail

trial resulted in moderate pain improvement. Computed tomography (CT) abdomen and pelvis was recommended for further evaluation, but after risks and benefits were discussed, the patient opted for an abdominal ultrasound (US). Right upper quadrant US did not show evidence of acute cholecystitis, and the patient was discharged on pantoprazole. She returned one week later with worsening right lower quadrant abdominal pain, nausea, vomiting, and guarding. CT abdomen and pelvis revealed acute perforated appendicitis with adjacent periappendiceal abscess. General surgery was consulted, and a laparoscopic appendectomy was performed.
Conclusions: This case demonstrates the difficulty in diagnosing appendicitis in pregnancy due to confounding anatomic and physiologic factors related to normal pregnancy. Diagnostic challenges also exist. While ultrasound is the primary imaging modality due to availability and low cost, obesity is associated with poor sonographic image quality.
Clinical Significance: Acute abdomen in pregnancy (AAP) represents an extensive range of etiologies, including obstetric and non-obstetric causes. Pregnant women with acute appendicitis have higher rates of adverse outcomes compared with nonpregnant women. Diagnosis of AAP is an essential step in management, and there is evidence that non-English proficiency puts patients at risk for reduced clinical investigation and adversely affects quality of care. Accurate diagnosis and optimal communication should be prioritized to ensure timely medical intervention and reduce complications.

Facebook Groups Provide Social Support to Patients After Bariatric Surgery

Athanasiadis D, Roper A, Voss A, Zike T, Hilgendorf W, Embry M, Banerjee A, Selzer D, Stefanidis D

Background: Social support after bariatric surgery is considered essential. Unfortunately, patient participation in such groups tends to be limited threatening their effectiveness. Facebook groups may provide a social support option that attracts more participation. The aim of this study was to describe our experience with the administration of a Facebook social support group and evaluate its perceived value by our bariatric patients.
Methods: After IRB approval, all Facebook group posts since its establishment in 2015 were reviewed and a thematic analysis was undertaken. Group members also completed a survey related to their Facebook group experience and its perceived value. Responses were collected using 5-point Likert scales. In addition, 30 members were phone interviewed using open-ended questions and their responses were analyzed.
Results: Over 4 years, the group accumulated 12,507 posts, 104,053 comments, and 197,594 reactions. On average, members check the group page more than once per day. Ten common themes were identified in the submitted posts: questions, motivation related, education related, diet related, physical activity related, current status updates, sharing failures, social, random/humorous and other. Members reported that the group helped them do well with their procedure (3.3/5) particularly due to the motivation of others' successful stories (3.5/5) and made them feel understood (3.9/5) even though it offered limited help controlling their eating habits (2.7/5). The phone interviews suggested that the Facebook group offered constant support, was simple to use, and provided the sole social support for many patients. They most appreciated the motivational posts that kept them on track and the assistance/comments of clinical staff. In contrast, they disliked repeated questions/spam and negative stories shared by some members.
Conclusions: Facebook groups can provide effective social support to patients after bariatric surgery. Peers educate, answer questions, and motivate patients by sharing their positive experiences. Whether this online connectedness also positively impacts patient outcomes requires further study.

Assessing the Role and Impact of a Free Community Eye Clinic

Rowe LW, Camp DA, MD, Tso HL, Wurster P, Kalafatis NE, Scheive M, Yung CR

Background: In partnership with the Indiana University Student Outreach Clinic (IUSOC), the Ophthalmology Student Interest Group at Indiana University School of Medicine operates a free monthly student-run eye clinic in Indianapolis, Indiana that provides assessments of visual acuity, intraocular pressure (IOP), peripheral visual fields, MD-provided refraction, and non-mydriatic fundus photography. Prescription glasses from LensCrafters and donated reading glasses are provided to those without vision coverage insurance. This study aimed to describe the patient demographics, review the services provided, and assess the impact of our high-volume student-run eye clinic over seven years.
Methods: Retrospective chart review of 875 patients seen at the IUSOC Eye Clinic from October 2013 to February 2020. Data on demographics, insurance coverage, ocular history, physical examination, suspected diagnosis, referral status, and glasses provided were collected and analyzed.
Results: Average Age: 46.7(±15.9); Gender: 51.1% female, 41.8% male, 7.1% undocumented; Ethnicity: 31.9% African American, 21.7% Caucasian, 21.5% Hispanic, 3.0% other, 1.0% Asian, 20.9% undocumented; Insurance Coverage: 39.2% none, 12.0% Medicaid, 8.2% Medicare, 4.8% other, 3.5% Healthy Indiana Plan, 2.4% private insurance, 29.8% undocumented Diabetes: 18.5%; Hypertension: 32.2%; Avg IOP: 18.1; IOP >21: 21.7%; Visual Acuity 20/40 or Worse: 61.4%; Near Visual Acuity 20/40 or Worse: 51.3%; Visual Field Deficits: 29.4%; Non-Mydriatic Fundus Photography: 14.6% with retinal pathology, 15.4% of diabetics screened

with retinal pathology; Avg cup-to-disc ratio: 0.36; Cup-to-disc ratio >0.6: 8.3%; Reading glasses provided: 244; Glasses prescriptions provided: 126; Referrals to Ophthalmology service at county hospital: 178 (49 for glaucoma, 39 for decreased visual acuity, 14 for diabetic retinopathy, 11 for cataracts, 5 for AMD, and 60 for other pathology); Estimated value of services provided:1053.58 RVU.
Conclusion: In providing basic eye care to nearly 900 patients since 2013, the IUSOC free eye clinic fills an important role in advancing ocular health and preventing irreversible blindness in the underserved Indianapolis community.

Choriocapillaris Vascular Flow Area as a Biomarker of Diabetic Retinopathy Severity

Rowe LW, Scheive M, Reinhart K, Hajrasouliha AR

Purpose: Optical coherence tomography angiography (OCT-A) offers the opportunity to safely and routinely image the choriocapillaris (CC), which is unable to be visualized by the established technique of fluorescein angiography. We performed a retrospective cohort study to compare the CC vascular flow area between diabetic patients with differing degrees of clinical diabetic retinopathy (DR) severity. We hypothesize that blood flow area in the CC can be used as a biomarker to correlate with clinical severity of DR.
Methods: This retrospective cohort study analyzed the measured flow area of the CC on quality OCT-A scans in non-diabetic control patients (n=206), diabetic patients without retinopathy (n=47), and diabetic patients with mild non-proliferative DR (NPDR) (n=40), moderate to severe NPDR (n=144), and proliferative DR (PDR) (n=81). A two-sample t-test was completed to compare CC flow area between control patients and diabetic patients with at least one quality OCT-A scan. A multivariate linear regression analysis was performed to compare CC flow area to clinical DR diagnosis when controlling for age, gender, and visual acuity in patients with at least one quality OCT-A scan.
Results: There was found to be a statistically significant decreased CC flow area ($p<0.05$) in diabetic patients compared to patients without diabetes. In comparison to diabetic patients without retinopathy, mild NPDR patients revealed an insignificantly increased CC flow area of 0.253 ($p=0.53$), while moderate to severe NPDR patients revealed a significantly decreased CC flow area of 0.691 ($p=0.04$) and PDR patients revealed a significantly decreased CC flow area of 1.11 ($p<0.01$).
Conclusions: CC vascular flow area, as measured by OCT-A, shows promise for the diagnosis and monitoring of DR as a biomarker of clinical disease severity. Future studies investigating longitudinal CC blood flow changes after anti-VEGF injections may be helpful in better understanding the treatment's effects.

Decoding Mouse Behavior from Neural Activity in Visual Cortex

Williams A, Makin M

Background and Hypothesis: Brain-machine interfaces (BMIs) aim to restore motor control to patients. To develop effective BMIs, it is imperative that we build highly accurate models relating cortical neural activity with natural movements. Neurons in the visual cortex of the brain respond strongly to visual signals, but are also modulated by fluctuating internal states such as alertness, which closely correlates pupil size. We thus hypothesized that an animal's pupil size can be decoded directly from the activity of a population of neurons in mouse primary visual cortex.
Project Methods: We used an open-access dataset from the Allen Institute for Brain Science, which consisted of in-vivo 2 photon calcium imaging data of 128 neurons recorded from primary visual cortex of an awake mouse viewing a video screen. Video imaging was used to track the mouse's pupil size. To relate neural activity with pupil size, we used linear regression, first smoothing the data with a Savitzky Gall filter. The model was fit on the first 80% of the data, and tested on the remaining 20%, using the computed coefficients to predict pupil size from neural activity. A Pearson correlation coefficient between the true and predicted data was computed. All analyses were performed in Python.
Results: We found that there was a strong linear relationship between neural activity and pupil size, as the correlation coefficient between the true and predicted data was 0.376. Therefore, we have shown quantitatively that pupil size can be modeled based on neuronal activity within the visual cortex with a high level of accuracy.
Conclusion and Potential Impact: This experiment demonstrates the feasibility of linear regression for modeling neuronal behavior in the visual system, particularly related to pupil size. This potentially presents another source for information for proper pupil size in patients experiencing a third nerve palsy.

Under-recognition of Leukemic Lung Infiltration in Patients with Leukemia and Acute Respiratory Illness

Ehteshami-Afshar S, Valda-Toro P, Lee S, Avery C, Cohen A, Kahn P, Dela Cruz C, Gautam S

Purpose: Respiratory illness is common in patients with acute leukemia. Infection is thought to be the most common cause, but a number of non-infectious pulmonary complications occur in such patients as well. These include pulmonary edema, alveolar hemorrhage, and leukemic infiltration. Failure to recognize these etiologies may lead to unnecessary evaluation and therapy for presumed infection and/or delays in chemotherapy for treatment candidates and palliative care transition for non-candidates. In this study, we sought to evaluate the etiology of respiratory illness during active

leukemia.
Methods: A retrospective analysis was performed on adult patients admitted to Yale New Haven Hospital from 2013-2018. Inclusion criteria were (i) peripheral blast count >3% (indicating acute leukemia), (ii) performance of bronchoscopy with bronchoalveolar lavage, and (iii) negative microbiological testing or designation of positive findings as nonpathogenic by an independent infectious disease physician. The cause of respiratory illness in included cases was determined by retrospective chart review by three independent clinicians.
Results: A total of 36 cases of non-infectious respiratory illness were identified (mean age of 62 2.1 years). The mean interval from bronchoscopy to the time of death was 15 5 days, and mean maximum peripheral blast percentage was 40.3 5.2%. Underlying hematologic malignancies were acute myeloid leukemia in 80.6% (11 new, 18 relapsed), acute lymphocytic leukemia (5.5%), chronic myeloid leukemia (5.5%), lymphoma (5.5%), and myelodysplastic syndrome (2.7%). Respiratory illness was attributed to leukemic infiltration in 94.4% cases and to alveolar hemorrhage in the remaining 5.6%. All 36 cases received broad spectrum antimicrobials even after having a negative bronchoscopy with an average treatment duration of 19 4.7 days. Patients underwent an average of 18 2.0 microbial cultures (all negative), 4 1.1 diagnostic imaging tests, and were hospitalized for 22 2.8 days. Of 34 cases with presumed leukemic infiltrates, 15 received chemotherapy (treatment candidates) and 18 were eventually transitioned to hospice care (noncandidates). On average, this transition occurred 36 20.2 days after bronchoscopy.
Conclusions: Although leukemic involvement of the lungs is considered rare, our study reveals that it is actually quite common in patients with active leukemia and negative bronchoscopic testing. Failure to recognize this condition leads to extensive infectious evaluations and delays in transitions to palliative care for treatment noncandidates.
Clinical Implications: Leukemic infiltration should be considered early in patients presenting with active leukemia, as this may obviate the need for aggressive infectious workup and treatment, and expedite transitions to hospice.

Pro-Bono Student Consulting: Development of a Medical Student Platform for Improving Community Health and Addressing Healthcare Disparities

Becker T, Giwa L, Rao V, DeLeon G

Introduction: Over a year removed from the onset of the COVID-19 pandemic, the need for innovative solutions to community health problems and healthcare disparities has never been more apparent. We proposed the creation of a student-led, project-based organization for medical students to improve community health and address disparities by utilizing their unique skillsets and previous experiences to provide pro-bono consulting. This outlet would provide real-time application of the concepts and values being taught in our medical school coursework, while also providing unparalleled learning opportunities for the next generation of physician-leaders.
Methods: In March 2021, we compiled a database of community health organizations and non-profits in the Fort Wayne, IN area to complete due diligence in determining the need for a pro-bono student consulting group. Organizations with missions to directly or indirectly improve health outcomes were included. We also created a list of industry contacts in consulting and healthcare disparities to promote the group's internal efforts in leadership development and education. Community and industry interest were determined by response rate.
Results: A total of 27 community organizations were identified with services in direct patient care, food security, disability services and women's health. Eight organizations were selected for initial outreach via email and telephone. Of the initial outreach, the response rate was 62.5% (n=5). Three of the respondents confirmed interest in developing a project at a later date, and the remaining two agreed that a medical student-led pro-bono consulting group would provide much needed services to local community health organizations. Four industry connections were contacted for guidance in identifying resources in consulting and healthcare disparities. Two of the connections were consultants, having worked for PwC and Google. One contact was the chief executive officer of a municipal health and hospital corporation in Indianapolis, IN, and the final contact was a human resources director for Eli Lilly and Company with experience in diversity, equity and inclusion. Industry interest was measured at 100% (n=4), with all contacts either providing guidance in organizational structure or offering to provide educational talks in the future. The meeting with Eli Lilly and Company led to an invitation for the group to present at LillyX, formerly TEDxLilly, in recognition of the group's success in reflecting, evolving and engaging.
Discussion: Student-led organizational development resulted in a pro-bono student consulting platform that community health organizations found beneficial to the point of interest in developing a project after one meeting. Industry interest was also positive, lending credibility to the process of medical student-led initiatives in healthcare. This model can serve as the basis for viewing medical students as a valuable resource in healthcare innovation.

Epilepsy in Pediatric Obstetrics

Bigelow K, Eckrote E, Brent J, Yeagley T

Case: 17 year old female G1P0 with a medical history of seizures treated with Keppra 250 mg BID presented for prenatal care at 17+5wks. She was diagnosed with epilepsy a year ago and reported seizure episodes 2-3 times per month, most recent being during her first trimester. Patient presented to the emergency department at 25+3wks stating she experienced a seizure and cramping and felt decreased

fetal movement. Fetal heart tracing was reassuring for her gestational age. After oral hydration and apple juice, over time she began appreciating the fetal movements again. The patient was monitored until normal fetal movement resumed. Patient denied headache, vision changes, vaginal bleeding and contractions at the time. She was discharged in stable conditions. Of note, the patient has continued on Keppra and not yet delivered.
Discussion: Epilepsy is the second most common neurologic complication in pregnant women, after migraine. Although a majority of women with epilepsy deliver healthy babies, treating obstetric patients with a history of epilepsy is complicated. It is ideal for these women to seek medical care before pregnancy since antiepileptic medications can be teratogenic and maternal seizures can cause temporary fetal hypoxia. Antiepileptic drugs are most dangerous during the first 10 weeks of development. Most women with epilepsy will continue on antiepileptic medication during pregnancy with adjustments to medication and dosage to maximize safety. Some factors that influence delay of prenatal care until after their first trimester include low income, lack of an OB provider, and being from a country other than the United States.
Conclusion: Youth with epilepsy need frequent attention and education on how to manage their medications. It is important to collaborate with neurology in cases like this. It is very possible for mothers with a history of epilepsy to give birth to healthy babies, however, consequences can be severe or even fatal if their care is delayed.

Patient Values Guides Decision-Making in Advanced Breast Cancer

Gambetta V, Hodapp A, Lewis K, Newton E

Case: The patient is a 50 year old female diagnosed in 2012 with Stage IIIA ER+ invasive lobular breast carcinoma. After neoadjuvant chemotherapy, she underwent mastectomy and axillary node dissection, followed by radiation and adjuvant anastrozole. In 2019, she presented with abdominal bloating and was found to have metastases to lungs, liver, and pelvis. Her cancer responded well to 3 doses of eribulin, but she developed neutropenic fever, severe mucositis, and a steep functional decline. Her therapy was then transitioned to fulvestrant and abemaciclib, but she was unable to tolerate the myelosuppression. Treatment was then changed to capecitabine which she is tolerating well with excellent disease control. Conclusion: Invasive lobular carcinoma is the second most common type of breast cancer, occurring in nearly 10% of cases. Without a single standard of care for metastatic ER+ breast cancer, navigating the numerous treatment options can be overwhelming and is best done by incorporating the patient's values and goals.
Clinical Significance: The patient was initially faced with several decisions regarding her treatment at presentation. After exploring her values and goals, a more aggressive adjuvant regimen was selected over a more conservative approach. Despite her outstanding compliance, her disease recurred in multiple organs. Even though she understood her disease could not be cured at this point, she maintained her resilient spirit and made clear she still desired aggressive treatment. Once better disease control was obtained the patient voiced a desire to decrease the side effects and thus capecitabine was recommended. As a strategy to navigate the complex myriad of available treatments, therapy regimens should be guided based on the patient's overall goals. As a result, patient autonomy was prioritized and she has had a good quality of life.

Intraoperative Mannitol Administration During Laparoscopic Donor Nephrectomy and Impact on Long-Term Graft Function

Gryzinski G, Farrow J, Bahler C, Sundaram CP

Introduction: End-stage renal disease frequently results in dialysis, and at best, transplantation. Laparoscopic donor nephrectomy was introduced in 1995 and has been a valuable source of high-quality organs. Improving long-term graft function of recipients through judicious intraoperative medical management remains an essential goal. Infusion of mannitol prior to hilar clamping during donor nephrectomy has been utilized based on its proposed cytoprotective properties - theoretically improving renal perfusion, free-radical scavenging, and diuresis. However, there is a paucity of large, long-term studies evaluating its use. In this study, we aimed to explore the long-term effects of intraoperative mannitol administration on graft function as measured by creatinine.
Methods: A single-center, retrospective analysis of a contemporary cohort of donor nephrectomies was performed. Eighty donors (sample determined using a power of 0.8 to detect a 20% difference in creatinine) were identified and then matched to recipients using Indiana University's Organ Transplant Tracking Record database. Patients were balanced by sex and stratified by intraoperative administration of mannitol (yes vs no). Creatinine was recorded at fixed intervals per routine nephrology follow-up. Statistical analysis was performed using SPSS.
Results: Basic demographics are presented in Table 1. The only significant difference in baseline clinical factors was donor intraoperative diuretic administration, which was more frequently co-administered with mannitol. Creatinine means by time can be seen in Figure 1. Multiple means comparisons were made using ANOVA and did not reveal any differences in creatinine at three years post-transplant ($p > 0.05$).
Conclusion: Mannitol administration did not statistically affect post-transplant creatinine up to the three-year follow-up. On post-hoc analysis, elimination of cases where diuretics were co-administered did not change these results.

Examining the Efficacy of a Virtual Interprofessional Education Intervention Compared to In-Person

Herriott HL, McNulty MA

Effective interprofessional (IP) collaboration has become an essential skill for practitioners in healthcare settings due to a shift towards team-based practice. In order to cultivate interprofessional competencies such as communication, teamwork, and role comprehension, a case-based learning (CBL) intervention targeting the aforementioned skills was incorporated throughout an anatomy course for physician assistant (MPAS), physical therapy (DPT), and occupational therapy (OTD) students. 4th-year medical (MD) students were recruited to facilitate these small group CBL activities in-person in 2019 and virtually in 2020. Data were collected from a clinically-focused role knowledge survey, administered to MD, MPAS, DPT, and OTD students before and after the course, as well as eight focus groups. Following the virtual CBL intervention, a mere 68.57% of students felt the CBLs improved their interprofessional competencies compared to 85.72% when the course was taught in-person. With respect to the pre-/post-role comprehension survey, students in the virtual cohort not only failed to demonstrate a significant decrease in role misidentification (as seen in the in-person CBL cohort, p=0.002), their change in the average rate of misidentified roles (-1.23%) was nearly identical to those observed in the historical control cohort that did not engage in CBLs (-1.19%). These findings suggest that the educational intervention aimed at promoting interprofessional communication was not effective in a virtual setting. Focus group data corroborate these quantitative findings, with many students asserting virtual learning-specific challenges impeded both communication and teamwork. Moving forward post-pandemic, as institutions begin to deliberate on the utility of virtual learning compared to hybrid, or in-person approaches; it is essential for stakeholders to consider the explicit, measurable learning objectives in tandem with the more difficult to quantify professional competencies an educational experience is aimed at promoting. With respect to interprofessional education and collaborative competencies, the results outlined above indicate virtual learning does not facilitate the acquisition of communication, teamwork, or role comprehension skills as well as in-person learning.

Utilization of smoke evacuation in dermatology: A national cross-sectional analysis

Holmes SP, Hooper PB, Que SKT

Background: Despite associated hazards of surgical smoke, there is limited data regarding smoke evacuation practices among dermatologists. Such information is especially relevant at this time as dermatologic procedures often involve exposure to aerosolized particles, which can carry viruses like COVID-19.
Objective: To examine the barriers underlying historically low utilization of smoke protection among dermatologists.
Methods: A survey was sent to dermatologists through the Association of Professors of Dermatology (APD) list-serv and a cross-sectional analysis of responses was performed.
Results: A total of 85 dermatologists responded. Twenty-four (28.2%) reported use of smoke evacuators during > 50% of dermatologic procedures. The odds of using smoke evacuation was 2.8 times higher in dermatologists with 10 or more years of experience (95% CI, 1.1-7.5; p=0.0358). The most commonly reported barriers to smoke evacuation were limited staffing (63.5%) and set-up time (61.2%). Sixty-seven (78.8%) respondents reported that a hands-free evacuator could potentially increase the use of smoke evacuation in their practices.
Limitations: Survey sent on an academic list-serv with relatively small sample size and limited generalizability.
Conclusions: Smoke evacuation remains low among dermatologists despite the risks. Identifying reasons for low utilization and receptiveness to potential solutions is necessary to improve safety practices relating to smoke evacuation.

Patient-reported outcomes and satisfaction associated with the use of a hydrocolloid dressing versus conventional wound care after dermatologic surgeries

Holmes SP, Rivera S, Hooper PB, Que SKT

Purpose: Hydrocolloid dressings have been documented in the literature to be helpful for chronic ulcers, but there is limited research documenting their use for post-surgical wounds after dermatologic procedures. The following study aims to investigate this gap by evaluating patient satisfaction and postoperative outcomes associated with a simplified wound care regimen involving the one-time application of a hydrocolloid dressing as compared to conventional wound care with daily dressing changes.
Design: The study included patients who underwent Mohs or standard surgical excision with linear closure at a tertiary care academic facility from January 2020 to January 2021. The patients selected additionally had a history of excisional surgery with conventional daily dressing changes within the last 3 years. A modified version of the validated Bluebelle Wound Healing Questionnaire was distributed to participants via phone, REDCap email link, and in-person at follow-up clinic visits. Responses were subsequently uploaded and stored in REDCap. Data was analyzed in SPSS using descriptive statistics, frequencies, and paired sample t-tests.
Findings: Data collection is ongoing. To date, 59 patients have participated, with an average age of 66.0±13.8 (range: 32-93) years old. The majority of patients (n=48, 81.4%) completed wound care independently. Dressings remained in place for 6.4±3.1 days after application. As compared to conventional

wound care with daily dressing changes, a one-time application of the hydrocolloid dressing rated higher in terms of comfort, convenience, scar appearance, and simplicity ($p<0.05$). Nearly all participants (n=57, 96.6%) stated if given the choice in the future, they would choose a one-time application of hydrocolloid dressing over conventional wound care. No participants in this study experienced fever, required antibiotics, or were hospitalized.
Summary: Wound care after dermatologic surgery can be tedious and confusing. With daily dressing changes, topical emollient applications, and hard-to-reach surgical sites, conventional wound care regimens have been a source of confusion and frustration for patients. Our study suggests that use of a simplified regimen involving a hydrocolloid dressing can lead to increased comfort, convenience, simplicity, and a subjective improvement in scar appearance

Balancing Student Sex Education Needs with Community Preferences: A Qualitative Study in Rural Indiana

Hoseus S, Meagher CG, James R, Cope-Barnes D, Ott MA

Background and Purpose: Rural youth experience high rates of teen pregnancy. Despite this increased health risk, little data exist on evidence-based sex education programs (EBPs) in rural communities. Using the Exploration, Preparation, Implementation, and Sustainment (EPIS) framework, we describe the challenges and community-derived solutions in implementing an EBP in rural Indiana schools, providing insight on rural EBP implementation.
Methods: As part of a larger federally funded implementation project, an abstinence focused EBP (Making a Difference! and Guiding Good Choices) was taught at middle schools located in twelve counties in rural southern and eastern Indiana. Three community agencies implemented the curriculum over three years. Afterwards, SH and CM conducted interviews of the agency partners (n=13) and of key school stakeholders (n=6). Interviews were conducted via Zoom, audio-recorded, transcribed, field notes written, and all data analyzed using thematic analysis. Codes were developed from the EPIS framework and included outer contexts of communities, inner contexts of schools, prepawwration activities, implementation, and potential sustainability. We asked participants to identify challenges and solutions.
Results: Challenges and solutions were mapped onto the EPIS framework. Outer context challenges included religion, conservative communities, outside agencies, and parenting beliefs. Inner context challenges included lack of teacher and administrator support. Preparational challenges included lack of communication with parents, lack of community outreach, and lack of parent education. Implementational challenges included teaching a 60-minute lesson in 45 minutes and classroom engagement of schoolteachers. Sustainment challenges included teacher discomfort with the topic. Community-derived solutions included building community trust before implementation, providing information to parents, inviting administrators to observe, offering a student question box, and training school staff to implement the program.
Conclusion and Potential Impact: Many challenges emerged during implementation because of perceived lack of preparation. Future implementation of EBPs in rural communities should focus more on aspects of exploration and preparation.

COVID-19 impact on female healthcare workers: a literature review

Howser L, Patel S, Dempsey H, Agarwal N

Background: The increased demand the COVID-19 pandemic has placed on health care workers, along with the desire of female health care workers to work on the front lines, clashes with the societal expectation of women to be the primary caregiver of her family. This project will look at the increased disparities of female healthcare workers during the COVID-19 pandemic. Our goal is to point out these inequalities in the hope of drawing awareness and sparking interest in creating solutions to reduce the impact of the pandemic on the mental health of female health care workers.
Methods: Systematic review of literature published relating to female healthcare workers during the COVID-19 pandemic was completed using PubMed. The following terms were used to complete the search: COVID-19, female, healthcare, physician, SARS-CoV-2.
Results: Women were shown to have more familial responsibilities even prior to COVID-19. In a study by Starmer et al., female physicians reported being primarily responsible for 13 out of the 16 household chores measured in the study. When looking at male vs female healthcare worker depression, anxiety, and insomnia during the COVID-19 pandemic, a study by Pappa et al. showed higher rates of affective symptoms in female healthcare workers. Interestingly, a study by Ing et al. showed only 10% of physician COVID-19 related deaths were of females. Females make up 76% of healthcare workers. However, the majority of healthcare executives are male, making the female voice underrepresented.
Conclusions: Women in healthcare have been affected in different ways than men during the COVID-19 pandemic. Women have had worse mental status likely due to balancing increased stress at work and home. There have been fewer COVID-19 related deaths of female physicians, which could indicate females backing away from front-line exposures to prioritize a familial role. These factors are important to be aware of while COVID-19 continues to impact healthcare workers.

Intraosseous cranial myxoma: a case report and review of literature

Howser L, Ye MJ, Boham S, Fan R, Nelson RF

Introduction: A myxoma is rare benign tumor of mesenchymal origin. In terms of head and neck myxomas, primary tumors are rare and most often arise from the mandible, maxilla, and oral cavity. There is a paucity of data on incidence and treatment of intraosseous occipital myxomas. Case reports have identified occurrences of other intracranial myxomas. In this case report, a 12-year-old boy with a myxoma arising from the occipital bone is presented due to the tumor's rare anatomical location, especially in a pediatric patient.
Case Report: A 12-year-old boy presented to the Emergency Department with left ear pain with tenderness to palpation overlying the left mastoid bone. A computed tomography scan (CT) with contrast at this time showed a 4.8 cm lytic mass centered in the occipital bone bordering the mastoid. The patient underwent biopsy of the suboccipital area mass. Initial pathological workup was inconclusive but thought to be suspicious for low-grade sarcoma. Definitive resection with left occipital craniotomy and gross total resection was performed through a post-auricular incision from the mastoid tip to the occiput. Immunohistochemistry was positive for vimentin and focally positive for actin. The findings were most consistent with an intraosseous myxoma. No postoperative complications, neurological deficits, or evidence of recurrence were apparent on clinical exam at one and three months.
Conclusion: The suboccipital region is a rare location for an intraosseous myxoma to occur. Early diagnosis and treatment are imperative for prognosis due to radical resection being the best chance for nonrecurrence. Even with surgical resection, long-term follow up is needed as high rates of recurrence are documented.

Repetitive Transcranial Magnetic Stimulation as a Probe of Episodic Memory Neurocircuitry in Schizophrenia

Kleyn T, Francis M, Visco A, Hummer T

Background and Hypothesis: People with schizophrenia often experience impairments with episodic memory (EM). Due in part to a lack of understanding regarding the neural mechanisms of EM, there are no effective treatments. Recent research indicates that the precuneus may be associated with EM impairment. Repetitive transcranial magnetic stimulation (rTMS) is a commonly employed intervention for treatment resistant depression, but its potential for investigating other psychiatric disorders such as schizophrenia is unclear. We hypothesize that, compared to sham stimulation, 1 Hz rTMS will decrease precuneus activity and 20 Hz rTMS will increase precuneus activity during an EM task.
Experimental Design: Seven patients with early phase psychosis underwent a baseline fMRI scan during an EM recognition task that required participants to accurately identify which images were previously shown (targets) or not shown (foils). Next, participants had three separate rTMS sessions targeting the precuneus, each one week apart, in a randomized order: inhibitory (1 Hz) rTMS, excitatory (20Hz) rTMS, and sham stimulation. Each rTMS session was immediately followed by fMRI during the EM task.
Results: We currently remain blind to the conditions because the study is ongoing. Participants had relatively lower accuracy during foil trials in one treatment session. During this same session, precuneus activity was relatively stronger to foils than targets, compared to other treatment sessions. These preliminary results suggest that rTMS applied to the precuneus may impact episodic memory and related brain activity in early psychosis .
Conclusion and Potential Impact: Data from this study will help determine whether targeting the precuneus with rTMS impacts functional activation in patients with schizophrenia during EM tasks. Additionally, relationships between EM performance and changes in precuneus activity will be identified. If effective, rTMS may represent a novel treatment for EM deficits in schizophrenia.

Durability of Cementless Primary Total Hip Arthroplasty in Patients Age 75 and Older

Saldivar R, Buller LT, Deckard ER, Ziemba-Davis M, Meneghini RM

Background and Hypothesis: Cementless femoral fixation in total hip arthroplasty (THA) has increased in prevalence worldwide. However, cementless fixation in elderly patients is controversial due to the risk of periprosthetic fracture and/or femoral component loosening. We evaluated the effect of age on implant survivorship in patients ≥75 versus <75 years of age. Intraoperative fracture, mortality, and revision cause also were evaluated.
Project Methods: 532 cementless THAs performed with consistent surgical, perioperative, and rehabilitation protocols by one surgeon between 2011 and 2018 were retrospectively reviewed. Patients with less than two years follow-up were excluded. 84 patients were ≥75 and 448 were <75 years of age. Average follow-up was 44±12 months (p=0.965). Revision rate, intraoperative fracture, 90-day mortality, and overall mortality were compared with p<0.05 considered statistically significant.
Results: In the ≥75 group there were more females (70.2% vs. 59.2%, p=0.067), more ASA-PS class 3-4 (76.2% vs. 46.2%, p<0.001), and lower BMI (28.6±5.7 vs. 31.3±6.9, p<0.001). Patients <75 had more hip dysplasia (p=0.023) and patients ≥75 had more kidney disease (p<0.001). Revision rates between the ≥75 and <75 groups (1.2%, 1.8%) were not different (p=1.000). Moreover, there was no difference in femoral component revision (<75 = 62.5%, ≥75 = 0.0%, p=0.444) with all femoral revisions due to infection not fracture or loosening. Intraoperative fracture (<75 = 0.9%, ≥75 = 1.2%, p=0.578), 90-day-mortality (one in

the younger group, none in the older group, p=1.000), overall mortality (10 in the younger, 4 in the older group, p=0.253), and mean months between surgery and death (p=0.694) did not differ in younger and older patients.
Conclusion and Potential Impact: Older patients had comparable implant survivorship compared to younger patients using cementless femoral fixation. In addition, there were no differences in risk for mortality or intraoperative fracture. These findings provide evidence for the safety and durability of cementless THA in elderly patients ≥75 years of age.

The Ripple Effect II - Analysis of the Cascade of Events Associated with CVC and PICC Line Loss and the Impact on Nurse Workflow, Patient Outcomes, and Resource Utilization

Schenk J, Will L, Saiko-Blair M, Graves M

Little research has been done on the costs of CVC or PICC line dislodgement to patients, staff, and the hospital. The primary objective of this study was to characterize and evaluate all the costs of a CVC or PICC line dislodgement in a general medical hospital. A questionnaire was utilized to determine patient demographics, causes of dislodgement, disruption of care, expense of dislodgement cleanup, and the expense of establishing a replacement IV, PICC line, or CVC for 7 sequential patients over a three month period. The average cost of dislodgement was found to be $216.14, and the average time without an IV was 156 minutes. The most common cause of dislodgement, 50% of total, was the result of a cognitive issue. Reducing catheter dislodgement will favorably impact the existing cost burden on the US healthcare system.

Invasive stratified mucin producing carcinoma (i-SMILE): A newer cervical adenocarcinoma variant with potentially aggressive behavior

Clark HE, Schenk JS, Muldoon JL, Segura SE

Case Description: Patient is a 32-year-old G_3P_{3003} with history significant for two prior abnormal Papanicolaou smear results of squamous cells of undetermined significance (ASCUS)/HPV+ (unknown p16/18) and atypical squamous cells that cannot exclude high grade squamous intraepithelial lesion (ASC-H)/HPV+ (p16+). Colposcopy revealed low grade squamous intraepithelial lesion and endocervical adenocarcinoma in situ (AIS) but no evidence of invasive carcinoma. A cold knife cone cervical biopsy demonstrated adenocarcinoma, invasive stratified mucin producing carcinoma (i-SMILE) variant in the background of stratified mucin-producing intraepithelial lesion (SMILE) and AIS. Conclusion: The patient subsequently underwent a total abdominal radical hysterectomy with bilateral salpingectomy, ovarian transposition and pelvic lymphadenectomy. Endocervix was positive for invasive adenocarcinoma with negative margins. Lymphovascular invasion was not identified.
Clinical Significance: SMILE is characterized by a combination of immature, stratified epithelial cells with intracytoplasmic mucin throughout all layers. The immunophenotype of SMILE demonstrates p16 expression, which correlates with high-risk Human Papillomavirus (HR-HPV) intraepithelial lesions. Its invasive counterpart, i-SMILE, can show a variety of architectural and cytologic patterns, which can cause a potential misdiagnosis, with cases been previously diagnosed as adenosquamous carcinoma, squamous cell carcinoma or other type of cervical adenocarcinoma. It is important to recognize the morphologic spectrum of i-SMILE, as these are potentially aggressive tumors, they are diagnosed at higher stages, and more frequently demonstrate destructive stromal invasion when compared with usual type endocervical adenocarcinoma. Clinicians should also be made aware of these newer histopathological diagnoses to be able to appropriately interpret their reports and determine treatment plans for their patients.

"My birth control is making me depressed," balancing potential mood effects of hormonal contraception with a patient's contraceptive goals

Steele E, Sandler R, Hadley E

Case: A 21-year-old woman with a history of polycystic ovarian syndrome (PCOS), dyspareunia, and bipolar disorder presented to the clinic wanting to switch contraception from the Nexplanon implant to a combined oral contraceptive (COC). At age 18, the patient was diagnosed with major depressive disorder (MDD). Shortly following her diagnosis, the patient was given the Nexplanon implant for birth control. The patient reports that soon after getting the implant, her psychiatric symptoms worsened and her diagnosis was changed from MDD to bipolar disorder. She hopes that switching contraceptive methods will alleviate her mood symptoms.
Conclusion: It is common for patients to have low compliance with contraceptives due to perceived negative mood effects. Data suggests that the type of progestin component may play a role. In response to the patient's concerns, she was switched to Loryna, a combined oral contraception with drospirenone, a progestin with known antiandrogenic effects. Due to these effects, it is less likely to contribute to adverse mood symptoms while also improving symptoms of PCOS. By honoring the patient's experience, the physician was able to adjust the contraceptive method and increase the likelihood of patient satisfaction and compliance.
Clinical Significance: While many studies have demonstrated beneficial mood effects of COCs, a significant number of patients who change or cease their contraceptive method

cite mood and sexual dysfunction as their primary reason. Variation between individuals may be due to differences in prenatal receptor organization. Assessment and management of underlying psychiatric symptoms is also important. To improve compliance with COCs and foster collaborative physician-patient relationships, it is critical for physicians to inquire about the patient's goals and engage in shared decision making to choose a contraceptive that is right for each individual.

Retrospective Chart Review Comparing CKD COVID-19 Positive Patient Outcomes to non-CKD Patient Outcomes

Eckert N, Sankari S, Allen K, Hui SL, Mendonca E

Background/Objective: Since January 2020, there have been over 3 million individuals infected with the coronavirus in the United States, quickly spreading across at least 171 countries. The severity and morbidity of patients with COVID-19 are significantly increased when comorbidities, such as Chronic Kidney Disease (CKD), are present. Because the main target of SARS-CoV-2 is ACE2, patients with CKD may be a more vulnerable population. The goal of this study was to determine if COVID-19 positive patients with CKD had increased mortality, inpatient admission, and ED visitation rates compared to those without CKD.
Methods: This retrospective chart review includes patients from over 100 separate healthcare entities who were diagnosed with COVID-19 between January 1, 2020 and July 13, 2020 and are over the age of 18. The subjects were first separated into those diagnosed with CKD and those without, basic descriptive calculations were computed, and a Chi Square test was used to analyze outcomes.
Results: The CKD COVID-19 positive population was compromised of 47.5% men and 52.5% women while the non-CKD control group was made up of 45.4% men, 54.1% women, and 0.5% other. The median Charlson index for the CKD and non-CKD population was 4 and 1, respectively. The interest and control groups were further divided into subpopulations by age and race and analyzed accordingly. Chi square tests demonstrated that there is a statistically significant difference ($p<0.05$) in all clinical outcomes tested of CKD patients diagnosed with COVID-19 compared to non-CKD patients. The CKD population had increased mortality, inpatient admission, and ED visitation rates when compared.
Discussion: This study demonstrates that comorbidities, more specifically CKD, may be associated with a higher severity of COVID-19 than those without. Future studies are needed to explore the relationship more extensively, analyze other outcomes, and manage confounding variables.

Effects of Behavioral Health Problems on ED Recidivism and Utilization

Dalal A, O'Reilly L, Peterson K, D'Onofrio B, Musey P

Background: Although it is known that mental health disorders are associated with higher rates of emergency department (ED) utilization and poorer quality of life, universal mental health screening is not standard in many EDs. Prior work has shown that up to 45% of ED patients have undiagnosed or comorbid psychiatric disorders, which remain undiagnosed after discharge. It is possible that early identification of these mental health concerns and provision of appropriate resources to these patients would reduce strain on emergency services and increase their access to high value care. This study seeks to assess the prevalence of anxiety and depression in a broad sample of ED patients, and its effects on ED utilization and recidivism.
Methods: This was an observational cohort study of adult patients presenting without psychiatric complaint to the IU Health Methodist Emergency Department between May 2019 to March 2020. Eligible patients were approached to complete a self-administered screening for symptoms of anxiety and depression using the validated Generalized Anxiety Disorder 7 item scale (GAD-7) and the Patient Health Questionnaire 8 item scale (PHQ-8) respectively via tablet computer. Among other data collected was the number of ED visits in the 12 months before and 30 days after enrollment. Patients who scored ≥10, the validated cutoff for at least moderate symptoms, on either the GAD-7 or PHQ-8 were categorized as mental health positive (MH+) versus all others without significant mental health symptoms (MH-) and mean visits in the 12 months before and 30 days after enrollment were analyzed via two sample t-tests.
Results: Of the 1854 patients who were approached, 818 patients were ultimately enrolled with an average age of 43.8 (SD ± 16.3). Two hundred forty-one patients (29%) were MH+ with 66% of these being female, 54% white, and 37% black. Among the MH population (577 patients), 60% were female, 51% white, and 41% black. MH+ patients had a greater average number of ED visits in the 12 months prior to study enrollment (3.2 visits versus 1.67 visits for MH- patients, $p<0.001$). There was no statistical difference in average number of visits in the 30 days post enrollment (MH+ = 0.4 vs MH- 0.5, $p=0.68$).
Conclusion: Clinically significant symptoms of anxiety and depression were associated with significantly higher rates of ED utilization in the 12 months prior to enrollment. The findings of this study contribute to the existing body of evidence that individuals with behavioral health problems have higher rates of ED utilization and provide incentive to institute more universal screening protocols to identify and refer these patients to the appropriate resources.

Three Uncommon Associations with Acute Compartment Syndrome Occur Simultaneously in One Case

Clodfelter K, Gaby A, Jones J, Hartman J

Case Description: Patient was a 48-year-old female, non-restrained passenger in a side-by-side ATV accident traveling between 10-15mph. The vehicle rolled toward her side and she was ejected from the vehicle. The vehicle ultimately ended up on her right leg. Shortly after, she attempted to stand but felt that her leg was broken. En route to the hospital, the patient noted great pain and a "pins and needles" sensation over the lower leg. In the ED, the patient described decreased right leg pain and inability to sense light touch with preserved motor function. Workup consisted of a negative CT of head, cervical spine, and facial bones. X-rays demonstrated distal fibular and posterior malleolar fractures. Due to displaying signs of acute compartment syndrome including pallor, poikilothermia, and paresthesia, the patient underwent a 4-compartment fasciotomy of the right lower leg the same day per a general surgeon. The procedure was well-tolerated, and she required 4 days to control pain, have wound vacuums placed, and undergo physical therapy to prepare for discharge home.
Conclusions: This case describes the progression, diagnostic work-up, and treatment of acute compartment syndrome. Presence of distal fibular and posterior malleolar fractures accompanied by pallor, poikilothermia, and paresthesia led to diagnosis of acute compartment syndrome. Patient was treated the same day via 4-compartment fasciotomy of the right lower leg.
Significance: Acute compartment syndrome occurs less often with distal lower leg bone fractures than with proximal lower leg bone fractures. Of all fractures associated with acute compartment syndrome, fibular fractures contribute to a minor percentage of cases. When looking at the incidence of traumatic acute compartment syndrome, it is reported to occur ten times more likely in males than females. This case provides a learning opportunity to study three associations less frequently reported in acute compartment syndrome.

Connecting Faith and Health: Improving Health Outcomes Through Congregant Networks

Campbell M, Christenson J, Craig D

Background and Hypothesis: People living in areas of high social vulnerability face health disparities in part due to disconnection. Health institutions recognize the importance of treating whole persons but are disconnected from local knowledge of community health assets and social and cultural barriers. People in health-challenged neighborhoods may experience disconnection and distrust in seeking the many resources and services needed for good health. Congregations are longstanding anchor institutions in marginalized communities. They build trusted relationships among members through shared values and care for wellness. Sometimes they extend these connections through on-the-ground service to neighboring communities. We hypothesize that a network of congregations can build trusted connections and share local knowledge and cultural competence to improve health outcomes and holistic wellness in vulnerable neighborhoods.
Methods: Community-engaged participatory research requires reciprocity in mapping assets, identifying priorities, narrating shared values, designing projects and messaging results. We developed mixed-methods tools to ensure community expertise drives an iterative research process. Methods include: an initial health and wellness survey, follow-up wellness interviews to collect stories and assets, an online learning community for 14 congregations with monthly focus groups, and visual maps of health data and wellness assets.
Results: While the study is ongoing, preliminary survey data demonstrates that congregations have local knowledge of issues affecting health and wellness among their congregants and the surrounding neighborhood. Their preexisting support for health and wellness through community outreach programs indicates building on their current network could expand their reach and improve health and wellness in vulnerable neighborhoods.
Conclusion and Potential Impact: Successful community engaged research prioritizes iterative methods that allow community participants to use their voice and tell their stories. Congregations' practice of shared values and knowledge of lived experience can forge connections for greater resilience and health supports in socially vulnerable communities.

Treatment of KRAS-Mutated Colorectal Lung Metastasis Complicated by Insurance Coverage

Avery C, Vaughan J, Wickstrom M

Case: A 61-year-old female with a diagnosis of stage 3, KRAS-mutated sigmoid colon adenocarcinoma with lung metastasis presented to her family medicine physician. The patient has also been diagnosed with emphysematous COPD, essential primary hypertension, iron deficiency and vitamin B12 deficiency anemia, cholelithiasis without obstruction, paroxysmal atrial fibrillation, peripheral neuropathy, an anal ulcer, and stricture of the intestine. The patient endorses constant pain especially on movement of her bowels. Although the patient is trying to cease her tobacco use via nicotine patches covered by her insurance, she is an active smoker. Celecoxib was prescribed because NSAIDs have shown some efficacy in prolonged mortality in KRAS-mutated oncology.
Conclusion: The patient failed normal chemotherapy treatment and is on a second-line chemotherapy regimen including celecoxib. Her insurance will not cover celecoxib, deeming it "experimental protocol." As a result, the patient is paying out of pocket and utilizing GoodRx.

Clinical Significance: Due to failed treatments and coverage denial for recommended treatment, this patient is a prime example of healthcare coverage complicating health access. Innovations in treatment options have led to decreased mortality in colorectal cancer over the last ten years, yet this patient's care is not fully covered due to being considered experimental. While navigating lack of insurance approval, this patient continues to work nights in a physically-demanding occupation, in part so that she can afford her current treatment regimen. While this patient has been able to afford her medication despite insurance denial, other patients may not be able to afford treatments and therefore may be non-adherent with their chemotherapy. This case explores potential cost-related medication non-adherence along with the impact on cancer treatment and mortality.

A Case of Aceruloplasminemia Which Was Not Wilson Disease

Williams CJ, Clemens JC, Wu J, Zimmerman MK

Case: A 58-year-old woman presented with 5+ years of fatigue and joint pain as well as recent short term memory concerns. On initial evaluation she was found to have mild anemia with elevated iron and persistently elevated ferritin as high as 2100 ng/ml. An unrelated cardiac scan had the incidental finding of hepatic iron accumulation. No fibrosis was noted on MRI. Liver biopsy was significant for 3-4+ hemochromatosis with sinusoidal dilation and congestion. Labs showed aceruloplasminemia, low urine copper, and low serum copper. Eye exam was negative for Kayser Fleischer rings but did show retinal iron deposits and early macular degeneration not supporting Wilson disease. Later genetic testing for CP (ceruloplasmin) gene showed heterozygosity for sequence variant c.2342A>C, predicted to cause amino acid substitution p.Lys781Thr.
Conclusion: MRI revealed abnormal signal in portions of basal ganglia and cerebellum consistent with iron accumulation. She was recently switched from deferasirox to scheduled phlebotomy due to medication side effects.
Significance: Our patient had a complex path to diagnosis given that low ceruloplasmin is commonly associated with Wilson disease. However, ceruloplasmin is also a key component in regulating ferric iron binding to transferrin and maintaining copper and iron homeostasis. Clinical evidence of anemia, ophthalmologic findings, and subjective cognitive dysfunction combined with histology and genetic results contributed to accurate characterization of aceruloplasminemia related hemochromatosis rather than Wilson disease. Genetic analysis revealed CP gene c.2342A>C (p.Lys781Thr), a novel mutation not reported elsewhere to our knowledge. Given her heterozygous status for the mutation, further investigation is needed. More importantly for our patient, recognition and treatment at this stage could reduce morbidity from neurodegeneration, pancreatic, and hepatic disease.

Avascular Necrosis of the Hip with Truvada

Wu J, Henry A

Background and Introduction: Tenofovir disoproxil fumarate (Truvada) is a common HIV pre-exposure prophylaxis regimen. Rare side effects such as renal toxicity and bone mineral loss have been reported, but the relationship between Truvada and avascular necrosis (AVN) has not been well reported. The patient reported in this case study has no additional risk factor or underlying conditions that predisposes him to AVN of the hip aside from Truvada use.
Case presentation:A 37-year-old homosexual male who is HIV negative is in a monogamous relationship with a HIV positive partner with undetectable viral load. The patient is taking Truvada prophylaxis with a goal of decreasing his HIV transmission risk. He began taking Truvada in Jan 2015 and was without complications until Apr 2018 when he presented with left hip/quadricep pain initially diagnosed with IT band syndrome. He failed to improve with multiple courses of physical therapy and pain has been recurrent. He received X-rays of the pelvis, bilateral hips, and lumbar spine with 4 views in Jun 2019.
Results were significant for AVN of the left hip. He had no other comorbidities and began taking NSAIDs for pain control. His Truvada was discontinued Jun 2019 and he began Descovy (Tenofovir alafenamide fumarate) but his routine care visit/imaging in Aug 2020 shows worsening AVN and symptomatic pain. Physical exam also showed significant atrophy of left lower extremity muscle groups and antalgic gait.
Conclusion: Truvada has been associated with AVN in patients without previous health risks for decreased bone health/density. Past research has identified improved bone mineral density with discontinuing Truvada and beginning Descovy. However, this patient failed to improve with Descovy and continues to have worsening AVN, perhaps suggesting AVN is not associated with bone mineral loss but possibly other occult reasons.

Gynecologic Malignancy: Consideration for Pelvic Exenteration

Mishra A, Villager N, Ivaturi S, Mueller M

Case Description: A 44-year-old female patient with metastatic vulvar squamous cell carcinoma (SCC) was diagnosed after a 1-year history of a vulvar lesion, first treated with radiation and radical vulvectomy. After vulvectomy, she had a chronic wound that progressively enlarged, exposing her pubic ramus. Biopsies showed recurrent SCC and osteomyelitis of the pubic ramus. Pain associated with the wound severely limited her mobility and ability to sit. A tumor board decided to proceed with total pelvic exenteration 21 months after initial diagnosis of SCC to try to improve quality of life, including removal of the uterus, right fallopian

tube and ovary, bladder, distal ureters, vagina, rectum, pubic symphysis, and pubic rami. Perineal reconstruction was completed with an anterior thigh flap.
Conclusions: Pelvic exenteration (PE) may be offered as a final curative or palliative option for recurrent gynecologic malignancies. Studies show PE may provide symptomatic relief, particularly for patients with significant pain. However, PE has also been shown to increase GI and GU comorbidities and physical and emotional dysfunction. Greatest decreases in quality of life (QOL) occur in the months immediately following PE. While some studies suggest QOL returns to pre-PE baseline around 1 year post-op, others suggest prolonged psychosocial and emotional repercussions of PE, particularly in elderly patients.
Clinical Significance: Pelvic exenteration is a complex operation with a high rate of complications and morbidity; however, it can be the final curative or palliative option for persistent gynecologic malignancies. Factors to consider pre-operatively include estimated quality of life, physical functioning, and emotional repercussions. It is the responsibility of the physician to make all potential outcomes known to the patient. Psychosocial support should be made available, especially within the first few months post-op, which when the patient is likely to experience the greatest decrease in QOL.

Pediatric Epilepsy: A Careful Examination for Lennox-Gastaut Syndrome Diagnosis

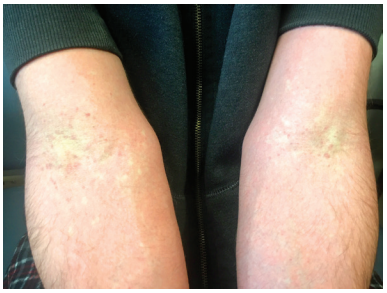
Mishra A, Olson S, Holmes S, Hochstetler A, Peterson R

Case Description: A 2-year-old female patient who initially presented at 2-months-old with a Brief Resolved Unexplained Event (BRUE) that was attributed to reflux and Sandifer syndrome re-presented at 3-months-old with another BRUE that was more concerning for a seizure. She was placed on a prolonged video-EEG monitor, which demonstrated abnormal findings consistent with partial or secondarily generalized seizure disorder. She was soon thereafter diagnosed with Type 1 Lissencephaly via a head CT. A sequencing/duplication deletion test for the LIS1 gene was sent out, which indicated a deletion of the entire LIS1 gene on one copy of Chromosome 17, confirming the diagnosis of Type 1 Lissencephaly. However, the patient was subsequently diagnosed with Lennox Gastaut Syndrome (LGS), a disease that manifests as a severe form of epilepsy with a peak age of clinical presentation between 3 and 5 years. LGS is classically diagnosed by the triad of multiple seizure types, cognitive impairment, and slow spike and wave pattern seen on EEG.
Conclusion: There are many different possibilities that are included on the differential for an infant or young child with a seizure or seizure-like episode. Leading the list would be Sandifer syndrome, febrile seizures, breath holding spells, West syndrome, EMAS, and LGS. Differentiation from the initial presentation can be difficult, especially if an episode was not witnessed in the hospital and was only qualified by parent report. There is potential for additional diagnostics and interventions upon these initial presentations to result in earlier diagnosis of LGS.
Clinical Significance: Although Lennox-Gastaut Syndrome is diagnosed by a classic triad, these symptoms may present asynchronously and mimic other disorders in the early stages of clinical presentation, adding to the challenge of its diagnosis. Helpful characteristics to look at when distinguishing between differentials are age of onset, seizure type, and EEG pattern. Upwards of 65% of those diagnosed with Lissencephaly ultimately result in an LGS diagnosis. Head CTs of infants presenting with seizure-like episodes help to rule-in or rule-out Lissencephaly, and early detection could aid in earlier diagnosis and treatment of LGS.

Child with an Atypical Diffuse Red Rash

Mohammed A, Rahnama-Moghadam S

Case Presentation: A 15-year-old boy presented to the dermatology clinic with a red, diffuse papular rash on his chest, face, arms, and legs along with fever, photophobia, pulsating headaches, nuchal rigidity, malaise, and myalgias in the upper back and shoulders. Suspected scarlet fever syndrome prompted treatment with clindamycin at the emergency department, without improvement. At the tongue, there was a white pseudomembranous exudate that was easily wiped away along with enlarged fungiform papilla and circumoral pallor (Figure 1). A linear array of petechiae were found at the antecubital fossa, dull rather than bright red and analogous to Pastia's lines (Figure 2).



Diagnosis: Mycoplasma pneumoniae. Anti-streptolysin antibodies (ASO) checked for scarlet fever were normal. However, testing was found positive for Mycoplasma pneumonia IgM. Doxycycline 100mg bid was prescribed for a 7 day course. Within 48 hours, the patient's exanthema, enanthem, and constitutional symptoms resolved.
While scarlatiniform mycoplasma infections have been described in textbooks, there are no reports in the primary literature. This varied morphology may result from the molecular mimicry involved in mucocutaneous diseases associated with Mycoplasma. Exposure to M. pneumoniae is theorized to result in the development of autoantibodies against mycoplasma p1-adhesion molecules, which share extensive sequence homology to mucosal keratinocyte antigens.

Drivers and Barriers to the Use of Health Information Exchange Amongst Clinicians in the Emergency Department

Richter B, Dixon B

Background: Health Information Exchange (HIE) describes the exchange of medical data between various health care organizations. Though research is limited, widespread use of HIE may improve patient outcomes while improving efficiency and thus lowering health care costs for patients. The paucity of existing research necessitates further study into the effects of HIE use in the clinical setting. The Indiana Network for Patient Care (INPC) is one of the most comprehensive HIE networks in the country, and provides an ideal environment for conducting research regarding factors that influence HIE use.
Methods:A group of 20 clinicians from the Emergency Department were chosen to answer a set of questions regarding their HIE use. This group included physicians, nurse practitioners, physician assistants, and registered nurses from various health care organizations across the state of Indiana. Interview questions were centered around four main themes: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. Interviews were recorded and transcribed, then subject to qualitative analysis using NVivo software.
Results: The Single Sign-On and EHR Button were the most commonly discussed features in terms of facilitating HIE use. Providers used HIE most often when the patient reported previous admission at a different hospital, or when the patient was incapacitated and could not provide information. Although clinicians had unanimous social support for using HIE, inadequate training regarding HIE was apparent, and served as the most common barrier to its use.
Conclusion/Impact:The implementation of Single Sign-On and access to the INPC via a button integrated into the user's EHR are critical for widespread use of HIE, while lack of physician training serves as a major barrier to its use. Implementing SSO and EHR button features while improving HIE training may spurn additional use of HIE and thus lower costs for both hospitals and patients.

Identifying spondyloarthritis in patients with inflammatory bowel disease

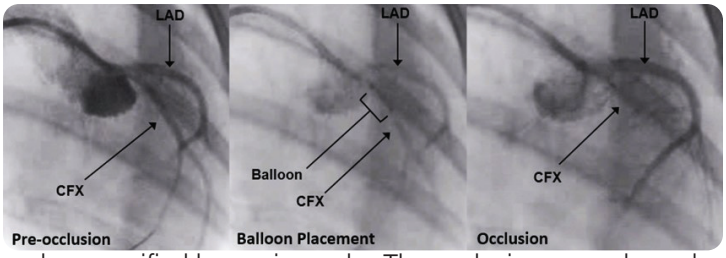
Burns C, Jan R, Flynn J, Rubin D

Background/Objective: Spondyloarthritis (SpA) has been posited to be the most common extra-intestinal manifestation of inflammatory bowel disease (IBD) with a prevalence between 17 to 39%. Axial SpA refers to a syndrome of inflammatory back pain associated with radiographic or magnetic resonance imaging abnormalities. Peripheral SpA can include dactylitis, enthesitis or oligo-arthritis. Given the link between IBD and SpA, establishing a uniform way to identify these patients could markedly decrease the historically long time to SpA diagnosis. The goals of this study are to validate the ability of the Toronto Axial Spondyloarthritis Questionnaire to identify patients with rheumatologic symptoms in the context of IBD, to re-evaluate the prevalence of spondyloarthritis in this population, and create a database identifying patients with both IBD and SpA.
Methods: Patients were selected based on the following criteria: diagnosis of IBD, upcoming appointment with their gastroenterologist, prior consent in the Genesys database, and access to an operational MyChart account. Patients were asked to complete the online survey modified from the Toronto Axial Spondyloarthritis Questionnaire. Positive patient responses will be analyzed in a follow-up visit with a rheumatologist to investigate the patients' symptoms.
Results: At present, 64 responses were collected. Forty three patients had a diagnosis of Crohn's disease, 19 with ulcerative colitis and 2 with unclassified colitis. From the total responses, 20 patients (31%) experienced back pain for a duration of 3 months or longer with 13 having back pain that improved with physical activity. Five patients (7%) had a prior diagnosis of ankylosing spondylitis. Thirty five patients (54%) have had pain and swelling of a joint unrelated to injury. Twenty patients (31%) experienced pain and swelling of an entire finger or toe unrelated to injury. 18 patients (28%) experienced heel pain unrelated to injury.
Conclusion/Potential Impact: Major extra gastrointestinal manifestations of IBD include axial or peripheral spondyloarthritis which can lead to disabling back pain and/ or joint disease. Using the modified Toronto Axial Spondyloarthritis Questionnaire, gastroenterologists could improve identification of concerning joint symptoms, leading to increased referral to rheumatologists and potential changes in treatment plans. The creation of a separate database for this population would allow further investigations into successful treatment.

Ossabaw swine with an impaired function AMP kinase mutation exhibit no preconditioning to myocardial ischemia

Arnold C, Lehr T, Strobel J, Byrd J, Alloosh M, and Sturek M

Background: Myocardial ischemia activates a major metabolic regulator, AMP kinase (AMPK), which affects the electrocardiogram (ECG). Preconditioning is the phenomenon whereby brief ischemic episodes render the heart more resistant to subsequent ischemic injury. The increase in time to reach adverse ECG criteria upon consecutive episodes of coronary occlusion-induced ischemia is a measure of preconditioning in humans. We hypothesized that AMPK mutants will not exhibit preconditioning in contrast to the wild-type swine.
Methods: Ossabaw miniature swine with a spontaneous point mutation Valine199→Isoleucine in the AMPKγ3 subunit were compared to wild-type swine with the Valine199. Balloon occlusion of the circumflex artery induced ischemia



and was verified by angiography. The occlusion was released once any of several ECG criteria were met: ST elevation of 5 mm, QRS widening greater than 50%, 1 premature ventricular contraction, or reaching the occlusion time limit of 15 minutes. A recovery period allowed ST elevation to return to the isoelectric point before beginning the next occlusion.
Results: Young AMPK mutants (3.1 ± 0.5 years, N=3) showed no increase in time to ECG ischemic criteria for 3 consecutive occlusions (mean = 4.3, 3.8, 4.3 minutes). In contrast, young wild-type swine withstood consecutive occlusions for 4.4, 8.8, and 15 minutes, thereby showing preconditioning. One aged (9 years) wild-type pig showed tolerance to ischemia by surpassing the 15-minute time limit without reaching ECG criteria while one aged (9 years) AMPK mutant tolerated ischemia even less than the young mutants. The oldest wild-type pig (14 years) failed to precondition.
Conclusion: Our data support the hypothesis that preconditioning to myocardial ischemia occurs in young wild-type, but not AMPK mutant pigs. Aging further decreased ischemic tolerance of AMPK mutants and impaired preconditioning in wild-type pigs. Future studies are needed to clarify the age-dependence of ischemic preconditioning and tolerance in the Ossabaw swine model.

No Strings: A Case of Malpositioned IUD

Junod C, Layman K, Kinney K, Wright M, Sides CC

Case: A 26-year-old G1P1 female presented to the OB/GYN clinic for a 5-week postpartum visit. The patient desired contraception, so using shared decision making the patient and provider proceeded with the levonorgestrel-releasing intrauterine device, Mirena.
Four weeks later, the patient returned for a follow-up visit. A speculum exam was performed, and the IUD strings were not visualized. A transvaginal ultrasound was done which did not show an IUD in the uterus. An abdominal x-ray revealed the IUD in the right lower quadrant. Informed consent was obtained, and the patient was taken to the OR for laparoscopic removal of the malpositioned IUD. The IUD was visualized on top of the omentum at the midline and was successfully grasped and removed. The uterus was inspected which revealed a healed punctate area posterior to the cervix which is presumably where the IUD perforated the uterus.
Clinical Significance: In the U.S., there are approximately 61 million women of reproductive age with 70% of these women not intending to become pregnant.3 IUDs have increased in utilization due to their low failure rate of 0.1-0.4%.2 An advantage of IUD contraception is convenience as the patient does not need to adhere to a regiment as other birth control require. Like with most medical interventions, there are risks and complications with IUDs. Uterine perforation is a rare complication (<1.0%), however some studies suggest there is higher risk for perforation in postpartum and breastfeeding women, both of which apply to the case presented.4
Conclusion: Intrauterine devices are a highly effective and safe form of contraception; however, providers should be aware of potential complications.

Physical Activity Can Enhance Treatment for Substance Use Disorder: A Systematic Review

Blake E, Sawyer A, Savaiano D

Background/Objective: Substance use disorder is a significant yet treatable mental health disorder affecting approximately 20.3 million Americans in 2018. Its continued prevalence indicates the need for additional approaches to complement existing therapies. Physical activity is one potential nontraditional therapy that has been utilized. A qualitative systematic review was conducted to investigate the effects physical activity as a therapy adjunct for non-alcohol and non-tobacco substance use disorder treatment, evaluating effects on substance use and craving levels.
Methods: Using PRISMA guidelines, English language papers in CINAHL, PubMed, Embase, and APA PsycArticles were searched with no date restrictions. In total, 387 abstracts were screened, of which 342 were excluded because they investigated irrelevant outcomes, analyzed solely alcohol or tobacco use disorder, were not primary research, or were duplicates. The remaining 45 citations were reviewed independently by two authors, and 17 were included in the final review. The included studies were graded using a quality criteria checklist based on the quality constructs and domains for research studies reported by the Agency for Healthcare Research and Quality.
Results: Of the 17 included studies, 9 reported favorable outcomes of physical activity on reducing substance use. Four of these articles were of positive quality, and 5 were of neutral quality. Additionally, 4 studies reported favorable outcomes of physical activity on reducing craving levels. All 4 of these studies were of neutral quality. No studies reported unfavorable outcomes.
Conclusion: The findings indicate that exercise may help to reduce substance use and cravings in those undergoing treatment for substance use disorder, but research on which forms of exercise improve treatment for specific substances is needed.
Impact and Implications: This study helps to clarify that further research is needed to optimize the effects of exercise as an adjunct treatment for substance use disorder.

The Effect of Biofilm-Forming Bacteria on Inflammasome Activity

Williams GL, Santra S, Roy R

Background and Hypothesis: Over 75% of chronic wounds have biofilm infection. Biofilm infection derails the overall process of wound healing. Biofilm bacteria have developed strategies to subvert macrophage inflammatory response. The underlying mechanisms of such subversion are currently unknown. Inflammasomes are multiprotein, intracellular complexes that contain caspase-1. Caspase-1 is responsible for cleavage and activation of cytokines IL-1β, a major pro-inflammatory cytokine in chronic wounds. We hypothesized that biofilm bacteria subvert macrophage inflammatory response by attenuating caspase-1 activity and thereby reducing IL-1β. The primary objective of the study was to determine Caspase-1 activity and IL-1β production by blood monocytes derived from patient blood samples exposed to biofilm infection ex vivo and clinical wound macrophages.
Methods: Wound macrophages were isolated from chronic patients seen at Indiana University Health Comprehensive Wound Center (CWC). Blood monocyte derived macrophages (BMDMs) were exposed to conditioning media from isogenic mutant strains SA300ΔsarA or SA300ΔrexB (derived from Staphylococcus aureus USA300LAC) as hypo- and hyper-biofilm forming mutants. Wound macrophages were isolated from wound fluid with known bacterial content. The IL-β release and caspase-1 activity from macrophages were determined using ELISA, PCR, and a colorimetric assay.
Results: Both RT-PCR and ELISA independently exhibited a significant reduction in IL-1β production in macrophages exposed to conditioned media from hyper-biofilm forming SA300ΔrexB as compared to hypo-biofilm forming SA300ΔsarA mutant.
The Caspase-1 activity was significantly reduced in the macrophages challenged with hyper-biofilm forming bacteria as compared to hypo-biofilm forming mutant.
Conclusion and Potential Impact: Biofilm forming bacteria leads to an attenuation in production of IL-1β from macrophages indicating a subversion of inflammatory response. The caspase-1 activity data exhibited a significant role of caspase-1 in biofilm mediated subversion of the inflammatory response indicating a reduction in inflammasome activity. A clear understanding of the mechanisms of biofilm mediated suppression of host response will help improve therapeutic strategies against wound biofilm infection.

Osteoarthritic Severity in Unresurfaced Patellae Does Not Adversely Affect PROMS in Contemporary TKA

Schmidt G, Farooq H, Deckard ER, Meneghini RM

Background: Selective patella resurfacing during total knee arthroplasty (TKA) is experiencing a resurgence as the value of universally resurfacing the patella with modern patella-friendly implants in contemporary TKA is questioned. However, as we define criteria for selective patella resurfacing, the degree of osteoarthritis (OA) acceptable to leave a native patella unresurfaced remains unknown. This study's purpose was to examine the effect of patellofemoral OA severity on PROMS at minimum 1-year in primary TKAs performed without patellar resurfacing.
Methods: 195 TKAs without patellar resurfacing were retrospectively reviewed. Preoperative patellofemoral OA was assessed in medial and lateral facets and graded on severity, marginal osteophytes, and joint space narrowing using Kellgren-Lawrence (KL) and OARSI atlas grading systems. All TKAs were performed using contemporary implants and modern perioperative protocols. Prospectively collected PROMS were evaluated at minimum 1-year follow-up in multivariate statistical models controlling for demographics and covariates.
Results: The cohort was 53% female with mean age and BMI of 61±11 years and 35±8 kg/m2. In multivariate regression, lateral patella KL grade of ≥2 was associated with lower pain scores and higher KOOS JR scores ($p \leq 0.013$), and a knee 'always feeling normal' at minimum 1-year (OR 2.37, 95%CI: 1.14-4.90, $p=0.020$). OA severity via marginal osteophyte and joint space narrowing grades were not associated with any PROMS in multivariate analysis with numbers available.
Conclusion: Interestingly, worse preoperative OA severity in the lateral patellar facet, graded with the KL system, predicted superior knee-specific PROMS in patients with unresurfaced patellae after contemporary TKA. This observation supports the clinical finding that patients with more severe OA have optimized patient satisfaction, and highlights the minimal contribution of patella OA to knee function after TKA for tibiofemoral disease. Further research is warranted to delineate selective patella resurfacing criteria for optimal TKA outcomes.

Selective Patella Resurfacing in Contemporary Total Knee Arthroplasty: A Matched Cohort Analysis

Schmidt G, Farooq H, Deckard ER, Meneghini RM

Background: Leaving the patella unresurfaced in total knee arthroplasty (TKA) is increasing due to modern patella-friendly implants, awareness that complications are not uncommon with resurfacing, and knowledge that historical studies were scientifically confounded for many reasons. The purpose of this study was to examine the effect of selective

patellar resurfacing on patient-reported outcome measures (PROMS) using modern implants and techniques.
Methods: 166 TKAs performed between 2012 and 2019 with patellar resurfacing were case-control matched to 166 TKAs without patella resurfacing. Indications for not resurfacing the patella were central congruent tracking, joint space preservation radiographically and ≤grade 3 patellar chondral damage. Case-control matching was based on age, sex, BMI, ASA-classification, preoperative comorbidities, and preoperative radiographic osteoarthritis severity scores. All TKAs were performed with contemporary patella-friendly components and modern perioperative protocols. Prospectively collected PROMS were evaluated at minimum 1-year follow-up.
Results: There were no significant differences between cohorts in demographics ($p \geq 0.347$), comorbidities ($p \geq 0.443$), or radiographic osteoarthritis severity scores ($p \geq 0.078$). Preoperatively, mean patellar tilt was less for the unresurfaced patella group (3 vs 4°, $p=0.003$); however, mean postoperative patellar tilt was not different (3 vs 3°, $p=0.225$). At minimum 1-year, there were no differences in PROMS between cohorts ($p \geq 0.090$); however, UCLA Activity Level was significantly higher for the unresurfaced patella group (6.4 vs 5.6, $p<0.001$) increasing from a slightly higher preoperative activity level (4.9 vs 4.4, $p=0.014$). There was no difference in all-cause reoperation rates between cohorts ($p=0.723$).
Conclusion: In modern contemporary TKA, not resurfacing the patella in select patients achieves equivalent minimum 1-year patient-reported outcomes and potentially greater functional activity level compared to patella resurfacing. Leaving select patellae unresurfaced will likely conserve healthcare resources, decrease cost, improve operative efficiency, and minimize resurfacing-related complications to the extensor mechanism. Continued research with contemporary implants and surgical techniques and enhanced scientific rigor is warranted.

The Contribution of Polytrauma and Hemodynamic Shock on Infection and Reoperation in Tibia and Femur Fractures: A Multivariate Regression Analysis

Schmidt G, Farooq H, Simpson A, Sharma I, Lopas L, Jang Y, Mullis B, McKinley T

Background: Tibia and femur fractures often result from high-energy injuries and frequently occur in the setting of polytrauma. Current literature suggests polytrauma is a risk factor for both delayed healing and nonunion of these fractures. Prior study in animal models have demonstrated a negative effect of hemorrhage on fracture healing. However, no clinical studies have delineated which components of polytrauma predict delayed healing or nonunion, and it is unknown if hemorrhage or shock at presentation contributes to postoperative complications after operative management of tibia and femur fractures.
Methods: A retrospective review of all tibia and femur fractures treated with an intramedullary nail (IMN) from 2013-2018 at a single level 1 trauma center was performed. Patients age 18-55 with a tibia fracture or femur fracture below the level of the lesser trochanter treated with IMN were eligible. 392 tibia and 367 femur fractures were included in the final analysis after all cases with pathologic fractures, planned revision for bone grafting, and subacute presentation were excluded. Patient specific variables including demographics, ASA, pH, base deficit, shock index, Injury Severity Score (ISS), open fracture, additional orthopaedic injuries, length of hospital stay, smoking, vascular injury, fasciotomies, use of external fixation, and postoperative weight bearing status were collected. Fractures were classified using the OTA/AO Classification. All data for reoperations were collected and categorized based on the indication(s) for surgery.
Results: There was no significant effect of ISS, pH, shock index, or base deficit on any of the analyzed outcomes. Multivariate analysis showed open fracture (Odds Ratio (OR)=4.85, $p<0.001$), fasciotomies (OR=2.32, $p=0.027$), restricted weight bearing (OR=1.92, $p=0.013$), and age (OR=1.03, $p=0.015$) correlated with overall reoperations. Deep infection was predicted by the need for flap coverage (OR=3.59, $p=0.050$) and open fracture (OR=3.12, $p=0.023$). Predictors of reoperation for aseptic nonunion included open fracture (OR=2.73, $p=0.0002$), smoking (OR=1.99, $p=0.018$), number of additional orthopaedic injuries (OR=1.12, $p=0.048$), and age (OR=1.03, $p=0.043$).
Conclusion: These results support previously published literature demonstrating the negative effect of soft tissue injury around the site of a fracture, but they do not show how shock at presentation effects the rate of reoperation, nonunion, or infection. There does not appear to be a clear link between the global magnitude of injury and reoperation whereas a high magnitude of local, soft-tissue injury resulting in open fracture, need for fasciotomies, and flap coverage had a significant effect on re-operation.

A connection between PTSD and schizophrenia and the need for better treatment for female veterans

Petroskey J, Tat K, Vander Missen T, Raza M

Case Description: A 57-year-old female with past medical history of schizoaffective disorder and alcohol use disorder in sustained remission, is admitted due to psychosis. She was reported missing by her husband and was later found wandering throughout the neighborhood. Her last visit with her outpatient psychiatrist was a month ago, at which time she was doing well. She is a veteran on full social support secondary to her psychosis.
Conclusions: A majority of returning veterans experience PTSD, and studies have suggested a possible connection between PTSD and developing schizophrenia. Reports show

a higher frequency of psychotic symptoms of schizophrenia in patients with PTSD, and certain studies have gone further to show a possible genetic component linking PTSD with schizophrenia. Thus, there could be dangerous future complications in patients with PTSD without proper diagnosis and treatment. This problem may be more prevalent in the female veteran population since they are the fastest growing group of veterans, less likely to use the VA compared to males, and tend to carry a greater psychiatric burden.
Clinical Significance: Since PTSD and schizophrenia present with similar symptoms, there may be failure to identify a comorbid psychotic disorder. This challenges traditional diagnostic boundaries with implication for treatment. Therefore, it is important for physicians to differentiate between psychosis and PTSD symptoms and to take notice of associated features of comorbidity so appropriate treatment can be provided. A recent study has shown that female veterans with PTSD treated in female-only settings report longer lengths of stay and have better adherence to treatment programs. Future work includes increasing the number of these programs along with decreasing the stigma of seeking mental health treatment.

Endogenous Maternal Lipids and Supplementation with Vitamin E Isoform Regulate Neonatal Dendritic Cells during Development of Allergic Disease

Tat K & Cook-Mills J

Background and Hypothesis: CDllb+CDllc+ dendritic cells (DCs) play a role in the development of allergic disease. It has been shown that of the vitamin E isoforms, α-Tocopherol decreases and γ-Tocopherol increases the generation of bone marrow-derived CD11b+CD11c+ DCs in vivo. And, in vivo experiments have also shown that β-glucosylceramides, endogenous maternal lipids, increase the neonate proliferation of this same subset of DCs. The mechanism for β-glucosylceramide regulation of these specific DC subsets is not known. Furthermore, it is also not known how vitamin E isoforms regulate DC development and differentiation. We determined whether α-tocopherol decreases and γ-tocopherol increases responses to β-glucosylceramide by regulating Protein Kinase C (PKC) activation during CDllb+CDllc+ DC differentiation and proliferation.
Project Methods: Cultured bone marrow cells (harvested from mice) were treated with lipid metabolites with and without supplementation of tocopherol isoforms, immunolabeled with antibodies that define DCs and with antibodies that detect active auto phosphorylated forms of PKC. Then, these cells were analyzed using flow cytometry.
Results: In vitro β-glucosylceramide elevated DC PKCα/β activity during CDllb+CDllc+ DC differentiation and proliferation/activation. Furthermore, these effects of β-glucosylceramide on DC PKCα/β activity were blocked by α-Tocopherol and elevated by γ-Tocopherol.
Potential Impact: These data provides a better understanding of how maternal β-glucosylceramide and dietary supplementation with vitamin E isoforms regulate DC proliferation and differentiation and ultimately development of allergic inflammation in offspring of allergic mothers.

Pathology Communication Following Endoscopy

Kabir J, Maratt J

Background: Colonoscopies and esophagogastroduodenoscopies (EGDs) are commonly performed to screen for polyps and Barrett's esophagus (BE), respectively. Findings from screening exams determine if, and when, surveillance is needed. Within the Veterans Health Administration (VHA), communication of test results is mandated; however, there is no clear guidance on how to communicate these results. The aim of this study was to determine the content and readability of endoscopy pathology letters that are used to relay results to patients within the VHA.
Methods: We used Corporate Data Warehouse to identify patients at VHA endoscopy sites nationwide who had a colonoscopy for colorectal cancer screening or post-polypectomy surveillance, or an EGD for BE screening or surveillance, between 2010-2018. We then identified patients who had either: low-risk colon adenomas (LRA), high-risk colon adenomas (HRA), non-dysplastic BE (NDBE), BE with low-grade dysplasia (BE-LGD), or BE with high-grade dysplasia (BE-HGD). Pathology letters for each of these findings were obtained and reviewed by two reviewers independently to categorize as containing 'alarming,' 'not alarming,' or 'balanced' terminology. The readability of each letter was determined by using Microsoft Word to obtain the Flesch-Kincaid reading ease and grade level equivalency scores. Preliminary results are presented below.
Results: Pathology letters from 8 VHA sites reviewed thus far were found to be non-alarming for LRAs and NDBE; balanced for BE-LGD; and balanced to alarming for HRAs and BE-HGD. The median Flesch-Kincaid reading ease and grade level equivalency scores for the letters were 43.3 and 10.4, respectively.
Conclusion and Potential Impact: While pathology letters may contain risk-appropriate terms to describe lesions, readability measures indicate that the content is written above the recommended 5th grade level for patient education materials. Improving the readability of pathology letters could improve patients' understanding of their risk status, thus leading to increased adherence to surveillance endoscopy recommendations.

Underweight is Associated with Mortality Among Ugandan Children with Plasmodium falciparum Severe Malaria

Brown LD, Datta D, Bond C, Namazzi R, Opoka RO, John CC

Background: The past two decades have witnessed a 60% decline in global malaria mortality. However, two thirds of all malaria deaths continue to occur among children <5 years, with a majority in the WHO African Region. Malnutrition is an important risk factor for malaria. Globally, wasting, stunting and being underweight are crucial indicators of malnutrition, and are associated with increased mortality in children <5. Those most vulnerable to malaria and malnutrition are children <5 living in Sub-Saharan Africa, particularly in rural areas often facing a higher burden of disease.
Objective: The objective of this study was to assess the prevalence and persistence of nutritional abnormalities causing children to be underweight, stunted, or show signs of wasting, and the association of these abnormalities with in-hospital and post-discharge mortality, risk of repeat illness and long-term sequelae in Ugandan children with 5 different forms of severe malaria (SM) compared to community children (CC).
Methods: We conducted a prospective observational study investigating neurocognitive outcomes at 12-months after severe malaria episode in 600 children with SM and 120 CC, aged 0.5-4 years, between 2014-2017 at 2 hospitals (Kampala and Jinja) in Uganda. Using age-adjusted scores from healthy CC, we calculated z-scores for weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ). We defined underweight, stunting, and wasting as 2SD below the WAZ, HAZ, and WHZ means.
Results: At baseline, children with SM had significantly lower mean WAZ and HAZ compared to CC (-1.1 [1.1 SD] vs. -0.47 [1.1], p<0.001; -0.68 [1.1] vs. 0.30 [1.0], p<0.001, respectively), with no difference by site. By 12-month follow-up there were no significant differences in nutritional markers between SM and CC. During admission, 44 (7.3%) children with SM died. Higher baseline WAZ was associated with decreased risk of in-hospital death in children with SM across the two sites (OR [95% CI] = 0.70 [0.51, 0.95], p=0.02), with no significant interaction between WAZ and site. Baseline HAZ and WHZ were not significantly associated with in-hospital mortality (OR [95% CI]) = 0.84 [0.66, 1.06] and 0.77 [0.57, 1.02], respectively). During the post-discharge period, 23 (4.4%) children with SM and 1 (0.9%) CC died prior to 12-month follow-up. Nutritional marker z-scores were not significantly associated with risk of post-discharge mortality in children with SM, overall and by site. However, children in Kampala who were underweight had increased odds of post-discharge mortality compared to those who were normal weight (OR [95% CI] = 4.18 [1.36, 12.84], p=0.01). Among those who survived in Kampala, higher WAZ was associated with increased risk of returning to clinic for any cause within 12-month follow-up (HR [95% CI] = 1.16 [1.06, 1.28], p=0.002), but was not significant for malaria sick visits or readmission. HAZ and WHZ in Kampala and all nutritional markers in Jinja were not significantly associated with return sick visits or readmission.
Conclusion: Underweight and stunting were worse in both sites among children with SM versus the controls at 1 month, and both of these nutritional parameters normalized by 12 months. In Kampala, low WAZ was associated with worse mortality outcomes after discharge, while high WAZ was associated with repeat clinic visits. In both sites, high WAZ was protective against in-hospital mortality. Chronic malnutrition and SM remain severe risk factors for mortality in Uganda. Weight status was found to have the most significant impact on mortality outcomes. The high incidence of mortality among children <5 with SM requires urgent intervention, and nutrition programs should be aimed at increasing weight, especially in the early months of disease.

Postoperative Pancreatic Fistula Following Traumatic Splenectomy: A Multi-center Analysis

Arnold P, Meagher A, Hartwell J

Background and Hypothesis: Development of postoperative pancreatic fistula (POPF) in cases of adult splenectomy following trauma occur in 1-3% of cases. Incidence of this complication leads to increased mortality rates, length-of-stays, and costs for patients. In cases where no previous pancreatic injury was noted, we hypothesized that the use of sutures in splenic hilum ligation instead of staples reduced the rate of incidence.
Methods: Adult trauma patients (age ≥17 years) that underwent non-elective splenectomy from 2010-2020 at Indiana University Methodist Hospital and Eskenazi Hospital were retrospectively evaluated from the hospitals' trauma registries. Patients were excluded if they were pregnant, currently incarcerated, expired within 72 hours of hospital admission, or had a pancreatic injury diagnosed preoperatively or intraoperatively. A logistical regression with Firth correction for rare events was used to analyze the data.
Results: 262 adult splenectomies following trauma occurred between 2010 and 2020 at Methodist Hospital; 160 passed exclusion criteria and were included in our analysis. 79 cases were conducted at Eskenazi Hospital during this period; 49 passed exclusion criteria. Sutures alone across hilar structures were used in 167 cases, 7 of which developed POPF (4.0%). Staples alone across hilar structures were used in 17 cases, 5 of which developed POPF (22.7%). A combination of staples and sutures was used in 11 cases, none of which developed POPF. 2 cases did not report their technique, but POPF did not develop in either of these patients. The use of staples alone in splenic hilum ligation holds an odds ratio of 6.983 (p<0.05) of POPF development compared to sutures alone. Individuals sent to interventional radiology prior to operation also developed POPF at a lower rate (3.3%) than those who were not (6.5%).

Conclusion:Our study finds a statistically significant increase in the rate of POPF formation when staples are used in splenic hilum ligation instead of sutures. In our 10-year retrospective review of POPF, we found the complication to be rare but morbid, with associated prolonged length of hospital and ICU stays and requiring multiple imaging studies and interventions, leading to increased costs. We conclude that further study of optimal technique for emergent splenectomy is warranted.

Failure to Launch: Risk Factors and Prevention in Same-Day Discharge Following TJA

Foley DP, Sonn KA, Ghosh P, Ziemba-Davis M, Meneghini RM

Background: Rapid recovery protocols have enabled the transition of total joint arthroplasty (TJA) from the inpatient to outpatient setting. However, reasons for same-day discharge (SDD) failure have not been comprehensively identified. This study explored barriers to successful SDD following primary TJA.
Methods: A retrospective review of 398 consecutive primary unilateral TJAs performed by a single surgeon at an academic center between 2017 and 2020 with planned SDD was performed. Failure of SDD was defined as lack of discharge before midnight on the day of the procedure. Failure to achieve SDD was examined in relationship to 35 demographic, medical, social, and psychological characteristics of patients; intraoperative factors; and postoperative complications.
Results: Fifty-seven percent of the sample was female, with average age and BMI of 58 (19 to 83) years and 31 (18 to 54) kg/m2. A binary logistic regression model retaining age, the Outpatient Arthroplasty Risk Assessment (OARA) score, morphine milligram equivalents (MMEs) consumed per hour, and postoperative urinary retention ($p \leq 0.003$) explained 74% of the variance in failed SDD. Every five year increase in age, 20 point increase in OARA score, and increase of 0.5 MMEs consumed per hour increased the likelihood of failure by 1.9 (95% CI 1.2, 2.9), 2.4 (95% CI 1.5, 3.8), and 4.0 (95% CI 2.4, 6.6) times, respectively. On average, patients who failed SDD (18±19) traveled fewer miles for surgery than those who achieved SDD (27±30, $p>0.05$).
Conclusion: Increasing age and comorbidities as reflected in OARA scores are predictive risk factors for failure to launch, highlighting the importance of patient selection when planning SDD. Urinary retention is a key complication that can prevent SDD. Successful outpatient TJA relies on the adoption of modern perioperative protocols, appropriate patient selection, and the ability to predict and prevent the common postoperative problems that routinely result in failure to launch.

The Impact of the COVID-19 Pandemic on the Mental Health and Health Care Use of Older Adults

Seibert T, Perkins AJ, Batista-Malat E, Fowler NR

Objectives: Fear of contracting coronavirus infection and mandatory stay-at-home orders may be associated with social isolation and loneliness, both risk factors for depression and anxiety. This study compared symptoms of depression and anxiety before and during the COVID-19 pandemic and to examine rates of loneliness and avoidance of health care seeking behaviors among a large sample of community dwelling older adults.
Methods: Participants were enrolled in the Caregiver Outcomes of Alzheimer's Disease Screening (COADS) trial and included 1,539 adults age ≥65 years old living in the community who receive primary care in central Indiana. Mean scores on the Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder Scale (GAD-7) before and during the pandemic were compared. Measures of loneliness and behaviors regarding health care use were also compared.
Results: Baseline characteristics were similar between the pre-COVID-19 and during COVID-19 groups with the exception of age, race, and educational level. Nearly one-third of older adults and their caretakers reported feeling down or depressed. In addition, more than 40% felt nervous, anxious, or on edge as a result of COVID-19, and up to 20% of patients and caregivers also reported feeling alone or apart from others. Furthermore, 7% of patients and 6% of caregivers reported delaying care for possible medical emergencies during the COVID-19 pandemic.
Conclusion: Targeted interventions may help reduce the impact of COVID-19-specific social isolation on the mental health of older individuals. Further research on the indirect consequences of the COVID-19 pandemic is required to determine the impact of delaying treatment.

Impact of SSKI vs. Corticosteroids on Total Thyroidectomy for Graves Disease: A Retrospective Review

Baumgartner TC, Allison HR, McDow AD

Background: Graves disease is an autoimmune disorder resulting in overproduction of thyroid hormone. While medical management can be used to reestablish euthyroid state, definitive management includes radioactive iodine or total thyroidectomy. For patients undergoing thyroidectomy, SSKI is frequently prescribed preoperatively to decrease thyroid vascularity and intraoperative blood loss. However, a corticosteroid is often given when rapid preparation is necessary prior to surgery. This study explores the impact of SSKI compared to corticosteroids and hypothesizes that replacement of SSKI with corticosteroid will improve surgical outcomes.
Methods: We performed a retrospective review of 26 Graves

patients undergoing total thyroidectomy from 2015-2020. 18 patients received SSKI prior to surgery, 2 received a corticosteroid in addition to SSKI, 1 received a corticosteroid alone, and 5 received neither. Symptomatology, length of stay, intraoperative blood loss, transient hypoparathyroidism, and thyroid weight were compared.
Results: Patients receiving corticosteroids experienced shorter stays (1.0 day vs 1.3 days), greater postoperative parathyroid hormone levels (43.0 pg/mL vs 28.9 pg/mL), less intraoperative blood loss (14.4 mL vs 41.4 mL), and presented with smaller thyroid glands (30 g vs 47 g) compared to those who received SSKI. There was a statistically significant difference in estimated blood loss between the groups ($p = 0.0348$). For some patients, the addition of a steroid to SSKI decreased surgery time (1.98 hours vs 2.32 hours).
Conclusion: Despite limitations in sample size and the retrospective nature of this study, results suggest a positive impact of corticosteroid use on surgical and patient outcomes compared to SSKI alone. Future examination may benefit from greater sample size and equal distribution of patients among groups. We propose further exploration with a prospective study to evaluate the impact of SSKI vs. corticosteroids on surgical difficulty and postoperative complications for Graves disease patients.

Comparison of Diffusion and Perfusion Techniques in Differentiating High Versus Low Grade Pediatric Brain Tumors

Chen E, Ho C, Gray B, Parker J, Diller E, Wen Q, Wu Y, Anthony G, Territo R

Background/Objective: Brain tumors are the most common solid cancer in children and cause significant mortality and morbidity. We compare the effectiveness of different parameters in predicting tumor grade between dynamic contrast enhancement (DCE), intravoxel incoherent motion (IVIM), dynamic susceptibility contrast (DSC) perfusion and diffusion weighted imaging (DWI).
Methods: A retrospective blinded review of pediatric brain tumors with DCE, IVIM, DWI, and DSC was performed. Parametric maps were registered to T2 weighted images. Volumetric regions of interest (ROI) were manually segmented from solid tumor components for each patient by a neuroradiologist (CH), neuroradiology fellow (BG), and medical student (EC). Resulting mean values for parameters from DCE (Ktrans, Kep, Ve, Vp,), IVIM (D, D*, f), DSC (rCBV) and DWI (ADC) were compared using Student's t-test for high- and low-grade tumor groups based on WHO grading from pathology. For significant parameters, receiver operating characteristic (ROC) analysis with area under curve (AUC) was performed.
Results: 20 subjects were included with 9 low grade and 11 high grade tumors. Significant differences between low versus high grade were demonstrated for D (10−3 mm2/s) (1.4±0.4 vs 0.9±0.2, p=0.01), f (0.04±0.02 vs 0.07±0.02, p=0.02), ADC (10−3 mm2/s) (1.4±0.4 vs 0.9±0.3, p=0.009) and rCBV (2.2±0.9 vs 4.7±2.1, p=0.003). No significant difference was found for D* or any DCE parameter. AUC from ROC was similar for all significant parameters [D (0.81, p=0.003); f (0.80, p=0.003); ADC (0.83, p=0.001); rCBV (0.83, p=0.0005)].
Conclusion: D and f parameters from IVIM can significantly differentiate high versus low grade pediatric brain tumors similar to ADC and rCBV. Conversely, no DCE parameter was significant.
Scientific Implications: The results will assist the selection of MRI sequences that best predict tumor grade, as well as guide tumor biopsy for the most aggressive tumor portions. Further study of these techniques may correlate with molecular profiling and predict outcome.

Depressive Symptom Screening in Youth Using a Community Diabetes Prevention Clinic

Wright A, Yazel-Smith L, Hannon T

Background: Rates of youth diagnosed with diabetes and prediabetes are increasing and comorbidities like depression warrant strict monitoring to improve patient outcomes.
Objective: The aim was to determine if increased depressive symptoms are associated with worse clinical findings, including BMI, obesity, diabetes, prediabetes, hemoglobin A1c (HbA1c), and demographic variables including age, gender, and race.
Methods: The study is a retrospective chart review of patients referred to the Youth Diabetes Prevention Clinic (YDPC) based on increased risk for type 2 diabetes (T2D). Patient Health Questionnaire (PHQ-9) forms, a 9-question depressive symptom screening tool, were evaluated for each patient. Total scores were assessed categorically, using a cut point of >=10 which indicates possible depression and a need for further evaluation. All data were evaluated for clinic visits occurring between 2013 and 2020.
Results: 178 patients filled out PHQ-9 pre-screening forms and returned them to clinic. Age ($p < 0.01$), sex ($p < 0.01$), BMI ($p < 0.01$), HbA1c ($p < 0.01$), and obesity diagnosis ($p = 0.01$) were associated with increased depressive symptoms based on screening score cutoff. Race ($p > 0.05$), BMI z-score ($p = 0.18$), prediabetes diagnosis ($p = 0.92$), and diabetes diagnoses ($p = 0.05$) were not. Middle adolescent youth were nearly 3.5 times more likely than early adolescents to fall into the moderate/high risk category for depression. Females were 2.6 times more likely and those with higher HbA1c or an obesity diagnosis were nearly 3 times more likely. A modest portion (36.5%) in this sample met criteria for possible clinical depression.
Conclusion and Impact: Patients at risk for prediabetes and diabetes should be screened for depressive symptoms in order to address and combat its adverse effects on diabetes management. Older youth, females, and those with obesity and higher HbA1c values may be at particularly higher risk of having increased depressive symptoms.

Being Born into a Pandemic: COVID-19 and Pregnancy

Swiezy S, Campbell M, Eckert N, Coutinho K, Yeagley T

Case #1: 34yo Asian female G2P1001 presents COVID19+ in 1st trimester. PMH insignificant. Meds: prenatal vitamins. Surg Hx: c/s healthy boy (2017). No h/o GHTN, GDM, or eclampsia. D/t COVID19+ infection, frequent fetal u/s monitoring done at 32w5d, 34w5d, 38w0d. Fetal growth over time: 63.4%, 48.8%, 14.3%. Fluid over time: AFI 8.58cm, MVP 4.52cm; AFI 10.86, MVP 3.52; AFI 2.73, MVP <2. Oligohydramnios diagnosed at 38w0d; emergent repeat c/s performed. Mother and baby healthy s/p delivery, d/c home on PPD#2. Pathology of placental tissue shows increases in villous fibrin accumulation and maternal vascular malperfusion.
Case #2: 29yo Caucasian female G1P0 presents to ED at 18w4d with c/o runny nose, cough, and headache; temp. 100.3*F; tests COVID+. PMH insignificant. Meds: prenatal vitamins. No h/o GHTN, GDM, or eclampsia. 21w0d u/s: growth 71.4%, normal anatomy. 30w0d u/s: growth at 82.3%, AFI 15.10cm, MVP 5.38cm. At 39w1d, healthy infant boy (7lb12oz) via VAVD. Mother and baby healthy s/p delivery, d/c home on PPD#2. Placenta not sent for surgical pathology.
Conclusion: Due to the short time course of the COVID19 pandemic, adequate evidence to link maternal-fetal outcomes to infection during pregnancy is just now becoming available. Other coronaviruses, SARS and MERS, are preferentially fatal in pregnant mothers; and, adverse perinatal outcomes in COVID19+ women are appearing. Case reports have associated COVID19 with preterm birth; one study reported 47% preterm deliveries in COVID19+ mothers. Molecular studies have confirmed ACE2 (receptor allowing viral cellular entry) mRNA overexpression in placentas. Placental histopathology has shown maternal-placental interfacing blood vessel anomalies.
Clinical Significance: COVID19 represents a monumental threat to public health. Pregnant women and fetuses may be at increased risk for complications compared to the general public. As yet, the relationship between COVID19 and pregnancy remains to be clarified and will require further investigations to understand associations and promote evidence-based treatment practices.

Motivations of Utilizing Midwifery and Birthing Centers over Hospital-Based Obstetrics Care in Rural Indiana

Eckrote E, Danek R, Reyes E

Midwifery has been around for centuries and has only recently been overtaken by obstetrician attended hospital-based births. However, women all over are still turning to midwives for their prenatal, birth, and post-natal follow-up obstetric care. There are numerous studies examining the motivations of women who seek out midwives, but few focus on rural women. For example, in studies using large urban populations, we know women choose midwifery because of the lower costs, more natural methods of pain management (such as breathing techniques and water births), longer prenatal visits, options for faith-based care, and more variety in birthing position and location options. Likewise, studies have shown that rural women seek out community births, births that take place in the home or a birthing center, at a rate far higher than their urban counterparts. Given the paucity of data on rural midwifery care and the increased utilization of midwifery in rural areas, there is a need for rural-specific research. This knowledge could be imperative for re-examining insurance coverage, birth data, pre-natal care records, and the rural healthcare system. For these reasons, it is imperative to learn if the women seeking care at rural midwifery practices and birthing centers are reflective of those seeking midwifery care nationwide.
This study examines the reasons why women are seeking midwifery care over the now traditional hospital-based obstetrical care. Data has been collected through a survey at three midwifery practices in Indiana and examines the values in obstetrics care, birth, and post-partum follow-up, in addition to other motivating factors, in women who have chosen midwifery care. The results of this study provide insight into the motivating factors that are leading women to choose midwifery and can influence clinical practice for both midwives and obstetricians, guide patient expectations, improve provider interactions, and change the way we view the rural midwife in our Midwest communities.

TB or not TB: A case of tuberculous mastitis with possible Poncet's disease

Fraser AL and Gandhi D

Tuberculosis (TB) is a common pathogen worldwide that is less commonly diagnosed in the USA with a host of clinical manifestations. Herein we will present a patient with tuberculous mastitis (TM) and possible Poncet's disease (PD).
A 32 year old Yemeni female presented with right breast pain for two weeks. Physical exam was significant for a tender, mobile breast lump without erythema or discharge. Ultrasound of the breast showed a 2.6 x 1.5 x 1.8 cm irregular hypoechoic mass. Biopsy showed noncaseating granulomatous inflammation with occasional histiocytic giant cells and negative acid-fast bacillus (AFB) staining. Several weeks later the patient returned for worsening joint pain involving the back and bilateral wrists, ankles, and knees. Imaging of the affected joints was unrevealing. Lab findings were significant for elevated ESR and CRP with negative rheumatologic workup. The patient was started on prednisone with little benefit for a presumed diagnosis of seronegative rheumatoid arthritis. A QuantiFERON gold test was positive for TB though chest x-ray showed no evidence of pulmonary TB. Given the findings, the diagnosis of TM was

made. With this diagnosis of extra-articular TB and symmetric joint pains the diagnosis of concomitant PD was raised as well. The patient began treatment for TB and is being monitored by infectious disease.
Both TM and PD are rare conditions that are difficult to diagnose. TM is a rare clinical entity, but is more common in south Asia and Africa. Diagnosis is based on clinical suspicion, granulomatous lesion on biopsy, and response to TB therapy. Since TM has few organisms, AFB culture is lower yield compared to other samples such as sputum. PD is a rare para-infective symmetrical polyarthritis that involves predominantly the large joints. It can precede, follow, or manifest concomitantly with features of active, generally extra-pulmonary TB. The diagnosis is largely clinical and patients generally improve with TB treatment.

Pedicled Cervical Lymphoadipose Tissue for Volume Reconstruction after Superficial Parotidectomy

Davis KP, Fraser AL, Shay EO, Sim MW

Volume restoration is often required after parotidectomy due to the resultant facial contour deformity. Common procedures include local pedicled flaps, such as the sternocleidomastoid muscle flap, fat grafting, and even autologous free flaps, for more extensive defects. Local pedicled flaps have the advantage of a single surgical site, which spares the patient the added morbidity of a separate fat graft donor site, while simultaneously reducing the operative time. We report two cases of a novel reconstructive option using pedicled level I and II cervical lymphoadipose tissue for volume restoration after superficial parotidectomy. This reconstruction would be useful for patients with benign parotid lesions and inferior parotid defects. In addition, with maintained blood supply to this tissue, it would likely provide sustained bulk over time.

Pineal gland hypermetabolic involvement without central nervous system symptoms in a pediatric patient with primary nodular sclerosis subtype classical Hodgkin Lymphoma

Kokoska R, Beltz E, Smith J, Razzouk B

This case report presents the first reported pediatric case of primary classical nodular sclerosing Hodgkin Lymphoma (HL) with pineal gland involvement, presenting without CNS symptoms, which completely resolved after 2 cycles of chemotherapy. The 12 year-old male first presented with a right inguinal mass and external iliac lymphadenopathy accompanied by B symptoms. He was diagnosed with stage IV B classical HL, and as part of the staging work-up, a full-body PET/CT scan was performed. In addition to the right inguinal mass, the PET/CT demonstrated increased FDG uptake at the pineal gland along with level II lymph nodes. The patient was treated with ABVE-PC chemotherapy (Doxorubicin, Bleomycin, Vincristine, Etoposide, Prednisone, and Cyclophosphamide) as per standard arm of AHOD1331 COG protocol for newly diagnosed high-risk HL patients, which resolved the pineal mass after 2 cycles without requiring radiation therapy. Following 5 cycles, a full-body PET/CT showed no brain or neck activity, along with decreased size and activity of the right groin mass.
To our knowledge, there are no other documented cases of primary HL with specific pineal involvement, and no cases that lack CNS symptoms altogether like this one did. Additionally, this is the third published pediatric case of primary CNS-HL, both of the previous cases were treated with radiotherapy and presented with CNS symptoms. Thus, this case demonstrates the importance of ordering a full-body PET/CT as part of the initial HL work-up and provides evidence that chemotherapy alone is a treatment option for some patients with primary intracranial HL.

Family Planning and Abortion Curriculum Topics are Not Adequately Covered in Medical School Pre-Clinical Years

Komanapalli S, Brown L, Swiezy S, McKinzie A, Bernard C

Introduction: In the United States, one in four women will have an abortion by age 45. Therefore, abortion is an extremely common medical procedure that many patients will experience and an exceedingly important topic that should be covered by medical education. However, medical schools often do not sufficiently educate students about this essential medical procedure. Our study sought to determine whether Indiana University School of Medicine (IUSM) adequately educates students about reproductive health topics, such as abortion and contraception.
Methods: We distributed a survey to perform a cross-sectional analysis of medical students to assess interest, exposure, and preparedness to counsel surrounding reproductive health topics.
Results: We surveyed 303 students with 61.72% being female, and 74.3% white. The majority of the students surveyed expressed a desire to learn about reproductive health topics, including abortion counseling, with 83% students reporting that IUSM should enhance its reproductive health curriculum. When asked if students felt prepared to counsel patients about various topics, only 18% responded "yes" regarding abortion options. In stark contrast, the majority felt prepared to discuss options for beta blockers (66%) and antidepressant therapy (70%) with patients. Most students surveyed said they would prefer abortion and contraception counseling instruction to occur during medical school as opposed to residency or fellowship.
Discussion: Our results suggest that while students expect to learn about abortion and contraception in medical school in order to adequately counsel patients, the current curriculum does not meet this need. Our study was limited by the number of students surveyed (20% of total student body)

and an over-representation of female and white students. In future studies, we would seek to sample a larger and more representative cross-section of students. We aim to use this data to improve our institution's curriculum so that it better prepares students for careers in medicine.

Understanding the health needs and priorities of people who access comprehensive harm reduction programs

Chhabra M, Stavas N, Vij N, Kumar E, Shea JA

Substance use disorder is a common cause of morbidity and mortality in the United States. Comprehensive harm reduction programs have emerged as a public health strategy to help those with substance use disorder. At this time, little is known about the population of people who utilize comprehensive harm reduction programs. To address this gap in knowledge, we examined health needs and priorities among people who utilize a comprehensive harm reduction program. We conducted in depth semi-structured interviews with 29 people who access services at a harm reduction program. Themes from the qualitative interviews revealed priorities included improving housing stability, sobriety, and reunification with children. Lack of trust of the health care system was often reported as a barrier to optimal medical care. Comprehensive harm reduction programs are in a position to offer services that can help improve physical health and social determinants of health for people with substance use disorder.

Subfascial epidural drainage protocol following intraoperative durotomy in posterior thoracic and lumbar spine surgery: reoperation prevention and outcomes among drained and undrained cohorts

McVeigh L, Wilson C, Williams A, Acchiardo J, Bradbury J

Introduction: Persistent CSF leak following intraoperative durotomy in posterior thoracic or lumbar spine surgery may lead to devastating complications often requiring reoperation, resulting in increased cost and morbidity. In this study we evaluate the safety and efficacy of our subfascial epidural drainage protocol designed to prevent CSF leak-related complications and reoperation in the setting of intraoperative durotomy.
Methods: We performed a retrospective review of drained and undrained cohorts at our institution to identify associated and protective factors for reoperation
due to persistent CSF leak-related symptoms. Incidence of reoperations, perioperative
complications, need for rehabilitation, and readmission were compared between cohorts. This protocol included primary durotomy repair if possible, followed by subfascial epidural drainage at full suction for up to seven days postoperatively. Drain was removed if persistent position headaches were present despite drainage at half suction or to gravity, head-of-bed recumbency, and caffeine supplementation.
Results: Among 170 patients (mean 18.5 month follow up), 156 underwent our subfascial epidural drainage protocol and 14 patients were undrained. Drainage for up to 7 days was associated with a significantly lower incidence of reoperation than no drainage (3.3% vs. 14%, respectively; p 0.03). No significant difference in perioperative complication incidence between cohorts was observed (12.8% vs 21.4%, respectively; p 0.37). Hospital LOS was unchanged regardless of drainage (median 7 days). Subfascial drainage conferred a significant risk reduction in inpatient rehabilitation requirement (RR 0.55) as well as 30-day (RR 0.31) and 90-day readmission rates (RR 0.36).
Conclusion: This subfascial epidural drainage protocol was successful in preventing reoperation for CSF leak-related symptoms without added cost or morbidity to the patient.

Mithramycin-A Prevents Early Diet-Induced Insulin Resistance in C57BL/6NJ Mice

Covert J, Grice B, Thornburg M, Tackett L, Bhamidipati T, Stull N, Kim T, Habegger K, McClain D, Elmendorf J

An inverse correlation between cholesterol content and glucose disposal rate is seen in human muscle biopsies from individuals across a range of insulin sensitivities. In vitro studies suggest increased hexosamine biosynthesis pathway (HBP)-mediated Sp1 transcription of HMG-CoA reductase (HMGR) as a mechanism of cholesterol accumulation and insulin resistance (IR). The aim of this study was to determine if Sp1 inhibition with mithramycin-A (MTM) would prevent muscle cholesterol buildup and IR seen in mice fed a HF diet for one week. Mice fed this short-term HF diet did not have an increase in adiposity, lean mass, or body mass, nor did daily MTM treatments affect body composition, caloric intake, or activity. However, this diet caused significant glucose intolerance and IR that MTM prevented. Consistent with this drug inhibiting Sp1 transcriptional activity, skeletal muscle Sp1 binding to the HMGR promoter was blocked. Similarly, MTM restored insulin sensitivity in mice with targeted muscle overexpression of glutamine-fructose-6-phosphate-amidotransferase, the rate-limiting HBP enzyme. Concomitant increases in HMGR expression and cholesterol were measured in muscle from transgenic mice and these were mitigated by MTM. These data identify increased HBP/Sp1 activity as an early mechanism of IR. Therapies targeting this mechanism may decelerate type 2 diabetes development.

Predicting cerebral vasospasm by the severity of hyponatremia after aneurysmal subarachnoid hemorrhage

Troja W, Weyhenmeyer J, Bohnstedt B

Background: Patients who suffer from aneurysmal subarachnoid hemorrhage (aSAH) are at increased risk of developing hyponatremia. Previous studies defining hyponatremia by serum sodium levels have led to controversial conclusions on the relationship between hyponatremia and cerebral vasospasm. We stratified hyponatremia based on severity of clinical treatment and aimed to determine if the treatment of clinical hyponatremia is independently associated with cerebral vasospasm.
Methods: A retrospective analysis of consecutive patients who presented and were treated for aSAH at our institution was conducted from 2008 to 2020. Patients were stratified by their hyponatremia treatment and evaluated for their relationship with cerebral vasospasm, inpatient vasospasm therapies, and discharge outcomes.
Results: Out of 992 patients, 873 met the inclusion criteria for aSAH. Hyponatremic patients were more commonly male ($p < 0.001$) and more likely to undergo external ventricular drain placement ($p = 0.03$) and endovascular coiling ($p = 0.016$). Patients with mild hyponatremia had similar outcomes to patients with eunatremia. Moderate hyponatremia was associated with medical vasospasm therapy ($p = 0.029$). Multivariate analysis demonstrated both radiographic ($p = 0.001$) and clinical ($p = 0.048$) vasospasm were associated with poor clinical presentation as indicated by the Hunt and Hess grades. Severe hyponatremia treatment was associated with radiographic vasospasm ($p = 0.002$) and clinical vasospasm ($p = 0.004$).
Conclusion: Hyponatremic patients were sicker at presentation than normonatremic patients, requiring EVD placement and endovascular coiling more frequently. Despite this, hyponatremic patients were discharged home more frequently. When stratifying the hyponatremic population by severity of clinical treatment, cerebral vasospasm was correlated with the increasing severity of hyponatremia and need for advancing treatment. Patients treated for severe hyponatremia should be monitored closely for cerebral vasospasm. Future prospective studies are warranted to further elucidate the relationship between hyponatremia and cerebral vasospasm.

More is not always better: A case of excess calcium carbonate ingestion causing milk-alkali syndrome

Waller S, Collins A, Luster T, Raymond-Guillen L

Case description: A 54-year-old female with a medical history significant for chronic kidney disease stage IV (baseline creatine 3) and alcohol use disorder presented to the Emergency Department with altered mental status. Labs were significant for sodium 123, potassium 2.3, chloride 56, bicarbonate 47, creatinine 9.5, and calcium 10.8. Ultimately, her symptoms were discovered to be due to excessive ingestion of calcium carbonate (aka: Tums), and she was diagnosed with milk-alkali syndrome (MAS). She was treated with IV KCl and normal saline, with frequent lab checks, and her labs and mental status normalized over the subsequent 48 hours. Clinical Significance: MAS is constituted by metabolic alkalosis, acute kidney injury, and hypercalcemia. It is a result of a large intake of calcium and absorbable alkali. The syndrome was first recognized in the early twentieth century, and it essentially disappeared when histamine blockers began being used to treat peptic ulcers in the 1980s. Recently, the syndrome is becoming more common with the increased use of calcium-carbonate in antacids and osteoporosis prevention medications. MAS is the third most common cause of hypercalcemia, after malignancy and hyperparathyroidism. Management involves holding calcium and vitamin D supplements and administering aggressive intravenous hydration. Bisphosphonates and dialysis may be useful in severe cases. Prognosis of MAS is typically good as the condition is reversible.
Conclusion: The prevalence of MAS is increasing due to the wide availability of calcium-containing supplements and antacids. In order to counteract this, increased awareness amongst at risk patient populations, such as the elderly and those with renal disease, is vital. Lastly, clinicians should be able to recognize this syndrome or consider it in their differential, since intervention is crucial to prevent morbidity and mortality.

Adherence Barriers to Breast Cancer Treatment: Fragmentation of Care, Mood Disorders, and Substance Use Disorder

Wells L, Brown L, Heitz A, Newton E

Case: The patient is a premenopausal, recently divorced 40-year-old female with a history of anxiety, depression, and alcohol use disorder. She presented with a 3-month history of a palpable right sided breast mass and was found to have Stage IIIA ER+ PR+ invasive ductal carcinoma of her right breast. She successfully completed neoadjuvant chemotherapy followed by a right mastectomy and axillary node dissection. She subsequently had a relapse in her alcohol use disorder and was admitted twice to inpatient treatment centers. As a result, she has had inconsistency in taking her adjuvant antiestrogen therapy and in completing the recommended course of radiation. Her substance use led to the loss of her job, custody of her children, and nearly every social support.
Conclusions: We identified three primary barriers to adherence to cancer treatment: fragmentation of care, mood disorders, and substance use disorder. As a result of these mental health and systemic communication challenges, her treatment was interrupted, and she has since been lost to

follow-up.
Clinical Significance: As many as 28% of breast cancer patients do not complete their recommended treatment, which increases risk for recurrence. Discontinuation of and non-adherence to therapy for breast cancer are associated with increased mortality. Among these patients who have difficulty with adherence, a common barrier is fragmentation of care. Studies have also indicated that mood disorders may play a role in non-adherence to treatment. Prevalence of depression is as high as 24% among breast cancer patients. Furthermore, rates of substance use disorders in cancer patients can reach up to 35%. Substance use disorders have been associated with higher rates of non-adherence to hormonal therapy in individuals diagnosed with ER+ breast cancer. Interventions aimed at better screening for mood and substance use disorders and at reducing fragmented care are important steps in increasing adherence among these patients.

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