September 2023
Volume 76
Number 9

South Dakota medicine

THE JOURNAL OF THE SOUTH DAKOTA STATE MEDICAL ASSOCIATION

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Contents

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PLANNING FOR FUTURE HEALTHCARE EXPENSES

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These days, you can insure just about anything. So, the question becomes "What is worth insuring?" The answer almost always boils down to how much you'll have to pay to insure the thing you don't want to lose.

Many of the clients I work with are concerned about how to pay for their future healthcare needs, particularly the costs associated with long-term care. Planning for these expenses can be tricky, because your future health is uncertain. One way to mitigate these expenses is to insure the risk. As you consider this, there are some important things to know.

On average, an American turning 65 in 2022, will incur $120,900 in long-term care costs* in his or her lifetime. In my experience, that is much less than what most people believe it will cost. The average is far less scary than general opinion. The tricky part is that it's an average.

It's important to note that Medicare doesn't cover long-term care costs, so you can expect to pay those yourself. But roughly 6 out of 10* individuals turning 65 won't even spend anything on long-term care costs. Because of this, many people make the decision to do nothing. I think this is a possibility you should prepare for.

As a financial planner, I work with all my clients to come up with a game plan for this possibility. There are two ways of mitigating the risk of future healthcare costs:

1. You can pay someone else to insure this risk.
2. You can act as your own insurer.

If you decide to work with an insurance company, they will create a pool of benefits that you can use if and when you need to use them. To access the benefits, you generally need to meet some qualifications first. These are called "ADLs" or Activities of Daily living. For example, if you can't get out of your bed and get dressed for the day, you would need some assistance. This could mean someone comes into the home or you go to a facility. This is one example of qualifying to get access to the benefit pool. Here are the six "ADLs":

1. Bathing
2. Dressing for your day
3. Transferring
4. Eating
5. Toileting
6. Continence

In the last 20-25 years, the costs for traditional long-term care insurance have been increasing, making them less affordable and less attractive to insure the risk.

The other option is to self-insure this risk. One of the best ways to do this is to build a Health Savings Account (HSA) now. Why is this the case? The HSA is triple tax-exempt, a unicorn in the tax code. If you contribute through payroll:

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These are two examples of how to insure the possibility of paying for your long-term healthcare needs.If you are wondering what your best option may be, reach out to Foster Group.

**Based on ASPE Research Brief (August 2022): Long-Term Care Services and Supports for Older Americans: Risks and Financing, 2022*

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Threats, Intimidation and Violent Attacks Against Medical Professionals on the Rise

Denise Hanisch, MD
President, South Dakota State Medical Association

I love that I was born and raised and continue to reside in our rural state. South Dakotans have a sense of safety because, wherever we go, we "know" someone. Unfortunately, working in healthcare, even in South Dakota, brings a risk of violence to our everyday life. When one thinks of violence against healthcare workers, they often envision it occurring in a large emergency department in a metropolitan area, but a recent report of the Council on Science and Public Health concluded that assaults in an emergency room happen "regardless of hospital size and location."

Violent acts may not be commonplace in our rural hospitals but they do happen and resources are often limited. Dr. Matt Owens from Redfield experienced this first hand when a man with two loaded weapons entered his hospital in June of 2018. After several hours of a standoff, the man was arrested and, thankfully, no one was injured. Events like this are rare and, after time passes, we tend to return to our comfort zone of feeling safe.

At the other end of the spectrum, health care workers in large emergency departments expect that they will be subjects of violence at some point in their career. There is an errant culture of thought that being verbally or physically assaulted is "part of the territory" and incidents often go unreported. Studies have revealed that up to 80% of emergency department staff have been subjects of violence. In 2018, the U.S. Bureau of Labor Statistics reported that individuals associated with the health care industry "accounted for 73% of all nonfatal workplace injuries and illnesses due to violence." Personally, while working in the emergency department, I have had chairs thrown at me, been pushed up against a wall, shoved and verbally abused many times and, like the majority of emergency department physicians, never reported these incidents.

Currently, there are two bills that have been introduced in Congress. The first is the Workplace Violence Prevention for Heath Care and Social Service Workers Act. This would require hospitals to have safety procedures in place based on the Guidelines for Preventing Workplace Violence for Healthcare and Social Service Workers published by the Occupational Safety and Health Administration of the Department of Labor in 2015.

The second bill is the Safety from Violence for Healthcare Employees (SAVE) Act which would create a federal law similar to the current federal law that protects airline employees from aggressive, abusive or disruptive passengers. Unfortunately, this act is not all inclusive and physicians who have private clinics or are not associated with a hospital system would not be protected.

Hospitals are the main focus when it comes to addressing violence against healthcare personnel, but even clinics are at risk, maybe even more so than a hospital, because they do not have specific security procedures in place. Exam rooms in a clinic are not designed to protect the physician or nurse. I am very aware of this. There was a day I was seeing a patient in a typical exam room. I was seated in the corner where the desk and computer were located. The patient sat in a chair between myself and the door. The exam table became an obstacle. The patient was agitated from the beginning and I asked a sensitive question. He slammed his fists on my desk, barely missing my hand, and stood up in front of the door.

He raised his fists and clenched his teeth. His speech was incomprehensible. He paced in front of the door and I was trapped. No panic button to push. No phone to call out. No one heard my yell for help. He bent over a chair and at that moment I was able to squeeze out between him and the exam table. Our hospital maintenance personnel doubled as our security but it took them time to get to the clinic. The patient stayed in the room but violently kicked chairs and would raise his fist if anyone tried to talk to him. What bothers me most about this incident is that nothing changed moving forward. No report was made. No policies or procedures were addressed. Clinic room design was not altered. It was a potential learning experience that was lost.

We need to remind ourselves that, because we chose to care for patients, doesn't mean we need to accept all that happens as "part of the job." Encourage your colleagues and coworkers to advocate for their own safety. Reach out to your elected officials to support legislation that ensures improved safety measures are in place. Continue to love to live in South Dakota and, always, be safe.

2023 Scholars' Research Symposium Abstracts

Sherri D. Koch, MD, FAAFP; Benjamin Aaker, MD, FACEP; Valeriy Kozmenko, MD, CHSE-A; Paul A. Thompson, PhD, PSTAT; and Candace N. Zeigler, MD, FACP

The Sanford School of Medicine (SSOM) at the University of South Dakota (USD) continues to achieve recognition in medical education. SSOM offers a rigorous and challenging curriculum to help prepare students for a medical career. Students are expected to attain academic excellence, maintain high standards of honesty, integrity, and perseverance. Students in the Scholarship Pathways Program (SPP) have the opportunity to pursue research during their four years in medical school as well as complete their academic training.

Research during medical school continues to be an area of emphasis in SSOM. A good understanding of evidence-based medicine is required for physicians in today's medical environment. Research is considered a key component of the education of the medical student and is a subject of discussion during the interviews for residency.

SPP admitted its first students in 2007 and gives approximately 20 students in each class the opportunity for hands-on, self-directed project experience, with the help of a mentor to provide guidance. Students design and propose a project in the areas of research, education, service, or social science. Students work closely with mentors and the SPP administrative staff, who provide vital and important support for SPP participants. The project is completed over the course of the students' four years of medical school, then presented as a poster, an abstract (which we publish here today), and as a manuscript. Participants are encouraged to present their work in one or more medical conferences, regionally, nationally, or internationally. SPP participants have had much success in the publication of the projects in peer-reviewed journals.

The annual Scholars' Research Symposium event is the culmination of the students' work over four years. This year was the sixth year it was held in conjunction with the Alpha Omega Alpha medical honorary society. In addition to the posters from the SPP Class of 2023, all medical students performing research were invited to apply to present other research projects.

Four outstanding SPP students were invited to present their projects formally, Ashley Durant (mentor: Valeriy Kozmenko, MD) investigated using medical students as simulation educators. Meghan Grassel (mentor: Douglas Yim, MD) investigated frequency and determinant factors of symptomatic hepatic abscesses in a rural setting. Annika Van Oosbree (mentors: Jerome Freeman, MD and Anne Cook, PhD) explored kindness towards patients with depression and if reading literature influences stigma levels in medical students. Mykayla Vollmer (mentor: Paul Thompson, MD) wrote, illustrated, and published the children's book, "A Party without Peanuts: How Food Allergies Affect Friends" then read it to third graders in a group setting and examined, through the art of storytelling, how medically important children's books can educate our upcoming leaders.

We are again pleased to share this year's Scholars' Research Symposium abstracts and thank *South Dakota Medicine* for giving us this opportunity. If you have a research idea or would like to mentor a Scholarship Pathways student please contact Benjamin Aaker, MD at Benjamin.Aaker@usd.edu.

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Development and Implementation of Screen-Based Simulation Technology to Meet Medical Education Demands During the COVID-19 Pandemic

Anja Cucak, MD | Mentor: Valeriy Kozmenko, MD

Background: Simulation-based learning has been a valuable integrated part of simulation curricula. Simulation modalities include high-fidelity simulation (HFS), clinical skills (SK), standardized patients (SP), hybrid and combined simulation. HFS and SK are usually taught face-to-face and require specialized equipment. In response to the COVID-19 pandemic and lockdowns, efforts to develop distributed screen-based high-fidelity simulation accelerated to provide enhanced remote learning. The authors set out to develop cost-effective, high fidelity, user-friendly software to assist medical students in developing cardiac auscultation skills and clinical reasoning. Physical manikins are expensive, where costs range from $23,000-$250,000 each. The following applications: Heart Auscultation Trainer (HAT), Lung Auscultation Trainer (LAT), and a distributed screen-based high-fidelity simulator (DSB-HFS) comprise a comprehensive medical education software package developed and implemented at the University of South Dakota Sanford School of Medicine (USD SSOM). The HAT application was specifically evaluated in this project.

Methods: HAT and LAT were developed for Macintosh, Windows, and Linux operating systems. Both applications feature an on-screen human torso on which users can auscultate heart and lung sounds. Users can select from 52 heart and 15 lung conditions, built-in lessons, a testing mode, and sonograms. DSB-HFS is a network of applications distributed over the internet. Learners can view a patient avatar, perform basic physical exam, review vital signs, and order treatments. An instructor can change avatar parameters in accordance to administered treatments. Information exchange between the instructor and learners occur via a cloud-based connection. Effectiveness, simplicity, and cross-platform usability of HAT was assessed via survey. DSB-HFS has been developed, tested, and piloted. As of December 2022, DSB-HFS was under next phase of development.

Results: The 11-question survey was distributed to medical students with an 81.4% response rate. More than half of respondents used HAT at least once per week. Most respondents agreed that: installation was relatively easy, the Graphic User Interface was easy to use, built-in lessons were somewhat useful, and he/she would recommend HAT to other students. Narrative feedback was collected to improve future iterations of HAT. No data were collected regarding LAT or the DSB-HFS simulator.

Conclusion: The suite of applications was found to be effectively implemented and was a cost-saving addition to a remote software package available to medical students at the USD SSOM. HAT was perceived by first-time users to be an easy to use and effective learning tool. User-generated feedback will be implemented to improve applications. Limitations to this project include a lack of quantitative data.

Medical Students as Simulation Educators

Ashley Durant, MD | Mentor: Valeriy Kozmenko, MD

Introduction: Physicians are expected to educate patients, students, colleagues, as well as members of the interdisciplinary team. However, unlike in the United Kingdom and Canada, US medical schools do not require teaching as a competency for graduation. High-quality teaching and communication skills are necessary to ensure patient safety and trust. As the field of medicine becomes increasingly expansive and complex, it can no longer rely on empiric forms of knowledge exchange. Physician training must include pedagogy to create competent educators. In this project, the educational efforts of senior medical students providing simulation-based education to junior students were compared with that provided by faculty-led education.

Methods: The "Medical Students as Simulation Educators" (MSASE) course consists of a didactic and a teaching application component. The didactic component delivers learning modules on topics such as simulation education history, learning theories, debriefing and feedback, curriculum development, teaching methods, assessment, evaluation, and essentials of running the Laerdal SimMan 3G simulation system. After completing didactic courses, student educators apply their pedagogic skills in facilitator-guided, high-fidelity clinical simulations in areas such as anaphylaxis, heart failure, and atrial fibrillation. The evaluation of MSASE compared the knowledge gain of learners led by clinical faculty to those led by student-educators. Learners completed the same multiple-choice quiz (MCQ) before and after the simulation training. In addition, student satisfaction surveys were used to assess their attitudes to being taught by their peers.

Results: Scores from the pre- and post-tests were nearly identical in the faculty and student-led groups. The faculty-led group's average pre- and post-activity scores were 41.67% and 72.81%, respectively. The average increase in scores was 31.14%. The student-led group's average pre- and post-activity scores were 44.43% and 75.71%, respectively. The average increase in scores was 31.28%. The results of the student satisfaction survey were supportive of peers as educators. The survey used a 5-point scale with 1 representing "strongly disagree" and 5 representing "strongly agree". Aspects surveyed include learning objective identification and achievement, educator preparedness, organization and structure, simulation realism, complexity appropriateness, engagement level, quality of debriefing, and more. The average student satisfaction score for each aspect of the survey was greater than 4.5. The average of all elements surveyed was 4.75/5.

Conclusions: Data support the contention that medical students are equally effective in simulation-based teaching as clinical faculty. Participating student educators and student learners reported satisfaction with the MSASE experience.

Higher Incidence of Pyogenic Liver Abscess in an Upper Midwest Hospital System: A 5-Year Study With Emphasis on Rural Impact

Meghan Grassel, MD | Mentor: Douglas Yim, MD

Introduction: Incidences of hepatic abscesses are increasing nationally. Current estimates of national incidence range from 8 to 20 abscesses per 100,000 hospital admissions. Understanding risk factors is essential for efficient diagnosis and treatment of hepatic abscess. This study aimed to assess if hepatic abscess incidence in a Midwest cohort was higher in rural areas compared to metropolitan areas. Water infrastructure factors were also considered.

Methods: A retrospective chart review was completed for all patients admitted with a diagnosis of hepatic abscess to an upper Midwest hospital system in South Dakota between Jan. 1, 2016 and Dec. 31, 2019. Microbiology cultures and patient demographic data were collected including age, gender, hometown, and ethnicity. Risk factors assessed included a history of abdominal surgery, gallbladder disease, sepsis, diverticulitis, cancer, and diabetes. The incidence of hepatic abscesses was calculated using the Poisson rate test and confidence interval equation. Averages of each risk factor were calculated. Finally, the hometowns were utilized to create a heat map of disease burden, which was then compared to the density of private wells in those areas.

Results: There were 116 confirmed cases of adult hepatic abscess admitted to the hospital between 2016 and 2019. The corrected incidence was 95.66 abscesses per 100,000 hospitalized patients per year. The Poisson exact probability p-value was <0.001 when compared with national average of 20 abscesses per 100,000 hospitalized patients. Rural areas had a higher per capita incidence of abscesses and higher density of private wells.

Conclusions: The incidence of patients with hepatic abscesses was significantly higher than the national average in this single-center study. Demographics, especially geographic location, may play an important role in abscess rates. Rural location may be affecting the incidence of hepatic abscesses, and might be one explanation of the much higher than expected incidence found in this study. Water infrastructure, as defined as incidence of private wells in the area, could be a contributing factor as much of the rural area is reliant on untreated groundwater from wells. The study was limited by data availability on true water source usage for patients with hepatic abscesses. Another limitation to this study is the lack of multicenter involvement.

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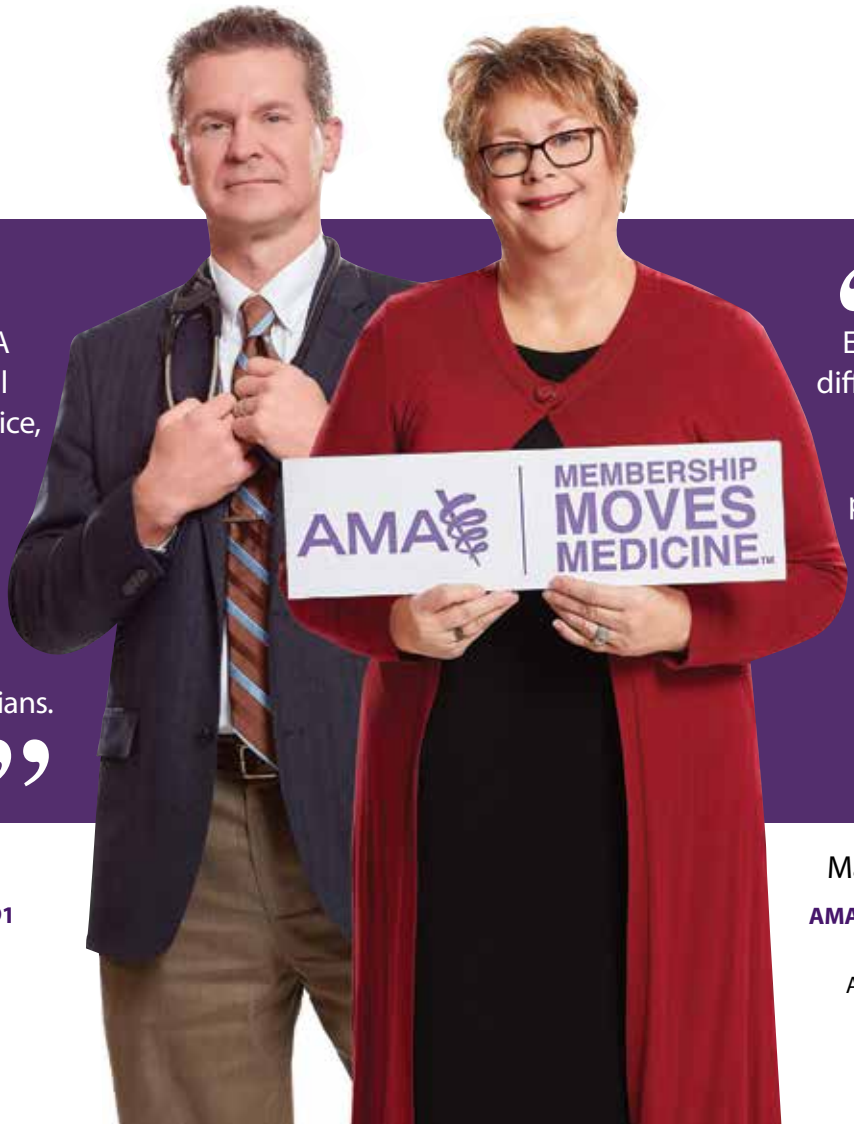

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Robert Allison, MD
AMA MEMBER SINCE: 1991
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Mary Carpenter, MD
AMA MEMBER SINCE: 1982
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Brief Provider Education is Associated With Decreased ED Visits by Super-Utilizers

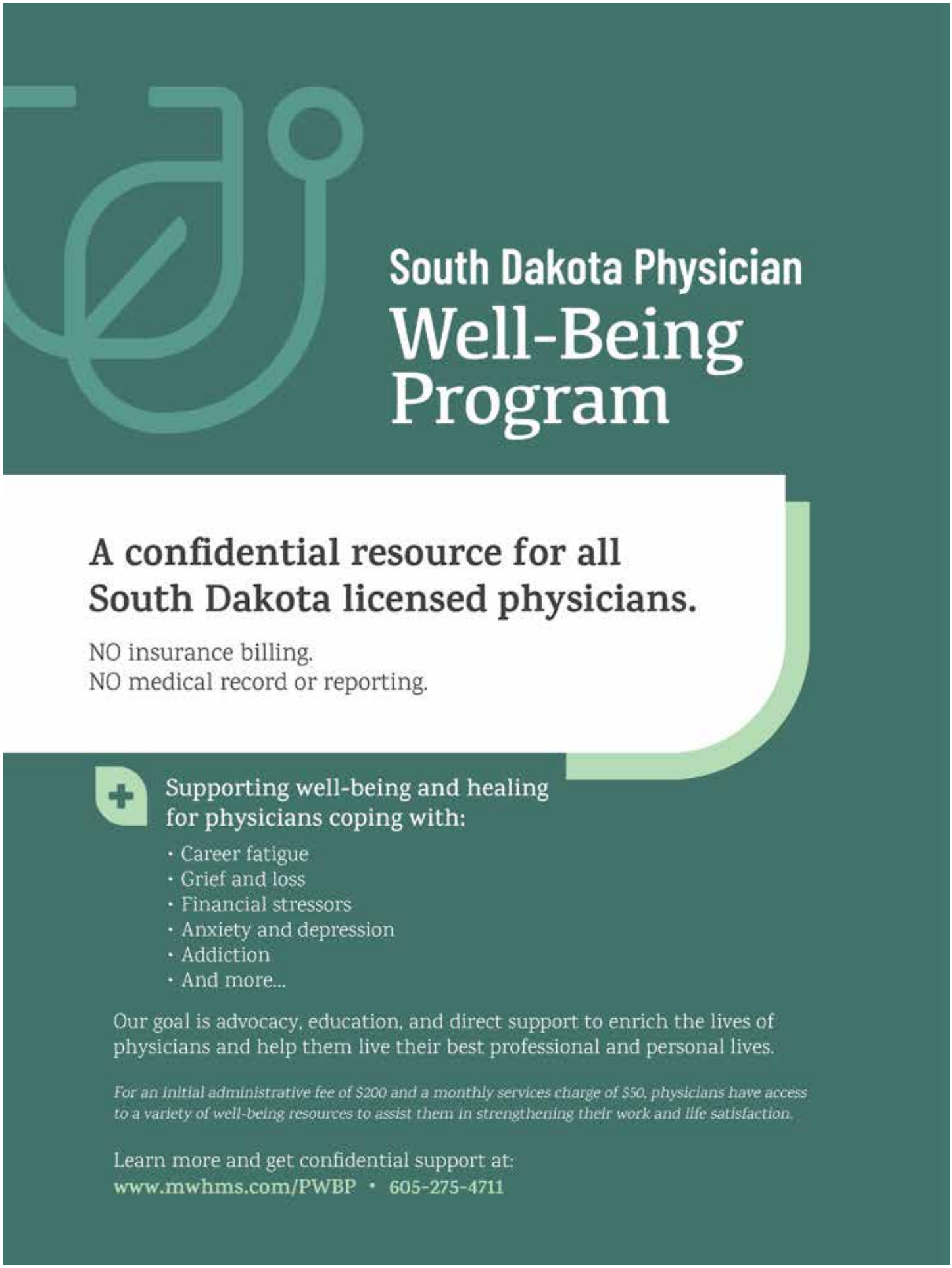
Kjerstin Hensley, MD | Mentor: Benjamin Aaker, MD

Introduction: Prior studies have demonstrated that the use of opioids in an Emergency Department (ED) increases the chances of a 30-day return to the ED for similar diagnoses. Super-utilizers (SUs) of the EDs tax the ED resources, resulting in sub-optimal outcomes for these patients. Most physicians receive sub-optimal formal training on pain and opioid prescribing. These facts provide an area of improvement for administering optimal patient care in the ED. Presenting a structured curriculum on how to treat patients with pain in the ED could result in a simple, cost-effective solution to decrease provider work-overload, decrease misuse of healthcare resources, and increase the well-being of opioid-addicted patients.

Methods: The American Academy of Emergency Medicine's Model ED Pain Treatment Guidelines were presented to ED physicians at virtual and in-person department meetings at five EDs in the Midwestern United States. Retrospective (Phase I) and prospective data (Phase II) of all ED visits for each hospital were collected and de-identified. The raw data were segregated by ICD-10 codes to identify the visits made for pain diagnoses. SU was defined as any patient who visited the ED more than once for the same pain diagnosis. McNemar's test assessed the change in the number of SUs. Z-Scores assessed the change in number of visits by SUs and visits made by non-SUs between the two phases. Data were categorized by hospital and by total type of SUs based on how many visits they made.

Results: The data from Phase I were assessed and divided by hospital into three groups, those that used the ED more than once, more than twice, and more than three times for the same diagnosis. A statistically significant decrease (p-value = 0.0006) was noted in the group that visited the ED more than once from Phase I (n=4,413) to Phase II (n=4,109). There was a statistically significant decrease (p-value = 0.0008) in number of visits (n=268) by SUs. There was a decrease in visits made by non-SUs (n=292) but it was not statistically significant (p-value=0.9992).

Conclusion: Opioid prescribing education was associated with decreased SUs who visited the ED more than once and in total visits made by SUs. This decrease in visits could be correlated to an estimated savings of over $1 million across five EDs with an estimated total 70,000 annual patient volume ED based on average costs of ED visits by SUs. There was no significant change in the groups of SUs who visited more than twice or more than three times. Provider opioid prescribing education may have little or no effect on some patients who may chronically use the ED for pain-related diagnoses, regardless of the training of the emergency providers.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Opioid Prescribing Habits of Emergency Department Providers in Response to an Educational Intervention

Tory Makela, MD | Mentor: Benjamin Aaker, MD

Introduction: Prescription opioid misuse and dependency has been a rising cause for concern in the United States in recent years, and many of these cases began with an initial prescription in the Emergency Department (ED). Prior studies found that patients seen by "high intensity" prescribers, who prescribe greater quantities of opioids than 75% of other ED physicians within the same hospital, are significantly more likely to suffer from long-term opioid use. Other studies have shown that educational interventions on appropriate opioid prescription in surgical settings have resulted in fewer post-operative opioid prescriptions and less variance in prescribing habits by providers. This study investigates whether a similar educational intervention within an ED setting results in decreased opioid utilization. It was hypothesized that the educational intervention provided to ED providers would result in a reduction of the amount of opioids prescribed.

Methods: This study was retrospective analysis of patient charts from an ED in southeast South Dakota in the year prior to and year after an educational intervention was given to providers in April 2015. Only charts with a diagnosis of back, abdominal, or head pain were included, and encounters in which the patient left against medical advice or left without being seen were excluded. Opioids administered in the ED and prescribed were converted to morphine milligram equivalents (MMEs), and a two-sample t-test was used to compare pre-exposure and post-exposure opioid utilization for the group overall, individually for each physician, and by diagnosis subset. Lastly, a two-sample t-test was performed to evaluate the mean number of non-opioid treatments utilized in the pre- and post-exposure periods.

Results: Opioids prescribed and total opioids were not significantly different in the group overall, by ICD diagnosis subset, or individually by provider. Opioids administered orally varied in significance based on chief complaint, with a decrease in oral administration in the back pain diagnosis subset and an increase in oral administration in the head and abdominal pain diagnosis subsets. There was also a significant difference in the average amount of non-opioid treatments prescribed per patient encounter, increasing from 0.797 to 0.890 ($p=0.02$) in the post-intervention period.

Conclusion: Overall, the educational intervention on the topic of opioid prescribing guidelines did not have the expected impact on amounts of opioids administered or prescribed during the study period. Total opioids utilized and opioids prescribed did not vary between the pre- and post-intervention groups overall, by subset diagnosis, or by provider. There was, however, an increase in utilization of non-opioid treatments that could be indicative of a partial response to the educational intervention. This study showed that long-term effects of education regarding recommended opioid utilization might be less effective than indicated by prior studies, which had shorter post-intervention investigation windows.

Substance Use Disorder in Adults with ADHD in South Dakota

Connor McMahon, MD | Mentor: Vivek Anand, MD

Introduction: Attention-deficit hyperactivity disorder (ADHD) increases the risk for multiple comorbid psychiatric disorders, such as substance use disorder. Comorbid ADHD and substance use disorder has been shown to increase the risk of adverse occupational, social, psychological, and physical outcomes. Because of the severe risks of substance use, it is useful to determine the relative comorbidity of ADHD among different types of substance use disorders. This study examined the prevalence of ADHD in residential addiction treatment as well as the relative prevalence of ADHD among mono-substance use, comorbid substance use (2 comorbid substance use disorders), and polysubstance use (3+ substance use disorders).

Methods: Participants were adults (≥18 years of age) admitted to residential treatment of substance use disorder. Participants were asked to complete a Wender Utah ADHD rating scale to assess the presence of ADHD. A cutoff score of 46 was used to determine presence of ADHD in this rating assessment. Participants were also provided with an ADHD history questionnaire designed for this study to gather information on childhood ADHD diagnoses, substance use history, and early-life effects o f attention disorders. Results from these questionnaires were analyzed for significance via SAS statistical software using an α level of $p \leq 0.05$.

Results: Using the Wender Utah assessment scores, 55 participants with substance use disorder demonstrated an ADHD prevalence of 45% (n=30). Of the study population, 20% (n=11) of participants being diagnosed in childhood and another 25% (n=14) having a positive Wender Utah questionnaire score for ADHD as adult patients without a childhood diagnosis. All participants who had a childhood diagnosis of ADHD had received treatment for this disorder. Polysubstance use disorder (n=21) had an ADHD prevalence of 62%. Alcohol use disorder (n=21) had an ADHD prevalence of 24%. Methamphetamine use disorder (n=4) had an ADHD prevalence of 75%. Participants with ADHD (either during childhood or adulthood) had a nearly significant increase in the prevalence of polysubstance use disorder as compared to participants without ADHD ($p = 0.0542$).

Conclusions: ADHD and substance use disorder have notable comorbidity. This study, among similar studies, demonstrates a high prevalence of ADHD in populations with substance use disorder. The presence of ADHD in patients with substance use disorder may influence which substances those patients choose to use. The difference in patients treated for childhood ADHD and those having a diagnosis of ADHD demonstrates a deficit in effective childhood ADHD screening. As such, effective screening and prevention of substance use disorder in patients with ADHD may be a useful tool in reducing the risk of developing substance use disorder. Additionally, adequate treatment of ADHD could be considered useful in treating a contributing element of substance use disorder.

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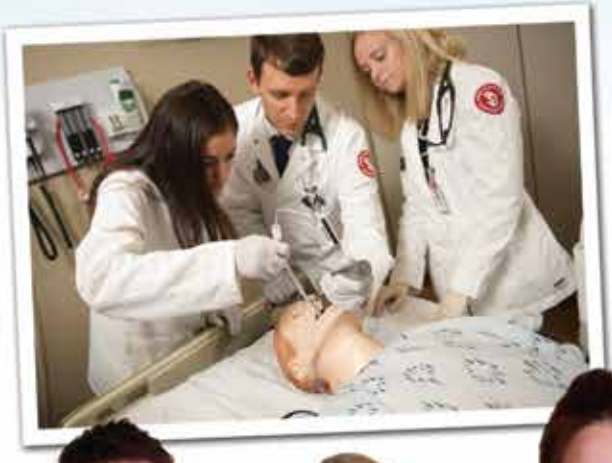

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Rural Residency Status in South Dakotans is Not Associated With More Advanced Stage Melanoma at Time of Diagnosis

Jazmin Newton, MD | Mentor: Marcus Frohm, MD

Introduction: Previous studies have established that geographic location strongly influences health literacy, access to care, and health outcomes across all disease types. There are many well-understood risk factors for the development of melanoma, and likewise various markers of disease severity. However, few studies have been conducted to determine what role locality and access to dermatological care play in both the incidence and severity of melanoma, particularly in South Dakotans. Here, it is hypothesized that living in rural regions with less access to care increases the risk for more advanced stage melanoma at time of diagnosis.

Methods: A retrospective chart review of the electronic medical records of patients with a diagnosis of melanoma from a Midwest dermatology practice in South Dakota was performed. The authors examined patients' rural vs. urban status, disease predictors, and markers of disease severity. Multivariate and descriptive statistical analysis were utilized.

Results: There were 148 unique cases identified. The average age was 62.32 (SD=16.69, min=25, max=98); 53.4% were male (n=79); 99.3% were Caucasian. Among them, 35 (23.6%) had a personal history of non-melanoma skin cancer (NMSC), 9 (6.1%) had a personal history of melanoma, and 20 (13.5%) had a family history of melanoma. Most cases (75.7%) had at least one documented visit to a primary care physician (PCP) within a year of melanoma diagnosis. When comparing geographic distance to the Breslow depth at time of biopsy, a significant negative relationship (p=0.009) resulted. However, when eliminating 3 outliers (Breslow depths of 22.2mm, 19.0 mm, and 15.0mm), this relationship was no longer significant (p=0.141). No significant findings resulted when comparing geographic distance to provider site for wide lesion excision (WLE) to post-WLE Breslow depth (p=0.778), pathological stage (p=0.079), +/- sentinel lymph node biopsy (p=0.299), or +/- chemotherapy/radiation (p=0.191). When comparing disease predictors to severity markers of disease, the only significant finding was between personal history of melanoma and post-WLE Breslow depth (p=0.026). Those without a personal history of melanoma had greater (3.08 vs 1.68) post-WLE Breslow depth.

Conclusions: Prior studies indicate increased distance to a dermatologist and decreased density of dermatologists represent significant associations with Breslow depth and mortality. In contrast, the present data did not appear to indicate a significant difference in melanoma detection or outcomes based on geographic parameters. However, it does support that the density of dermatologists is a more appropriate proxy for melanoma outcomes than is PCP density. The lack of impact based on rural vs. urban status may suggest the current literature is not applicable to all states or populations or that some disparities in access to dermatologists and melanoma treatment may be overcome by factors not investigated presently (e.g. AI, tele-dermatology). Other limitations include analyzing patients within a single health system and a sample population consisting primarily of persons located in the Sioux Falls metropolitan area. With rural South Dakotans representing a significant portion of the population, this state presents an opportunity to identify disparities in access and treatment based on population and community resources.

A Comparison of LASIK Versus PRK Enhancement Outcomes in Eye With Prior Cataract Surgery

Derek Rohlf, MD | Mentor: John Berdahl, MD

Introduction: Cataract surgery continues to evolve with increasing levels of precision through the development and introduction of new technologies. Despite these advances, unexpected visual outcomes attributable to residual refractive error still occur. Additional "enhancement" procedures to the cornea can treat this residual refractive error to achieve a satisfactory outcome. Two frequently employed excimer laser enhancement procedures include laser in-situ keratomileusis (LASIK) and photorefractive keratectomy (PRK). While both of these procedures are widely accepted as safe and effective in treating refractive error, there is a paucity of data comparing the two as enhancements in the post-cataract population. The purpose of this study was to investigate visual and refractive parameters in the pre- and post-enhancement setting on post-cataract surgery patients to compare the effectiveness of both excimer laser-enhancement treatments.

Methods: This study examined patients that underwent post-cataract extraction excimer laser enhancement surgery targeted for emmetropia (±0.50 D). The setting was a private, tertiary surgery center. Refractive enhancement procedures were performed by 3 different surgeons. Post-enhancement uncorrected distance visual acuity (UDVA) and manifest refraction spherical equivalent (MRSE) was recorded for all available follow-ups and compared for both groups.

Results: This study included 822 post-cataract enhanced eyes (491 LASIK; 331 PRK). For patients with at least six months follow up, mean UDVA was 0.05 ± 0.13 logMAR in LASIK-enhanced patients and 0.15 ± 0.20 in PRK-enhanced patients ($p<0.001$). Mean absolute value MRSE was 0.22 ± 0.36 and 0.48 ± 0.62 for LASIK- and PRK-enhanced patients at or beyond six months, respectively ($p<0.001$). A total of 330 (67%) of LASIK-enhanced patients achieved 20/20 or better post-enhancement UDVA, compared to 142 (43%) PRK-enhanced patients ($p<0.001$). Categorized by pre-enhancement UDVA, LASIK-enhanced patients showed significantly better post-enhancement UDVA than PRK-enhanced patients, except in those with pre-enhancement vision of 20/20 or better, or those worse than 20/50. LASIK-enhanced virgin corneas had mean post-enhancement of 0.05 ± 0.14 UDVA compared to 0.13 ± 0.19 UDVA in PRK-enhanced virgin cornea patients ($p<0.001$).

Conclusion: LASIK provides better and more predictable outcomes in UDVA than PRK in post-cataract enhancement patients, even when categorizing patients by their pre-enhancement visual acuity, prior ocular procedures, and allowing for sufficient time for healing and stabilization of the cornea.

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Relationship Between Gene Expression Networks and Muscle Contractile Physiology Differences in *Anolis* Lizards

Luke Smith, MD | Mentor: Andrea Liebl, PhD

Introduction: Muscles facilitate most animal behavior, from eating to fleeing. However, to generate the variation in behavior necessary for survival, different muscles must perform differently. For instance, sprinting requires multiple rapid muscle contractions, whereas biting may require fewer contractions but greater force.

Methods: Here, a transcriptomic approach was utilized to identify genes associated with variation in muscle contractile physiology among different muscles from the same individual. Differential gene expression was measured between a leg and jaw muscle of *Anolis* lizards (*A. chlorocyanus, A. cybotes, A. osa, A. sagrei*) known to differ in muscle contractile physiology and performance. For each individual, one muscle was used to measure muscle contractile physiology, including V_{max} (the muscle contraction velocity at zero force), V_{40} (the muscle contraction velocity at 40% force), power ratio (a measure of the trade-off between force and velocity), and twitch time (the amount of time it takes to create and dissipate tension at 50% force). The contralateral muscle was used to extract RNA for transcriptomic sequencing. Weighted Gene Co-Expression Analysis (WGCNA) was performed to cluster differentially expressed genes into groups, or modules with color designations, based on an eigengene. Modules were correlated to physiologic metrics and analyzed for function with gene ontology (GO term) analysis.

Results: Using the transcriptomic data, clear clustering of muscle type was found indicating there were no specific differences among the four species. Several contractile metrics were significantly different between the jaw and leg: twitch time ($F_{1,10} = 87.56$, $p < 0.0001$), V_{40} ($F_{1,8} = 45.60$, $p = 0.001$), and power ratio ($F_{1,8} = 432.24$, $p < 0.0001$). Expression of genes clustered in GO terms related to muscle contraction and extracellular matrix was negatively correlated with slower twitch times (turquoiseTT: $r = -0.91$, $p < 0.0001$; blueTT: $r = -0.59$, $p = 0.004$; greenTT: $r = -0.7$, $p < 0.0001$) but positively correlated to power ratio (blueOM: $r = 0.77$, $p = 0.0002$; turquoiseOM: $r = 0.97$, $p < 0.0001$) and V_{40} (blueOM: $r = 0.56$, $p = 0.02$; turquoiseOM: $r = 0.85$, $p < 0.0001$). Conversely, genes related to the GO terms related to aerobic respiration were downregulated in muscles with higher power ratio (blackOM: $r = -0.65$, $p = 0.003$) and V_{40} (blackOM: $r = -0.63$, $p = 0.005$, and over-expressed with slower twitch times (brownTT: $r = 0.75$, $p < 0.0001$).

Conclusions: Determining the molecular mechanisms that underlie variation in muscle contractile physiology can begin to explain how organisms are able to optimize behavior under variable conditions. Key areas of difference between gene expression of the jaw and leg included muscle contraction, energy synthesis, and extracellular structures. Modules relating to aerobic respiration are strongly correlated with slower twitch time likely due to slower utilization of ATP. Modules relating to muscle contraction and extracellular structure are negatively correlated with slower twitch time and positively correlated with V_{40} and power ratio indicating the increased need for structural components to increase and transmit force for greater power.

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Creating an Advanced Statistics Interest Group to Increase Medical Students' Confidence and Competence in Statistics and Data Analysis

Sawyer Stevens, MD | Mentors: Paul Thompson, PhD and Val Kozmenko, MD

Introduction: Post-graduation exit surveys have consistently demonstrated that the subjects of statistics and data analysis are considered a challenging aspect of medical education. This is reflected in student attitudes towards the subjects, which are often neutral to negative. Whether due to a lack of exposure to the subject or decreased retention of their education, practicing physicians often lack advanced statistics and data analysis skills. As data analysis continues to become ever more important for the practice of evidence-based medicine, many medical school curricula only provided a limited education on the subject. Previous studies have shown that the implementation of a student-taught supplementary education in statistics and data analysis can improve students' attitudes toward statistics and their confidence in performing data analysis.

Methods: For this project, an advanced statistics and data analysis interest group was created, called the Fisher Society. This organization provided an additional two-year curriculum in advanced statistics and data analysis to medical students. The organization met bimonthly with meetings consisting of a lecture followed by deliberate practice using the discussed methods of data analysis. The Fisher Society also hosted an annual public lecture on high-yield statistics and data analysis topics covered on medical licensure and board exams. In conjunction with the student interest group, an annual survey (M-STATS) was sent to the entire Sanford School of Medicine medical student body that was used to gauge medical students' perceived competence and confidence in the subjects of statistics and data analysis. The survey consisted of 11 questions assessing students' confidence, competency, and exposure to statistics and data analysis using the five-point Likert scale.

Results: Between 2021 and 2022, no statistically significant difference was observed in the average response to the questions on the M-STATS within the entire medical student cohort. Data from 1st and 2nd year medical students demonstrated a statistically significant decrease in students' perceived difficulty with statistics from 2021 to 2022. Additionally, a statistically significant increase in student-perceived knowledge of statistics and data analysis was displayed in the data from 1st and 2nd year students. Between 2021 and 2022, a statistically significant increase in confidence for 1st and 2nd year medical students in teaching data analysis and statistics was also observed.

Conclusions: Between 2021 and 2022, there was no statistically significant change in the confidence or competence in the fields of statistics and data analysis among the medical students at the Sanford School of Medicine. However, promising trends are beginning to show increases in positive attitudes towards the subjects as well as decreases in perceived difficulty of the subject. Additionally, the 1st and 2nd year medical student responses to the 2022 survey displayed greater confidence and decreased perceived difficulty with statistics and data analysis when compared with responses from the 2021 survey.

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Effects of Alcohol Use on Sperm Chromatin Structure

Ariadne Trautman, MD | Mentor: Keith Hansen, MD

Introduction: The evaluation of the infertile couple is often complex as multiple factors in both the male and female can contribute, including social history. Previous studies have displayed that male ethanol consumption can disturb sperm motility, nuclear maturity, and DNA integrity, likely resulting in infertility. A previous study primarily looking at vitamin D levels and sperm parameters incidentally demonstrated increased high DNA stainability (HDS), which correlates with immaturity of the sperm nucleus, in males who do not use alcohol. The main purpose of this study is to evaluate the effects of male alcohol use on sperm chromatin structure analysis (SCSA), including DNA fragmentation and HDS.

Methods: This study was a retrospective chart review of 210 consecutive couples that presented to a midsize infertility clinic in the Midwest and had a semen analysis and SCSA performed. Data were extracted from the electronic medical record, de-identified, and independently entered into an Excel spreadsheet by two investigators. The spreadsheets were electronically compared, and discrepancies resolved by reference to the EMR primary data. Data extracted included demographics, tobacco use, alcohol use, occupational exposures, semen analysis results, and SCSA results (DNA fragmentation index (DFI) and HDS. Statistical analysis (regression) was performed on this data set to determine significance with a p-level of 0.05, with primary input being level of alcohol use and outcome being the SCSA parameters.

Results: 11% of the cohort had heavy alcohol use (>10 drinks/week), 27% moderate (3-10/week), 34% rare (0.5-3/week), and 28% no alcohol use. 36% of the cohort had HDS>10% (a marker of immaturity of sperm chromatin). Level of alcohol use was not significantly associated with HDS>10% (p=0.55). Average total DFI was 12.99% (>25% is associated with poorer fertility). Total DFI was not significantly associated with the level of alcohol use (p=0.7). Heavy alcohol use was significantly associated with lower sperm density (p=0.042). Increasing age was significantly associated with increasing DFI (p=0.006), increased sperm density (p=0.002) and lower semen volume (p=0.022). Exposure to heat at work was significantly associated with lower semen volume (p=0.042). Tobacco use was associated with lower sperm motility (p<0.0001) and lower sperm density (p=0.002).

Conclusions: There was not a significant association between the level of alcohol use (heavy, moderate, rare, or none) and the HDS or DFI of sperm. The overall literature remains equivocal with respect to alcohol's effect on sperm chromatin structure. Heavy alcohol use was associated with lower sperm motility. Alcohol may exert a negative effect on semen parameters via disruption of the testosterone hormonal axis, through direct toxicity to Leydig and/or Sertoli cells, and/or through oxidative damage to sperm DNA. The overall effect on fertility and the possibility of transgenerational effects through DNA damage both require further characterization. Increasing age was associated with poorer sperm parameters as expected. Heat exposure was associated with lower semen volume and tobacco use was associated with lower sperm motility and density.

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Reading Literature Enhances Empathy and Decreases Stigma in Medical Students Towards Patients With Depression

Annika van Oosbree, MD | Mentors: Ann Cook, PhD and Jerome Freeman, MD

Introduction: Stigma towards people struggling with depression is pervasive across society— even in health care. Many anti-stigma interventions have been tested across a variety of healthcare professionals in an attempt to decrease stigma levels. These interventions have generally elicited short-term change in stigma levels but failed to produce long-term destigmatization.

Methods: This study sought to determine if literature could be used to decrease stigma levels and increase empathy/kindness towards patients with depression in medical students at the University of South Dakota, Sanford School of Medicine. Students were administered a 51-question survey scored on a 6-point Likert scale designed largely from peer-reviewed surveys to measure stigma, empathy, and kindness levels towards patients with depression. Students then read a collection of autobiographical or semiautobiographical literature written by authors who had clinically diagnosed major depressive disorder (MDD). This literature was selected with the help of a medical student focus group. Immediately after reading this, students took the survey again. The survey was again administered one week later and 6 months later. A pre-intervention demographics questionnaire was administered to identify potential confounding variables, including personal experience with major depressive disorder and interest in psychiatry.

Results: Twenty-five medical students completed all 3 phases. Statistical analysis comparing pre-intervention score to the three post-intervention composite scores were completed via one-tailed paired two-sample t-tests using Microsoft Excel software. The pre-intervention stigma score mean was 61.84. Although stigma scores did decrease from pre-intervention to all the post-intervention time points (immediate: 59.92, 1 week: 60.08, 6 months: 58.28), these differences were not statistically significant. Students who reported personal experience with MDD did not have a statistically significant drop in stigma; however, students who reported no personal experience with MDD did have a statistically significant decrease in stigma levels at 1-week post-intervention (mean=58.6, p=0.008) and 6-months post-intervention (mean=57.9; p=0.03) with a pre-intervention mean score was 66.2. The empathy pre-intervention mean score was 63.48. Empathy score changes were statistically significant at all three post-intervention time points (immediate: 66.62, 1 week: 66.92, 6 months: 67.24; $p \leq 0.001$ for all). The pre-intervention kindness score mean was 41.32. Kindness scores did not increase in a statistically significant manner at any of the post-intervention time points (immediate: 41.88, 1 week: 41.36, 6 months: 42.32).

Conclusions: A literature-based intervention significantly decreased stigma levels at the 1-week and 6-months post-intervention time points in medical students who reported no personal experience with MDD. This intervention significantly increased empathy levels, irrespective of personal experience. It did not increase kindness levels. These results suggest that literature could be used as a long-term stigma reduction technique in medical students in the absence of personal experience with MDD. Additionally, it could be used to improve empathy levels in medical students, regardless of their personal experience with depression.

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Influencing Children Through the Art of Storytelling Using a Medically-Informed Children's Book

Mykayla L. Vollmer, MD | Mentor: Paul Thompson, PhD

Introduction: The purpose of this study is to demonstrate how children learn about a health topic from an interactive reading session. Due to the large number of children with allergies, the specific topic chosen for this research study was peanut allergies. The goal of the project was to educate children about a leading, medically relevant health topic through a story about a child with a peanut allergy.

Methods: For the purposes of the research project, author Mykayla Vollmer wrote, illustrated, and published the children's book, *A Party Without Peanuts: How Food Allergies Affect Friends*. The children's book was then read, in a group setting, at local third grade classrooms and students were provided adequate time to ask questions following the reading session. The students were assessed through both pre- and post-read surveys to evaluate knowledge gained during the session. Specific topics discussed in the reading include allergies, anaphylaxis, preventative measures, and treatments.

Results: There were 65 pre- and post-read surveys matched in data analysis. There was a significant increase from a pre-read score of 5.38 (76.92%) to a post-read score of 6.38 (91.21%) for the overall survey with a mean difference of 1.0 ($p < 0.0001$, 95% CI 0.68-1.31). In addition to comparing the overall results of the study, each question in the survey was assessed on an individual basis. 4 of the 7 questions demonstrated a significant change in percentage of students who answered correctly following the reading session.

Conclusion: The overall findings of the study demonstrated that through interactive reading sessions students significantly increased their scores between pre- and post-read questionnaires. This study serves to encourage the use of children's books as an educational tool for young learners.

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Health Challenges in South Dakota: Creation of Healthcare Provider Referral List for Special Olympic Athletes

Patrick Wilson, MD | Mentor: Marni Johnson Martin, AuD

Introduction: Individuals with intellectual and developmental disabilities (IDD) face significant health challenges affecting their overall morbidity and mortality. Special Olympics is one of the largest non-profit organizations that focuses on the promotion of health and fitness for individuals with IDD (referred to as athletes) year-round. At the state level, Special Olympics South Dakota (SOSD) hosts an annual Summer Games where athletes are provided the opportunity to obtain free health screenings. If an area is identified as needing further attention, a referral is made for the athlete to obtain more in-depth care. The referral process often leads to difficulties for athletes, ranging from finding a healthcare provider (HCP) who is comfortable working with individuals with disabilities, to ensuring the acceptance of a wide range of health insurances (such as Medicaid). Obstacles to finding a HCP for a referral is what necessitates the need for a statewide HCP referral list. The purpose of this project is to increase the ease of accessibility to HCPs for individuals with IDD who are Special Olympics South Dakota athletes.

Method: Data from Special Olympics and the CDC Disability and Health Data System (DHDS) was gathered to compare health outcomes between those with disabilities nationwide to those with disabilities in South Dakota. The referral list obtained HCPs via an online two-part survey. Survey 1 focused on demographic information on HCP and place of practice and Survey 2 focused on HCP training and professional work with those with IDD. The surveys were sent to individual providers via their respective professional state associations as well as through convenience sampling (relationship with Clinical Directors for SOSD). Survey 1 gathered 233 responses total, with 95 meeting completion criteria. Survey 2 offered to those 95 and gathered 66 responses total.

Results: Data on multiple health outcomes from the Special Olympics and CDC DHDS revealed individualized areas of concern with little overlap between the two datasets. Of the 95 HCPs added to the referral list (40% completion rate from Survey 1), the majority were localized to areas of higher population density in South Dakota (Sioux Falls and Rapid City areas). In Survey 2, 90% of HCPs indicated some level of training for working with individuals with IDD and 74% of responding HCPs were interested in obtaining further training. All HCPs that responded to Survey 2 had encounters with individuals with IDD in their current professional role, with 94% having 4 or more encounters.

Conclusions: The Special Olympics South Dakota HCP referral list provides a direct method for SOSD athletes to find referral care. Currently, this is the only database of health care providers that is accessible to individuals with IDD that are members of SOSD. Geographically however, much of South Dakota is not represented on the current HCP referral list. While 90% of HCPs have training, 30% indicate not having received formal training on working with individuals with IDD during their professional training, also showcasing a need for HCPs to strive to limit potential gaps in care.

Inflammatory Bowel Disease: A Concise Review

Allison Hemmer, MS IV; Kennedy Forest, MS IV; Joseph Rath, MS IV; and James Bowman, MD

Abstract

Inflammatory bowel disease is a term describing a group of diseases, Crohn's disease and ulcerative colitis, that cause chronic inflammation in the gastrointestinal tract. Both conditions tend to have episodic flares of diarrhea, abdominal pain, fatigue, and unintentional weight loss. This analysis will discuss the etiology, pathophysiology, epidemiology, clinical and histologic features, treatment, and complications of Crohn's disease and ulcerative colitis. Though there are many similarities between these two conditions it is important to recognize their differences for accurate diagnosis, treatment, and surveillance for potential long-term complications.

Introduction

Inflammatory bowel disease (IBD) encompasses two major diseases: Crohn's disease (CD) and ulcerative colitis (UC). These conditions are the result of damage to the gastrointestinal (GI) tract secondary to chronic inflammation. CD and UC are differentiated from one another based on the location of GI inflammation, depth of involvement, and histological findings. It is important to identify these differences ad make an accurate diagnosis as treatments and long-term complications vary between diseases.

Crohn's Disease

The hallmark findings of CD include relapsing transmural inflammation of the wall of the GI tract. Inflammatory lesions can occur in any area of the GI tract from the mouth to the anus. Inflammation in CD may occur in a discontinuous pattern known as "skip lesions." The most commonly involved areas include the terminal ileum and the colon. The rectum is usually spared of lesions in CD.[1,2]

Ulcerative Colitis

UC is characterized by episodic chronic inflammation of the distal end of the GI tract. The inflammation involves the mucosa and submucosa and extends continuously from the rectum to more proximal areas of the colon.[3,4]

A third and lesser-known form of IBD is known as indeterminate colitis. In this form of IBD, patients have symptoms and test results that overlap with both CD and UC. These patients are unable to be distinctively identified as having CD or UC, thus are referred to as having indeterminate colitis.[5,6]

Etiology and Pathophysiology

IBD is characterized by chronic relapsing intestinal inflammation. It has an increasing incidence worldwide with the highest rate increases seen in Westernized countries.[7] The etiology of IBD is largely unknown, but development of disease is believed to be complex and multifactorial with contributions from the environment, genetics, microbial factors, and the immune response. It is believed that none of these factors alone can initiate disease. Risk factors specific to Crohn's disease include familial aggregation, tobacco smoke, and genetic predisposition.[2,8] Risk factors for UC include family history of UC, genetic predisposition, increased dietary fat intake, and sleep deprivation.[9,10] Smoking and history of an appendectomy are considered protective for UC.[11]

Specific immune dysregulation seen in Crohn's disease includes disruption in the IL-23-Th-17 signaling which leads to unrestrained Th17 cell function causing inflammation. Mutations in nucleotide oligomerization binding domain 2 (NOD2) protein are also considered as contributors to the pathogenesis of Crohn's through modulation of both the innate and adaptive immune system in the gut.[8]

In patients with UC, there is dysfunction of the intestinal epithelium which leads to increased permeability for bacteria to infiltrate. This disruption of the barrier leads to increased secretion of proinflammatory cytokines (IL-6, IL-12, TNF-a) and chemokines which recruit additional immune cells to the area. There is also upregulation of lymphatic cell activity in the walls of the colon which causes an enhanced immune response and cytotoxic effect on the epithelium leading to inflammation. UC is primarily mediated by a Th2 cell

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response.[3] Autoantibodies against the intestinal epithelium known as perinuclear antineutrophil cytoplasmic antibodies (pANCA) may also play a role in the pathogenesis.[12]

Epidemiology

Crohn's disease has a prevalence of 322 per 100,000 persons in a population and an incidence of 20.2 cases per 100,000 persons in North America per year. The typical age of onset has a bimodal distribution with one peak at 15-35 years and another at 55-70 years of age. Ulcerative colitis has a prevalence of 505 per 100,000 persons and an incidence of 19.2 per 100,000 persons in North America per year. Peak incidence is seen at 15-35 years of age. Both UC and CD have a higher prevalence in white populations and people of Ashkenazi Jewish descent. In both types of IBD there is similar incidence for men and women.[11]

Clinical Features

Patients with IBD may have symptoms for extended periods of time before presenting to a clinician with their concerns. Symptoms that are common to CD and UC include persistent diarrhea, abdominal pain, bloody stools, unintentional weight loss, and fatigue.[5,13,14]

CD follows a chronic episodic course alternating between symptom flare ups and periods of remission. Patients frequently present with complaints of abdominal pain, diarrhea, weight loss and fatigue.[13] Diarrhea fluctuates over periods of time and stools tend to be watery. However, in cases with rectal involvement, bloody stools may be present. Up to 20% of patients present with progressive disease with the development of abscesses, fistulas, or strictures.[1,15] Since a common location of disease is the terminal ileum, patients often have right lower quadrant (RLQ) abdominal pain. Abdominal masses in the RLQ may also be present.[14,15]

The onset of symptoms for UC tends to be gradual and progressive. Patients often present with concerns of frequent diarrhea which may or may not be bloody.[3,5] Depending on severity of disease, patients may have a single episode of diarrhea daily to more than 10 per day with associated cramping and rectal bleeding. Other common symptoms include fecal incontinence and tenesmus.[3,4,16] Abdominal pain is common in the left lower quadrant (LLQ). Patients may also experience tachycardia and orthostatic hypotension from volume loss secondary to excessive diarrhea.[4] Table 1 displays some of the extraintestinal manifestations that are associated with IBD.

Table 1. Extraintestinal manifestations of inflammatory bowel disease.[1,2,13,17-22]

System	Manifestation
Musculoskeletal	Inflammatory arthropathies, ankylosing spondylitis, osteopenia/osteoporosis
Hematologic	Anemia (iron deficiency, folate deficiency, B12 deficiency, chronic disease), increased risk of thromboembolic events
Renal	Nephrolithiasis (calcium-oxalate stones)
Metabolic	Growth failure in children, delayed puberty, osteopenia/osteoporosis
Hepatopancreatobiliary	Primary sclerosing cholangitis (PSC), pancreatitis, fatty liver, cholelithiasis
Ocular	Uveitis/iritis, scleritis/episcleritis, corneal ulcers
Integumentary/oral	Pyoderma gangrenosum, erythema nodosum, aphthous ulcers
Psychiatric	Anxiety, depression, difficulty in social situations

Diagnostics

A thorough clinical history is important in initiating the establishment of a diagnosis of IBD. Providers should always ask about family history of IBD. Exploring a differential should include asking questions about recent travel or parasitic exposure, ischemic disease to consider ischemic colitis, and history of antibiotic use for potential Clostridium difficile infection.[11] Abdominal examination may reveal tenderness to palpation and distention. Rectal exam is indicated to assess for fissures, abscesses, or skin changes in the perianal region. It is difficult to differentiate a diagnosis of CD, UC, and other gastrointestinal pathologies based on a clinical history and physical exam. Initial laboratory tests may include CBC, CMP for liver and renal analysis, and stool cultures. Other diagnostic tests include fecal calprotectin as an elevated amount is 89-98% sensitive and 81-91% specific for IBD. Stool lactoferrin levels have a sensitivity of 80% and a specificity of 82% for IBD. The presence of anti-saccharomyces cerevisiae antibodies (ASCA) has a 96% to 100% sensitivity for CD.[11] pANCAs may be present in up to 70% of patients with UC, however, the sensitivity for this finding is low so it is not recommended to be used for diagnosing or ruling out UC.[16]

The gold standard for diagnosis of IBD is endoscopic exam, usually colonoscopy with biopsy. On endoscopy, UC reveals inflammation beginning in the rectum and extending continuously and symmetrically proximally through the colon.[3,4,11] The bowel wall may appear granular and petechiae, edema, erosions, and spontaneous bleeding may be observed. Macro ulcers (Figure 1) may also be visible

Figure 1. Endoscopic imaging of severe colonic ulceration in ulcerative colitis.[23] Severe ulcerative colitis causes continuous ulceration visualized on endoscopy.

during endoscopic procedures.[23,24] Histologically, only the mucosa and submucosa are affected in UC.[11] Biopsy findings that are suggestive of UC include the presence of crypt abscesses in which the crypt epithelium breaks down and polymorphonuclear cells invade the lumen. Abnormalities of epithelial cells may be present, such as metaplasia of Paneth cells (Figure 2) and mucin depletion. The lamina propria increases in cellularity, specifically leukocytes. Basal lymphoplasmacytosis may also be seen on histologic examination, which is the presence of lymphoplasmacytic infiltration between the base of the crypts and the muscularis mucosa.[11,24,25,26] Similar histologic changes should be present in each biopsy of the involved colonic wall.[26]

CD has different involvement than UC as it can involve areas of the digestive tract outside of the colon, and in CD the rectum is often spared. Macroscopic findings include discontinuous lesions along any area of the GI tract that appear patchy and asymmetric. The pathognomonic endoscopic finding is the "cobblestone" appearance from ulcerations as seen in Figure 3. Biopsy of the terminal ileum is important for diagnosis of CD as it is one of the most commonly involved areas of the GI tract. Biopsies in a patient with CD show transmural inflammation. Microscopically, granulomas without central necrosis or caseation are seen in 15% to 70% of cases, as seen in Figure 4.[11,13,23,25] Another pathognomonic finding of CD is «creeping fat» which is a hyperplastic growth of mesenteric fat surrounding the bowel wall.[27]

Treatment of Ulcerative Colitis

Treating UC is based on the clinical severity as well as the extent of the disease within the colon. The goals of treatment are to induce remission, prevent relapse, and improve

Figure 2. Histologic image of ulcerative colitis.[25] Active ulcerative colitis with crypt abscesses (black arrowhead) and Paneth cell metaplasia (black arrow).

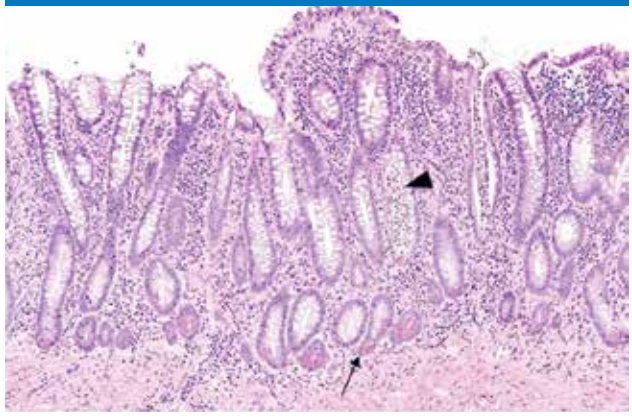


Figure 3. Endoscopic findings of Crohn's disease.[23] Typical endoscopic findings of Crohn's disease often include a cobblestone appearance of the mucosa from ulcerations.

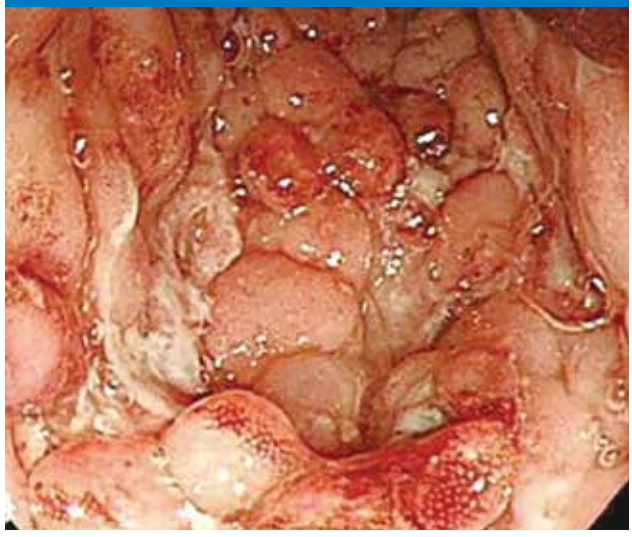
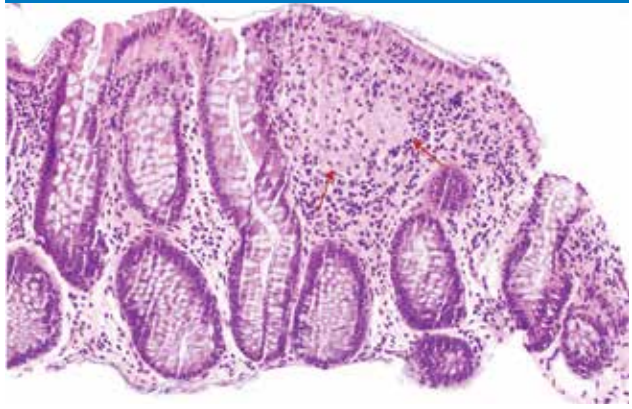


Figure 4. Histologic image of an epithelioid nonnecrotizing granuloma in Crohn's disease.[25] Granuloma lacking central necrosis (red arrow) is a histologic finding in Crohn's disease.



patient's quality of life.[19,28] Extent of colonic involvement and clinical symptoms including stool frequency determines severity and guides treatment.[28] Histological severity is rarely used to guide treatment.[19] Classification of UC based on anatomic location and severity are shown in Table 2.

Table 2. Classifications of UC based on colonic involvement and symptom severity.[19,28]

Anatomic classification	
Distal	Colonic involvement entirely distal to the splenic flexure
Extensive	Colonic involvement proximal to the splenic flexure
Severity classification	
Mild	Less than four stools per day, no blood, no systemic signs, ESR within normal range
Moderate	Four or more stools a day, minimal signs of toxicity
Severe	Six or more bloody stools per day, evidence of toxicity
Fulminant	10 or more bowel movements daily, continuous bleeding, toxicity, pain, tenderness, anemia, colonic dilation

Proctitis and Sigmoid Disease

Mild to moderate distal UC is managed with topical 5-ASA (mesalamine) suppositories (for isolated proctitis) and with enemas for disease up to the splenic flexure. Topical 5-ASA is the most effective compared to topical corticosteroids, oral corticosteroids, oral 5-ASA, and combined corticosteroids with oral 5-ASA.[19,28] Topical corticosteroids or corticosteroid foam may be used to induce remission, however topical mesalamine has been shown to still be superior. For mild to moderate disease, 4-6 weeks of therapy is recommended. Therapy may also be dictated by patient preference for oral or topical treatment.[19]

Mild to Moderate Extensive UC

For extensive UC, oral 5-ASA is utilized in combination with topical 5-ASA. If the disease remains refractory to oral and topical 5-ASA compounds, or a faster response is necessary, oral corticosteroids may be used.[28] Mercaptopurine (6-MP) or azathioprine may be considered for those who fail oral prednisone.[19] Finally, IV infliximab is administered if remission is not yet reached.[28]

Severe to Fulminant UC

Patients presenting with severe pain, colonic distension, GI bleeding, fever, tachycardia, anemia, and/or leukocytosis could require hospitalization. Patients with severe to fulminant UC that do not require hospitalization can be put on maximal topical/oral 5-ASA as well as oral corticosteroids with the addition of IV infliximab in the outpatient setting. IV corticosteroids are utilized in patients who fail outpatient treatment or begin to show signs of decompensation. After three to five days of IV corticosteroid treatment, patients should begin IV cyclosporine as it has been shown to increase rates of remission.[19,28] If patients have yet to reach remission at this point, a proctocolectomy may be considered.[28]

Surgery as a treatment for UC

Absolute indications for surgery include exsanguinating hemorrhage, perforation, or confirmed/suspected carcinoma.[19] Patients who fail to reach remission on maximal medical therapy and who have severe disease or proctocolitis should be managed with proctocolectomy. Ileal pouch anal anastomosis is the most common procedure.[19,28] Patients tend to have an increased health-related quality of life that is equivalent to the general population after surgical intervention.[28]

Remission and maintenance of UC

Once remission is reached, the same therapeutic agent is typically used as a maintenance drug but at a lower dose.[28] Distal disease can continue to be managed by 5-ASA suppositories and enemas. The use of corticosteroids is not effective and not recommended due to their adverse effects associated with long term use.[20,28]

Treatment of Crohn's Disease

Much like UC, therapeutic recommendations for CD are based on disease severity and location.[13] Inducing remission by treating active disease and maintaining remission are the goals of therapy, both clinically and endoscopically.[1] Disease severity and anatomic location should guide treatment of CD.[1,13] Table 2 displays how the severity of CD is determined. Most methods of treatment can induce remission within three months.[13]

Mild to Moderate

Although not useful at achieving mucosal healing, oral corticosteroids are indicated for mild to moderate flares. Budesonide is gut specific and can be used orally for mild to moderate flairs.[1] Systemic corticosteroids are used to induce remission in moderate to severe disease.[13]

Moderate to Severe

Immunomodulators such as the thiopurines (6-MP and its prodrug azathioprine) and methotrexate may be used when moderate to severe CD remains symptomatic despite corticosteroid therapy.[1,13] Unfortunately, clinical response may take up to 12 weeks. 6-MP and azathioprine are more effective at maintaining remission than inducing remission. Immunomodulators that are not effective in treating

THE LOWDOWN ON TELEHEALTH

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Payment gateways are the first step in the online payment process, and they have been crucial in helping companies more easily accept online transactions. Healthcare organizations that had never before, or only occasionally, offered virtual care began to see it as a lifeline. It offered both a way to reserve in-person care for the patients that needed it most, as well as a way for others to seek care from the safety of their homes.

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CD include mycophenolate mofetil, cyclosporine, and tacrolimus.[13]

Anti-TNF agents including infliximab, adalimumab and certolizumab are effective in treating CD that is refractory to other treatments. Anti-TNF agents are also more effective when combined with immunomodulators than either medication is when used alone. Biosimilar Anti-TNF agents could be as useful at treating CD, although further research is needed in this area.[1,13]

Patient's with CD that are resistant to the aforementioned treatments, may benefit from agents that modify leukocyte trafficking (vedolizumab and natalizumab) and those that target IL-12/23. These agents can be used to induce and maintain remission in moderate to severe CD.[11,13]

Topical and oral mesalamine, while very effective in treating UC, has not been shown to be consistently better at inducing remission in CD.[1,13] Antimicrobial therapy has not been shown to be more effective than placebo at inducing remission nor for maintenance therapy.[13]

Once remission is achieved, the same agent can often be used at a lower dose as maintenance therapy. Medications inducing remission are typically not discontinued due to increasing risk of relapse, need for surgery, and disease complications.[1]

Intestinal Complications of Ulcerative Colitis & Crohn's Disease

Surgery and Pouchitis

Severe UC may require surgical intervention in the case of exsanguinating hemorrhage perforation, severe to fulminant disease resistant to treatment, toxic megacolon, or carcinoma. Patients with intractable symptoms or intolerant to medications may also be considered for surgery.[19,28] Pouchitis is an inflammatory disease which affects the ileal pouch anal anastomosis after surgery. The etiology of pouchitis is unknown, but it can occur in up to 50% of patients after surgery. Presentation includes stool frequency, urgency, cramping, tenesmus, and fevers.[28]

Fistulas and Perianal disease

Up to 80% of patients with CD will develop perianal disease.[15] Fistulas to the vagina, urethra, skin, and bladder can be seen with severe CD.[13] 26% may develop anal fistulas requiring drains or surgery.[13,29] Surgery or drain placement may be necessary for patients with fistulas. Anti-TNF medications and antibiotics are indicated for fistulas.[2] Even with treatment, fistulas have a recurrence rate of 50%.[15]

Colorectal Cancer

Patients with IBD, both UC and CD, are at an increased risk for colorectal cancer (CRC) once disease has been present for 8-10 years. CRC in patients with IBD often occurs at a younger age than sporadic CRC.[19,30] The degree of risk is directly related to disease duration and extent of inflammation. Risk for CRC is even higher in patients who also have primary sclerosing cholangitis (PSC). CRC screening with colonoscopy is recommended 8-10 years after diagnosis and repeated annually or biannually thereafter.[19] Patients with CD also have a slightly increased risk for small bowel cancer.[13]

Prognosis

Both CD and UC have a slightly increased mortality rate than the general population.[13,31] A meta-analysis by Bewtra et al. found a statistically significant increase in pulmonary-related and nonalcoholic liver disease related mortality for both CD and UC compared to the general population; colorectal cancer-related mortality was also increased for UC.[31]

Conclusion

Inflammatory bowel disease is a disease of chronic inflammation with potential intestinal and extraintestinal manifestations that can severely impact a patient's quality of life. Both clinical features and endoscopic examination play a role in the diagnosis of IBD and the differentiation between ulcerative colitis and Crohn's disease. Medicinal treatment and surgical recommendations differ between UC and CD, but continued research of the pathophysiology of both types of IBD is critical in the development of new treatment options to achieve and maintain remission.

Literature search methods – *Information for this review was collected using resources from the digital Wegner's Health Science Library. The search was conducted between September and December 2022 and was limited to literature in English. Articles were screened by title, then by abstract, and finally, by full text. The literature search for this article was conducted by the authors.*

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Please note: Due to limited space, we are unable to list all references. You may contact South Dakota Medicine at ereiss@sdsma.org for a complete listing.

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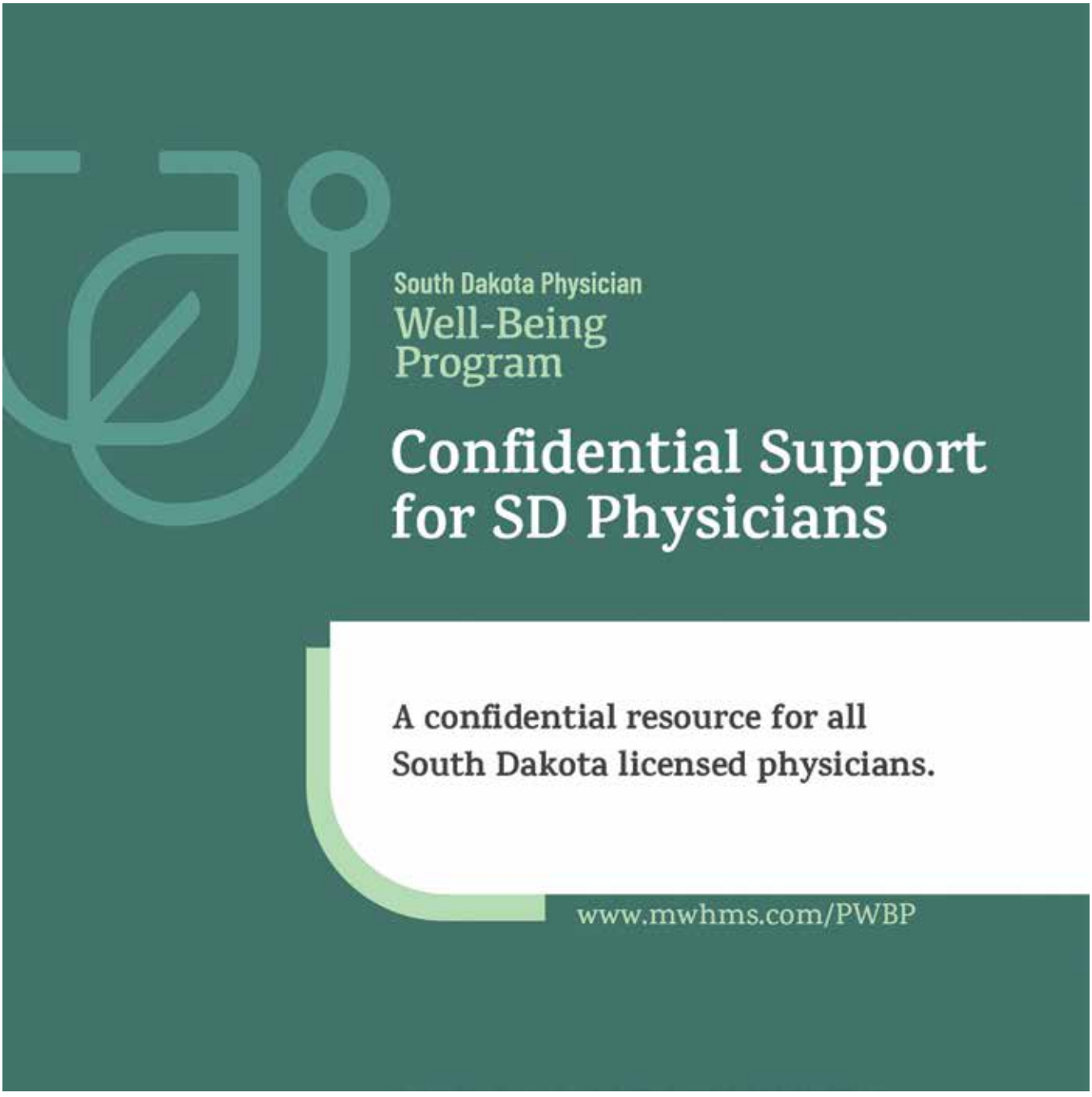

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EXTENUATING CIRCUMSTANCES:

There is Always Hope: The Legacy Trip 2023

Anthony La Nasa, MS IV; Jamuna Buchanan, MS IV; Layne Hohn, MS IV; David Jensen, MS IV; Matt Pohlmann, MS IV; Ryan King, MS IV; Brenda Orozco, MS IV; Autumn Hurd, MS IV; Madison McLaury, MS IV; and Michelle Schimelpfenig, DO;

When you hear the words "Make a Wish," what is the first thing that comes to your mind? For most of us, the image of a young child meeting their favorite celebrity or scoring a free trip to Disney World would be commonplace, but not as many of us would first think of the families. Even as fourth-year medical students, our education has revolved primarily around the diagnosis of complex diseases and their treatments, with very little emphasis placed on the ripple effect that these diseases create. When we are one-on-one in the clinic, the time allotted to spend with a patient and their family is simply not enough to allow for a deeper understanding of these extrinsic effects to be cultivated in one encounter.

When Eleanor Turner, an education coordinator at the University of South Dakota Sanford School of Medicine, proposed the idea of volunteering for a week at Give Kids the World (GKTW) Village to serve Make a Wish children and their families, it seemed like a prime opportunity to start to fill that gap in our understanding. The inspiration for this trip comes from Eleanor's son, Owen Turner, who visited GKTW on his Make a Wish Trip in 2016. Owen passed away in September 2021 at the age of 12. To honor and celebrate his life, Eleanor created the non-profit organization The Legacy Foundation, and began planning the first annual Legacy Trip.

Preparation began with a litany of fundraising and planning. As one can imagine, successfully organizing a seven-day trip on the other side of the country with a bunch of medical students who are in the middle of clinical rotations is no easy feat. Thankfully, the passion of our trip leaders and participants provided more than enough fuel to push through the logistical headaches and culminated in nine fourth-year medical students, three practicing pediatricians, and two Sanford School of Medicine staff flying down to Orlando, Florida, on May 7.

We stayed at a rental home about 10 minutes from the Village, volunteering for an average of six hours per day on assigned shifts. The shifts varied greatly, from working in the cafeteria or ice cream shop, to helping organize and put on a science fair or holiday party. Though the shifts were busy, and it was sometimes a challenge to get everyone where they needed to be, we were still able to make time to be with the children and their families – and it was as eye-opening as it was inspiring. Each day, students filled out a Google form with a variety of reflection questions, prompting them to record their responses, thoughts, and experiences.

When observing many of the families, it could be hard to tell that there was an ill child. Sometimes the children themselves showed no indications at all of being limited in any way. Our surprise revealed to us just how preconceived our image of a "Wish child" was. This preconception fell flat on its face on day one, and staying cognizant of our inaccuracy serves as an important reminder that very rarely can you tell what is happening in someone's personal life simply by looking at them.

"The atmosphere was great. I really wasn't sure what to expect, but I was expecting somewhat of a sad tone to some of the experiences; however, every family just seems like a regular family on vacation, with excitement and parents trying to keep up with kids." -Brenda Orozco, MS IV

Another reason it was hard to discern the presence of an illness was due to the genuine happiness of the entire family. Every single person in the Village, from the volunteers and employees to the over 150 families, was overflowing with joy and compassion. The amount of positivity and happiness that we witnessed that week cannot be overstated, and that is exactly the goal of GKTW Village: to provide families a carefree week where they don't have to feel the pressures of day-to-day life with a child who is sick.

"At the ice cream parlor this morning, I loved seeing the parents getting ice cream for breakfast just as much as the Wish children. It was great to see the whole family take the opportunity to let loose and enjoy the time as a complete release." -Matt Pohlmann, MS IV

Figure 1. Layne Hohn, MS IV makes a banana split in the Starlite Scoops ice cream shop.

Figure 2. Jessica Olcott, MD and Kassy Thorpe, MD support a child as she rides a horse around the specially designed barn area.

Figure 3. The Legacy Trip 2023 participants. Left to right, starting with back row: Kassy Thorpe, David Jensen, Tyler Hill, Anthony La Nasa, Matt Pohlmann, Ryan King, Layne Hohn, Eleanor Turner, Jessica Olcott, Jamuna Buchanan, Michelle Schimelpfenig, Brenda Orozco, Autumn Hurd, Madison McLaury. Pictured outside the guest services building at GKTW Village.

What came as an additional surprise to us, was that many of them chose not to utilize all the free tickets to the nearby Universal Studios and Walt Disney World, instead staying at the Village for portions of the week. When asked why, the answer was always the same: the accommodations at the Village allowed for their Wish children to feel exactly like their siblings, very often for the first time in their lives. Nowhere in the Village was there an activity that everyone couldn't participate in. The carnival rides had mechanisms to allow a wheelchair-bound child to ride *in the wheelchair.* When it came to horseback riding, if a child was unable to leave their wheelchair, the owner of the horses carried them on his lap on the horse. There was not a single thing that was exclusionary at any point. Sure, the Village couldn't match the scale or magnificence of the nearby theme parks, but that's not what mattered to the families. Inclusion took precedence over spectacle.

Going into this week, we expected there to be moments of sadness. We assumed that the effect of witnessing children who are all affected by terminal illness, whether it is their own or the diagnosis of a sibling, would weigh on us. But we never once experienced anything other than hope and, very often, joy. We were able to give comfort, fun, and relaxation to families whose lives have been turned upside down, and the gratitude and kindness we received in response is something that leaves a lasting impact on us as medical providers and as people.

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The HLI offers current and future leaders the opportunity to gain an in-depth knowledge of the role leadership plays in medicine, and prepares participants for roles within their practice location, health system, greater professional development and leadership skills training.

The program consists of six monthly sessions beginning October 13:

- October 13-14, 2023
- November 17-18, 2023
- December 15-16, 2023
- January 19-20, 2024
- February 16-17, 2024
- March 22-23, 2024

How do I apply? Those interested in participating may contact Justin Ohleen at 605-336-1965 or johleen@sdsma.org.

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Member News

Legal brief highlight: dispensing controlled substances and drug packaging requirements

South Dakota's Prescription Drug Monitoring law requires, with few exceptions, any person who delivers a controlled substance to the user must submit particular patient, prescriber, and prescription related information to a central data repository at least once each week to the South Dakota Board of Pharmacy.

Additionally, the Federal Poison Prevention Packaging Act requires physicians dispensing drugs and other medically related substances to package them in child-proof containers. The Poison Prevention Packaging Act of 1970 requires special packaging of a wide range of hazardous household products including oral prescription drugs and other substances related to medical treatment. If accidental poisoning occurs, a physician may be liable for failure to provide child-proof packaging of drugs dispensed in the physician's office.

More information is available in the SDSMA legal brief *Dispensing Controlled Substances and Drug Packaging Requirements* at sdsma.org. The SDSMA provides legal briefs online for member physicians on a variety of rules and regulations that apply to the medical profession. For nonmembers, legal briefs are available for purchase.

Physician peer support group meetings

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8-9:30 a.m., All Day Cafe, Sioux Falls

- September 11, 2023
- October 9, 2023

All retired or soon-to-be retired physicians are welcome to join in this informal gathering. RSVPs appreciated but not required. Email Dan Heinemann, MD at djheineman@aol.com or Tad Jacobs, DO at doctalkconsulting@gmail.com to save your spot.

PHYSICIAN MOMS GROUP - VIRTUAL
7-8 p.m. CT, Zoom

- Third Tuesday of each month

Physician moms are invited to a one-hour Zoom to share their experiences, struggles and encouragement with one another. Email Beth Jensen, DO at elizabethj@mwhms.com to be provided with the Zoom link or call 605-275-4711.

Please call the South Dakota Physician Well-Being Program at 605-275-4711 if you have questions about any of these groups.

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The Issue Is...

SDSMA meets with Sen. Thune

SDSMA members met with Sen. John Thune during August Recess to discuss issues of importance to South Dakota patients and physicians – Medicare physician payment reform, fixing prior authorizing, and telehealth.

Medicare physician payment reform – The SDSMA shared concerns with Sen. Thune about the growing financial instability of the Medicare physician payment system due to fiscal uncertainties physician practices face related to the pandemic, statutory payment cuts, lack of inflationary updates and significant administrative burdens. According to an American Medical Association analysis, Medicare physician payment has been reduced 26% adjusted for inflation from 2001–2023. The Medicare physician payment system lacks an adequate annual physician payment update, and a continuing statutory freeze in annual Medicare physician payments is scheduled to last until 2026, when updates resume at a rate of 0.25% per year indefinitely, well below inflation rates. Sen. Thune worked with the SDSMA and AMA last year on legislation to avert all payment cuts that had been scheduled to take effect.

Pictured with Sen. Thune are SDSMA Director of Advocacy & Policy Justin Ohleen; Robert Summerer, DO; Mary Carpenter, MD; and SDSMA CEO Barbara Smith

Prior authorization – 94% of physicians surveyed by the AMA said that prior authorization delays access to necessary care, and even worse, 34% of physicians reported that prior authorization has led to a serious adverse event for a patient in their care.

Sen. Thune and Sen. Mike Rounds have supported a final rule of the Centers for Medicare & Medicaid Services to right-size the prior authorization process imposed by Medicare Advantage plans. Additionally, the House Ways and Means Committee recently passed a bipartisan measure to strengthen the Seniors Timely Access to Care Act to require Medicare Advantage plans to establish prior authorization processes to streamline approvals and denials and require HHS to establish a process for those plans to provide "real time decisions" for prior authorization requests of items and services that are routinely approved. The SDSMA asked Sen. Thune to support this Act, as well as the Gold Card Act that would exempt physicians from Medicare Advantage plan prior authorization requirements so long as 90% of the physicians' pre-certification requests were approved in the preceding 12 months.

Telehealth – The SDSMA has long supported legislation to expand telehealth policy, research, and resources to ensure physician practice sustainability and fair payment. Specifically, the SDSMA supports congressional action to lift limitations on the locations of patients and physicians or other clinicians, remove in-person requirements for telemental health, ensure continued access to clinically appropriate controlled substances without in-person requirements, and increase access to telehealth services in the commercial market.

The flexibility granted during the COVID pandemic benefits patients. According to a survey of physicians nationwide, 80% of physicians used televists in 2022, up from 14% in 2016 and nearly triple from 2019. Nearly 70% of doctors say they want to keep providing telehealth services.

The SDSMA believes telehealth visits that include a physician evaluation lead to better patient outcomes than expanding the scope of practice for nonphysicians to perform those services, as would be permitted under the Equitable Community Access to Pharmacist Services Act (S. 2477 and H.R. 1770), which Sen. Thune is a sponsor. The SDSMA supports the Creating Opportunities Now for Necessary and Effective Care Technologies (CONNECT) for Health Act (S. 2663), the bipartisan legislation which would expand coverage of telehealth services through Medicare and make permanent COVID-19 telehealth flexibilities. Sen. Thune is not a cosponsor of the CONNECT Act at this time but shared that he supports it.

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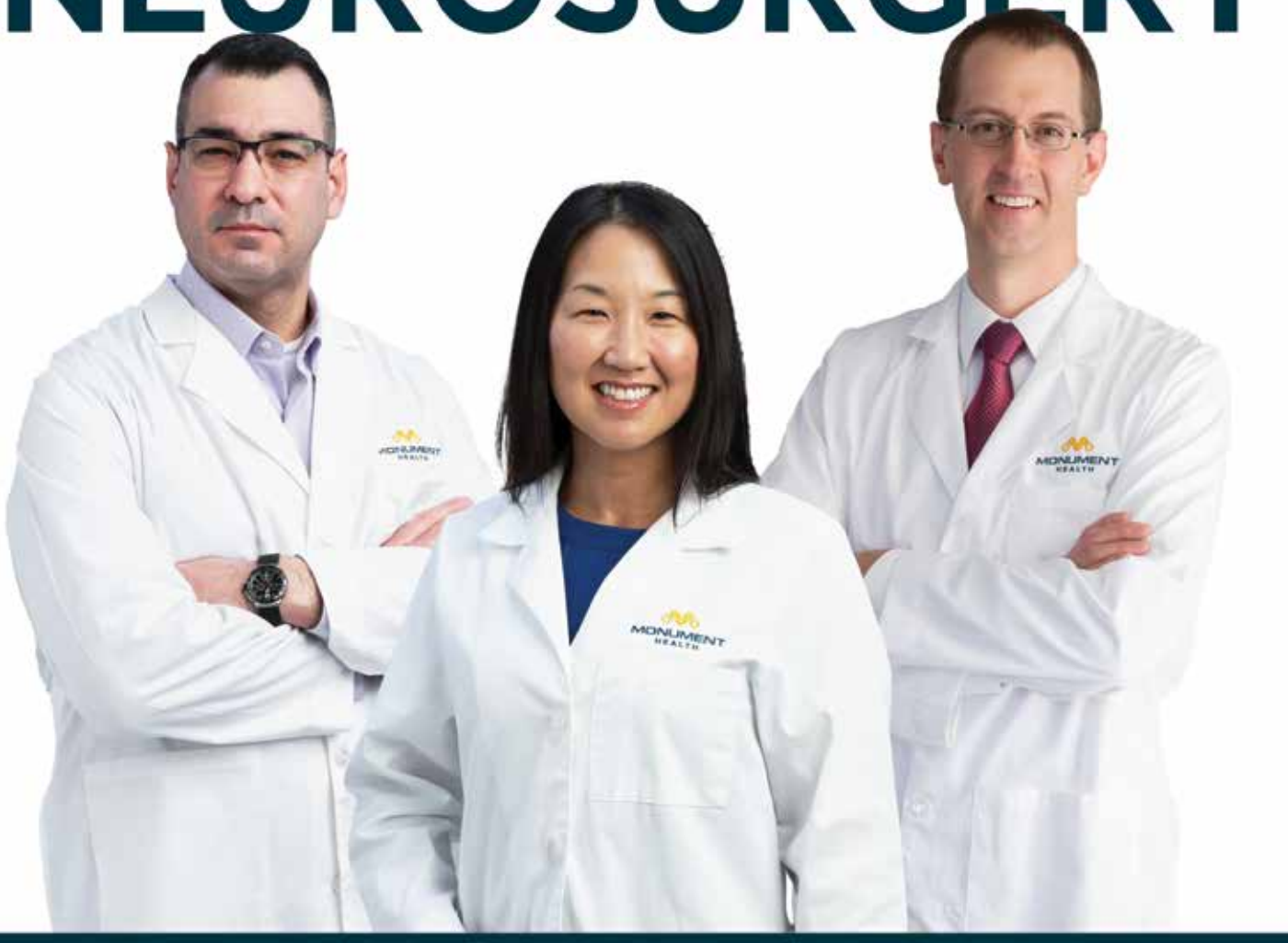

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