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South Dakota medicine

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If this resonates with you, consider whether paying attention to your investment accounts or the markets is emotionally or behaviorally helpful. My guess is that your life and your investments would be largely better served if you stopped paying attention. My recommendation is to check your investment accounts a few times each year, perhaps only when you meet with your advisor. If you are a daily checker, give this a try for the next few months, and see if you are less anxious and less prone to make decisions that would harm your long-term investment goals.

Remember, a successful investment experience involves endurance, sticking with it through thick and thin. If you are a long-term investor, the daily ups and downs of the market may have little influence on your long-term financial success. So, stop giving any of your mental and emotional energy to the news about what's going on in the market and what do about it. This is entirely out of your control.

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The Path to Survival

Lucio N. Margallo II, MD
President, South Dakota State Medical Association

The first-ever and only atomic warfare took place on Aug. 6 and 9, 1945 when the U.S. detonated two atomic bombs over the Japanese cities of Hiroshima and Nagasaki, respectively. The nuclear assault on Japan which killed about 200,000, mostly civilians, was executed three months after the conclusion of the war in Europe; it however eventually ended WWII, but certainly not the long-lasting havoc of the holocaust such as the multifold radiation side effects on the victims and other lifelong associated medical debilitations.

As of this writing, there are nine countries that continue to possess nuclear weapons - the U.S., Russia, the U.K., France, China, India, Pakistan, Israel, and North Korea. Against this backdrop, recent events are unfolding that could push us to the precipice of another intense hostility, short of open warfare, not only with an old nemesis, Russia, but with a more potent and rising hegemon, China.

Born in 1942, I only have implicit, if unconscious, memories of the fury of the war, like the rumblings of air raids or the sounds of machine guns, the cries for help, or maybe more, all vaguely suffused with the agony and emotions of the conflict suffered by civilians and soldiers alike, even by animals.

During peacetime, I enjoyed and was always excited watching the guys in uniform with their oversized backpacks, rifles, bayonets, and funny canteens. But the other side of the pictures grew clearer – the massive destruction of school buildings, churches, roads, bridges, playgrounds, and homes.

My family endured the conventional war in the Philippines with a few even moving on to serve in the Korean and Vietnam wars or remaining in active duty having survived as POWs.

Now, we face the grim prospect of repeating a dreadful history, or much worse – a global catastrophe that could trigger the wholesale devastation of life caused by the dreaded nuclear winter capable of screening out sunlight for years in a world of darkness and extreme cold. The breakdown of healthcare infrastructure would be a minor casualty as the whole planet would become uninhabitable, and the fabric of our society would collapse before humanity itself would perish.

We are not incapable of caring for one another despite ourselves. Thus, international relations should also be dictated not just by the malevolent forces of geopolitics but by brotherly love.

Let's hope and pray then that on the invasion of Ukraine by Russia or on the brewing hostilities in the Taiwan Strait, diplomacy, dictated by people power, will prevail and remain our main instrument of foreign policy and global stewardship.

Prayers still matter. God bless us and God bless America.

Working to Improve the Coyote Clinic

Brian Bishop, MS IV; and Jamuna Buchanan, MS III

After a busy week of clinical rotations, nine students from the University of South Dakota Sanford School of Medicine (SSOM) packed their bags and traveled to Mobile, Alabama. Over a recent weekend, they presented research and collaborated with medical students from across the country at the Society of Student Run Free Clinics (SSRFC) Annual Conference. These nine students have a diverse set of backgrounds and specialty interests, but what they have in common is a position on the Coyote Clinic Steering Committee and a passion for serving the underserved community in Sioux Falls.

The Coyote Clinic is a student-run free clinic (SRFC) that was founded by USD SSOM medical students in 2006. The mission of the Coyote Clinic is to provide free, high-quality healthcare to uninsured and underinsured members of Sioux Falls and surrounding communities.The Coyote Clinic is staffed by medical students of all levels, as well as volunteer physicians, nurses, clinic staff, and undergraduate students. The clinic operations are overseen by a steering committee, with positions held by six members of each medical school class.

On top of offering appointments for acute visits, chronic condition management, and behavioral health services, the Coyote Clinic also hosts annual flu/COVID-19 vaccine drives, and recently started an evening clinic at the Bishop Dudley Hospitality House as well as a health screening program at The Banquet Meal Ministry, both in downtown Sioux Falls. With the help of grants and generous donors, the Coyote Clinic is able to assist patients with prescription costs and provide free laboratory testing such as blood tests, urine analysis, sexual-transmitted infections testing, and more.

This year, the Coyote Clinic was represented in six poster presentations at the SSRFC Conference. The conference was attended by hundreds of medical students from schools across the country and consisted of a weekend full of inspiration, creativity, and collaboration between students with the common goal of improving their hometown SRFC. The keynote speaker, Rachel M Pearson, MD, PhD, a pediatric hospitalist and bioethics professor at the University of Texas Health Science Center, reminded students that while SRFCs are an important tool for providing care for the uninsured, our ultimate goal should be to work towards a more just healthcare system that doesn't rely on charity to address its shortcomings in providing equitable healthcare to all.

Left to right: Jamuna Buchanan, Anja Cucak, Brian Bishop, Sydney Lovrien, Garrett Quinn, Sydney Bormann, Annika VanOosbree, Alaire Buchholz, Carolyn Kennedy, Sabdi Bravo

After a whirlwind weekend, the Coyote Clinic representatives made their way back to South Dakota, minds and hearts full with ideas to improve upon their clinic. The students felt that the conference was a fantastic opportunity to meet and collaborate with other students from across the country on solving common issues. Like many other SRFCs represented at the conference, the Coyote Clinic was impacted by the COVID-19 pandemic. One such impact has been a decreased number of filled appointments. To combat this issue, a number of initiatives that other SRFCs have undertaken have been discussed by the Coyote Clinic Steering Committee, such as developing a website for marketing, reviewing the local Community Health Assessment to address additional healthcare needs in Sioux Falls, and developing a clinic phone system. These initiatives would aid the Coyote Clinic in reaching more people, providing more services, and ensuring the services offered are relevant to community needs.

Since the conference, The Coyote Clinic Steering Committee has been busy electing and orienting a new cohort of members from the class of 2025. We are excited to start implementing new ideas in order to grow the clinic and provide the best care possible to the underinsured and uninsured population of southeastern South Dakota. We would like to thank the University of South Dakota, Avera, and the USD Sanford School of Medicine for making this trip possible.

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Telemedicine in the Wake of COVID-19: A Statewide Demographic Study on Provider Utilization and Perspective In South Dakota

Rebecca Patrick, MD; Dane Hegdahl, MD; Ryan Patrick, MD; Jackson Shriver, MD; Katie Titus, BA; and Tim Ridgway, MD, FACP, FASGE

Abstract

Introduction: The COVID-19 pandemic has ushered in a rapid evolution of regulations surrounding telemedicine and the public's need for affordable, accessible, high-quality care at a distance. This necessity led to a rise in telemedicine demand that forced health systems to adapt, and for providers to witness the potential benefits and limitations of such services.

Methods: In this analysis, Sanford Health EMR data was evaluated from Q2 of 2019 to Q2 of 2020 to compare specialty utilization of telemedicine and quantify percentage change within the midst of the COVID-19 pandemic. A survey was conducted to evaluate provider opinion within the Sanford Health system regarding demographics, usage, perceived benefits, and perceived barriers to this rapid adoption.

Results: Results suggest that Sanford Health experienced a significant, 1,600 percent increase of telemedicine usage. Additionally, with this increased usage of telemedicine, provider opinion of telemedicine and its potential has improved. During the pandemic, a greater percentage of providers believe telemedicine is highly beneficial to their practice and a majority believe telemedicine will continue to play a vital role in their practice in the future. However, the barriers found within the survey included limited patient access, technical difficulties, reimbursement, and insurance coverage.

Conclusions: With the rapid increase in provider usage and the subsequent approval of providers, telemedicine has the potential to facilitate higher quality healthcare going forward. The COVID-19 pandemic has necessitated evolution and adoption of virtual media in medicine and has provided a unique glimpse into telemedicine's limitations and exceptional potential.

Introduction

Telemedicine offers an especially promising platform for the provision of health care in South Dakota, a state whose providers serve a large footprint, frequently seeing patients who live hundreds of miles from their providers' offices. Given the state's spread of over 76,000 square miles with only nine of its 66 counties having more than 20,000 people, telemedicine has the potential to bridge large care gaps and improve overall patient access.[1] Yet, despite its potential, research has shown telemedicine has historically been underutilized.[2]

Unsurprisingly, the COVID-19 pandemic has necessitated change in virtually every industry – including medicine. With the requirement of social distancing and rapid, mainstream adoption of virtual communication media, providers throughout the country have been forced to adapt, frequently turning to telemedicine to maintain their practices. Increased patient demand and physician utilization of telemedicine is especially evident following the recent Centers for Medicare and Medicaid Services (CMS) announcement of coverage changes involving expanded physician reimbursement for telemedicine visits.[3] Given this widespread provider adoption of telemedicine, there existed somewhat of a perfect storm to analyze changes in provider perspective and intent to utilize telemedicine going forward.

The authors of this manuscript partnered with Sanford Health, the nation's largest rural, nonprofit health system, to explore changes in provider perspective regarding

telemedicine and data surrounding such visits during the COVID-19 pandemic.[4] The authors believe telemedicine could drastically improve healthcare visits in terms of efficiency, convenience, and overall satisfaction for both providers and patients. This widespread adoption of telemedicine by providers and patients during the COVID-19 pandemic served as an ideal time to gather data and better understand telemedicine's role in healthcare during this pandemic and its future implications.

Methods

This investigation utilized a two-pronged approach involving a survey of providers and data analysis of provider telemedicine usage. The Sanford Health IRB determined this investigation did not qualify as human subject research and provided a waiver of approval.

Survey

A survey regarding provider opinions of telemedicine was designed specifically for this study. The survey underwent multiple iterations throughout its development process, with input from medical staff and physicians as well as the research team. The survey design was informed by a comprehensive literature review of recent telemedicine research projects. A standardized pilot survey was not performed, as input from Sanford Health's director of telemedicine, physicians, and other researchers were used to improve each iteration of the survey instrument. A total number of eight questions were proposed. The survey contained sections determining demographic information, perceived barriers and benefits of telemedicine, opinions of telemedicine before and during the COVID-19 pandemic, and a free-response section for personal opinions of telemedicine within their practice. Demographic information included number of years in practice and types of and preferences for telemedicine media utilized. Providers were asked to select all perceived barriers in a multiple-choice format. The same format was utilized for perceived benefits and which types of visits were best suited for telemedicine media. Providers were asked to indicate how beneficial telemedicine was to their practice before and during the COVID-19 pandemic using a 5-point Likert scaled response which included "strongly disagree," "somewhat disagree," "neither agree or disagree," "somewhat agree," and "strongly agree." A similar response format was used to evaluate providers' perspective regarding the potential usefulness of telemedicine following the pandemic's resolution and whether they believed telemedicine would constitute a "vital part of their practice" moving forward. There was a free response section allowing each provider space to communicate their thoughts regarding telemedicine's role in their practice moving forward.

The digital survey creation and data collection was conducted through the Qualtrics software managed by Sanford Health's market research department. This department distributed the survey to 248 primary care providers, including medical doctors, nurse practitioners, and physician assistants, practicing in South Dakota in the following primary care specialties: family medicine, pediatrics, obstetrics and gynecology, outpatient internal medicine, and acute care. The survey was sent through each provider's Sanford Health associated email. The data collection period was approximately three weeks following the time the initial recruitment communication was sent. The survey was distributed on Sept. 10, 2020 and closed Sept, 30, 2020. Two reminder emails were sent in that timeframe.

Survey reliability is high given questions, excluding the single free response question, were closed-ended, used neutral language, and offered broad answer ranges with a write-in answer option, thus minimizing bias in researcher interpretation of responses. Survey validity is also high, as the questions represent a wide range of telemedicine medium options and measures the specific aims the research team intended to capture, as the survey was created by the research team. The research team wanted to research sentiments surrounding telemedicine during the COVID-19 pandemic, and, as this had not been done before, decided to use an exploratory and descriptive study design to measure these sentiments.

Electronic Medical Record Database Analysis

Telemedicine usage data were collected from Sanford Health's Epic Electronic Medical Record (EMR) database. The EMR is the enterprise-wide documentation repository for all patient encounters at Sanford Health. Data specific to telemedicine encounters were collated by Sanford Health's Enterprise Data Analytics Team, an administrative team dedicated to the oversight and analysis of data pertaining to Sanford Health's providers systemwide. The data maintain high accuracy and validity, as the encounters selected as part of this study were identified by a unique visit type identifier in the EMR. The accuracy is, however, limited by whether a patient scheduled a telemedicine visit and subsequently did not show up or inadvertently presented to the clinic in person after requesting a telemedicine consultation. The accuracy of visit typification is thus reliant on administrative diligence when these incidents occur, affected by whether they are re-coded as a clinic visit or remain under a telemedicine

label. The data provided and analyzed in this study were deidentified of both patient and provider information. As patient medical records were not accessed, the status of completed visit type could not be verified.

Inclusion criteria included Sanford Health providers serving in South Dakota. The geographic location of the patient had no bearing on this study. Data was collected from identical three-month periods (April 1 through June 30) in 2019 and 2020. As noted above, the data include the number of telemedicine visits scheduled during these time periods – patient no shows are not accounted for. Categories of telemedicine visits available to patients in 2019 include telemedicine visits conducted at approved patient locations (not from home locations), coded as "Telemed New referral" or "Telemed visit," along with Tytocare services. Categories of telemedicine visits available to patients in 2020 include "Telemed home visits," "MyChart E visits," "MyChart Telemed home visits," and "TytoCare visits." "Telemed home visits" were developed in 2020 as a result of CMS coverage expansion which allowed provider-to-patient meetings to occur over media other than Epic (i.e. FaceTime, Zoom, Doxy.me, WebEx, etc.). The "MyChart E visits" and "MyChart Telemed home visits" seen in 2020 are telemedicine visits conducted over the Epic interface for patients with MyChart access; these visits could be conducted at any location in contrast with the 2019 telemedicine services available that restricted patients to predetermined locations. "TytoCare visits" involve virtual communication via video between providers and patients and were available in both 2019 and 2020. TytoCare is a telemedicine platform that utilizes a handheld exam kit and app that allows patients to perform guided medical exams while communicating with a healthcare provider. Due to the database's structure and filing methods, some specialties are paired with or nested within subsets of others. For our analysis, psychiatry and neurology have been separated, as have psychiatry and psychology. Similarly, internal medicine has been analyzed separately from its subspecialties along with differentiation applied to inpatient and outpatient internal medicine. It should also be noted these data include telemedicine visits with medical doctor, nurse practitioner, and physician assistant providers.

Results

Survey

A total of 248 providers were surveyed throughout the Sanford Health network in South Dakota. In total, 72 clinicians responded to the survey, yielding a 29 percent response rate. The participants varied in years since completing medical training from 0 to 44 with an average of 16 years (Min 0, Max 44, STD 10).

A majority of respondents utilized video and verbal visits when conducting telemedicine visits, 88 percent and 86 percent, respectively, while very few (2 percent) of respondents stated they have not used telemedicine services within the past two years. When asked, a majority of providers indicated their preferred method of telemedicine is video visits.

When surveyed regarding ways in which telemedicine enhances their practice, 87 percent indicated improved patient access, with 66 percent suggesting improved patient satisfaction as well (Figure 1). Continuity of care, increased provider productivity, decreased patient no-show rate, and improved efficiency of ancillary staff were also indicated as ways telemedicine served to enhance providers' practices. Eleven percent of respondents indicated telemedicine does not enhance their practice. A review of the comments made regarding this question highlight concerns about usefulness in addressing more complex visits and increasing liability.

When asked, lab result discussions, behavior health visits, medication reconciliation, and follow-up visits were indicated as visit types that work well via telemedicine. By contrast, pre- and post-operative visits, wellness visits, and new patient visits were selected the least. Free responses for effective visit types suggest providers agree that straightforward, uncomplicated needs of patients can be adequately addressed via telemedicine.

When questioned about the barriers that exist with current telemedicine usage, 79 percent of respondents indicated patient access to appropriate technology, and 54 percent suggested IT (information technology) issues. Six percent of respondents indicated there are no barriers to the use

Figure 1. Provider opinions of telemedicine.

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Table 1. Total scheduled telemedicine visits from April 1 to June 30.

	2019	2020	Percent increase
Number of visits	3,633	61,742	1,600%

Table 2. Percent increase by specialty from 2019 to 2020.

Specialty	2019	2020	Percent increase
Neurology	4	2,206	55,050%
OB/GYN	49	2,065	4,114%
Family medicine	1157	18,017	1,457%
Hematology and oncology	174	2,187	1,157%
Psychiatry	586	6,584	1,024%
Emergency medicine	65	403	520%
Vascular surgery	145	509	251%
Nephrology	563	1,385	146%
Infectious disease	360	547	52%

of telemedicine in their practice. Free response comments regarding barriers to telemedicine usage include the inability to gather objective information, such as vitals or a physical exam, and busy clinic schedules.

Respondents were asked what their views regarding telemedicine's benefit to their practice before and during the COVID-19 pandemic, as well as the potential for their future use of telemedicine following the pandemic's eventual resolution. When surveyed, 29 percent of respondents agreed that telemedicine was highly beneficial to their practice before the COVID-19 pandemic, while 26 percent disagreed. In contrast, 83 percent of respondents agreed that telemedicine was beneficial to their practice during the COVID-19 pandemic, while 10 percent of respondents disagreed. Seventy-two percent of respondents agreed with the prospect of using telemedicine more in their future compared to pre-pandemic usage, while 13 percent disagreed. When asked if telemedicine will play a vital role in their practice in the future, 58 percent of respondents agreed; 26 percent disagreed (Figure 2).

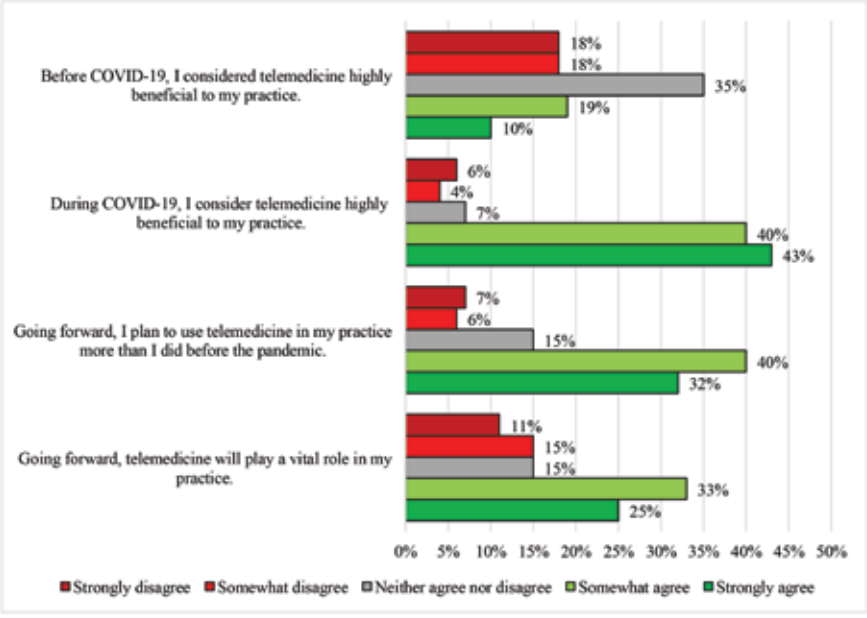
EMR Database Analysis

Comparing data from select, identical three-month periods in 2019 and 2020, the number of telemedicine visits scheduled by South Dakota providers across all specialties within the Sanford Health system increased by 1,600 percent (Table 1). In both time periods, family medicine and psychiatry were the highest and second highest telemedicine visit users, respectively. Family medicine usage increased by 1,457 percent from 2019 to 2020, while psychiatry increased by 1,024 percent. All analyzed specialties demonstrated an increase in telemedicine usage when comparing these two timeframes, with neurology demonstrating the largest relative increase of 55,050 percent and OB/GYN showing a second-highest increase of 4,114 percent (Table 2). Of note, only 4 neurology visits were conducted via telemedicine in 2019. Importantly, all clinics from which data were recorded were open to in-person and emergency visits throughout both time periods.

Discussion

The COVID-19 pandemic ushered in a new era of virtual communication with its imposition of social distancing requirements and these circumstances have subsequently led to increased telemedicine utilization by healthcare providers. Analysis of EMR data from South Dakota providers across all specialties showed a 1,600 percent increase in telemedicine utilization during the pandemic when compared to last year. When considering this increase, it is important to note that the realm of telemedicine in 2020 differs vastly from that of 2019. As the COVID-19 pandemic has spread throughout the United States, temporary changes have rapidly been

Figure 2. Evolution of provider opinion regarding telemedicine.



integrated into telemedicine legislation. Centers for Medicare & Medicaid Services (CMS) has drastically expanded the breadth of telemedicine services covered due to the current public health emergency.[5] Following suit, private insurance companies have also increased insurance coverage and options for telemedicine care.[6] Providers now have a broader array of telemedicine services in their arsenal that qualify for reimbursement due to these temporary expansions. The vast increase in telemedicine usage data reported in the Sanford Health system as well as in primary care settings nationwide should be interpreted in this context. Had CMS and private payers not expanded their services, it is possible this drastic uptick in telemedicine usage would not have occurred to the same degree. Yet, creating opportunities for providers to utilize more telemedicine services is only half the battle – providers must appreciate benefits to encourage continued use.

Widespread telemedicine adoption requires provider satisfaction. Wade et. al propose clinician willingness to use telehealth as the biggest influence on the successful operation of telehealth services.[7] Survey findings suggest that primary care providers see the potential benefits of increased telemedicine implementation within their practice and intend to use more telemedicine moving forward.

Providers' perceived benefits of telemedicine include improved patient access, patient satisfaction, continuity of care, and provider productivity. Previously reported studies have determined providers appreciate these same benefits.[8] Seventh-two percent of surveyed providers plan to use telemedicine in their practices more than they did prior to the pandemic. Furthermore, 58 percent of these providers believe telemedicine will play a vital role in the future of their practice.

Importantly, increased telemedicine utilization comes with the recognition of barriers, too. According to surveyed providers, the most frequently perceived barriers to telemedicine included patient access to appropriate technology, IT issues, insurance coverage, and physician reimbursement. This parallels commonly reported barriers prior to the COVID-19 pandemic.[9] These perceived barriers have implications for how healthcare systems will direct their ongoing development of and support for telemedicine services. It has become clear that continued production of and funding for adequate technology to facilitate patient access will play a vital role in furthering telemedicine's utilization and impact.[1] The detrimental problems IT issues can pose has also become evident – what is more, these "issues" must be fully fleshed out and explored. The sorts of solutions to these problems likely include bandwidth and internet connectivity improvements, patient and provider information dissemination including training programs and instructional resources, and expanded IT department staff to facilitate trouble shooting and assistance.[10]

Limitations

This study has several limitations. The survey yielded a 29 percent survey response rate, which introduces the potential for a response bias from responding healthcare providers. Additionally, distribution of the survey was limited to healthcare providers within the Sanford Health system in South Dakota, limiting generalizability to other geographic areas or health systems. Furthermore, the authors surveyed primary care practitioners in the fields of family medicine, internal medicine, obstetrics and gynecology, pediatrics, and acute care, limiting generalizability to other, non-primary care specialties.

Conclusions

The COVID-19 pandemic spurred a 1,600 percent increase in telemedicine visits across a South Dakota health system's providers. A majority of providers surveyed from that provider base indicated the increased use of telemedicine during the pandemic has positively influenced their opinion of and intent to utilize telemedicine in their practices going forward. Over half suggested telemedicine will likely play a vital role in their future practices. Given this increased provider utilization and positive reception, telemedicine appears poised to bolster healthcare quality through the reported improvements in patient access, patient satisfaction, continuity of care, and provider productivity.

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ST Elevation MI with Normal Coronary Arteries: A MINOCA Case

Hilal Olgun Kucuk, MD; Ugur Kucuk, MD; Muhammed Hamza Saad Shaukat, MD; Brian Simpson, MD; and Adam Stys, MD

Abstract

Background: Myocardial infarction with nonobstructive coronary arteries (MINOCA) is a syndrome characterized by clinical evidence of myocardial infarction with normal or near-normal coronary arteries on angiography.

Case Report: A 35-year-old female patient presented with typical chest pain. EKG revealed sinus rhythm, 1 mm ST elevation in DI-aVL, prominent R waves in V1-V3 and ST-segment depression in DIII-aVF. She underwent emergent coronary angiography which revealed normal coronary arteries. Troponin levels peaked at 123 ng/mL. 2D Transthoracic echocardiogram showed an EF of 50 percent with lateral wall hypokinesis. A cardiac magnetic resonance imaging (CMR) showed myocardial scar tissue. Epicardial late gadolinium enhancement (LGE) was noted in the lateral left ventricular wall consistent with transmural myocardial infarction

Discussion: MINOCA is not an uncommon presentation of acute MI (AMI). It is more frequent in younger women and nonwhites, is associated with fewer traditional risk factors, and usually presents with non–ST-segment elevation–myocardial infarction. Patients with MINOCA should undergo further testing to reveal the underlying etiology as treatment will vary depending on the cause. MINOCA is not a benign syndrome, with outcomes comparable to their AMI-CAD counterparts especially in younger patients.

Introduction

Myocardial infarction with nonobstructive coronary arteries (MINOCA) is a syndrome characterized by clinical evidence of myocardial infarction with normal or near-normal coronary arteries on angiography. Diagnosis of MINOCA is challenging as several clinical entities can cause it. It represents a working diagnosis that requires exclusion of other causes of troponin elevation (i.e., Takatsubo syndrome, myocarditis, or other cardiomyopathies). Although patients with MINOCA may not need interventional therapy because of the absence of coronary artery occlusion, they may have a worse prognosis if the condition remains underdiagnosed and is not appropriately managed.

Here we report a case of MINOCA who presented with acute ST-elevation MI.

Case Report

A 35-year-old Hispanic female patient presented to ED with acute onset typical chest pain of two hours duration. Past medical history was significant for hypertension, type 2 DM and hyperlipidemia. She was a smoker. Vitals signs, as well as physical examination were within normal limits. EKG revealed sinus rhythm, 1 mm ST elevation in DI-aVL, prominent R waves in V1-V3 and ST-segment depression in DIII-aVF (Figure 1). She underwent emergent coronary angiography which revealed normal coronary arteries. The patient's chest pain resolved shortly after admission, and she was transferred to the coronary care unit for further observation. Troponin levels were monitored every 6 hours, and the pattern was consistent with that of acute MI. The peak value of troponin was 123 ng/mL. 2D Transthoracic echocardiogram showed an EF of 50 percent with lateral wall hypokinesis. A cardiac magnetic resonance imaging (CMR) was obtained to rule out other causes of troponin elevation showed myocardial scar tissue. Epicardial late gadolinium enhancement (LGE) was noted in the lateral left ventricular wall consistent with transmural myocardial infarction (Figure 2). Based on clinical, angiographic and CMR findings MINOCA was diagnosed. The patient was treated with dual antiplatelet therapy and aggressive risk factor modification was done.

Discussion

In contemporary literature, MINOCA is an umbrella term for all causes of troponin elevation inclusive of coronary (e.g., plaque rupture, spasm, spontaneous coronary artery

Figure 1. EKG revealing sinus rhythm, 1 mm ST elevation in DI-aVL, prominent R waves in V1-V3 and ST-segment depression in DIII-aVF.

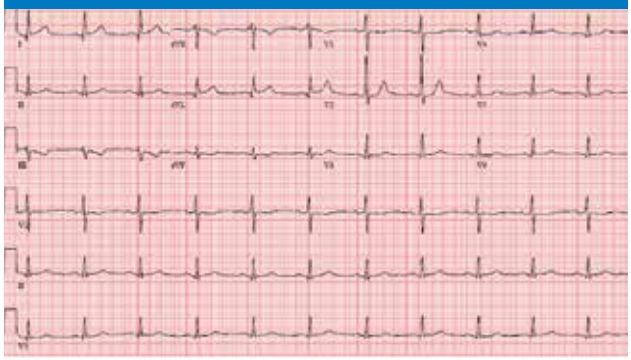
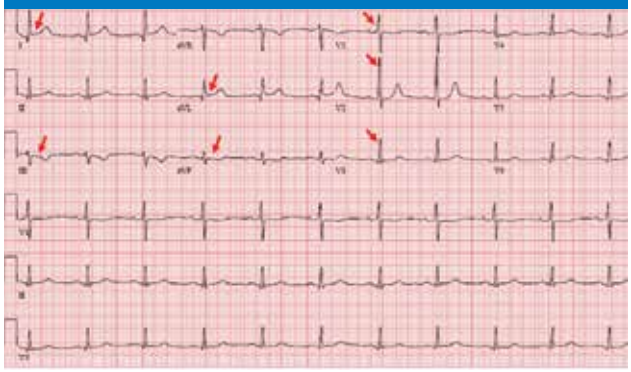


Figure 2. Cardiac MRI showing late gadolinium enhancement (arrows) in lateral left ventricular wall.



dissection, or embolization) and noncoronary causes of ischemia (e.g., myocarditis or takotsubo). More recently, however, it has been proposed to describe patients with coronary related ischemia primarily.[1] American Heart Association (AHA) released a statement paper in 2019.[2] It proposed the following diagnostic criteria for MINOCA: (1) acute MI (AMI) criteria as defined by the "Fourth Universal Definition of Myocardial Infarction",[3] (2) nonobstructive coronary arteries as per angiographic guidelines, with no lesions ≥50 percent in a major epicardial vessel; and (3) no specific alternate diagnosis for the clinical presentation.

The prevalence of MINOCA ranges between 5 and 15 percent of all myocardial infarctions.[4] The demographic and clinical characteristics of MINOCA patients differ from other patients with AMI secondary to coronary artery disease (AMI-CAD). MINOCA patients are usually younger, women make up close to 50 percent of the MINOCA population but only 25 percent of the population with AMI-CAD and it is also more likely to occur in patients of black, Pacific race and Hispanic ethnicity.[5,6] The prevalence of traditional CAD risk factors and clinical features also varies among patients with MINOCA versus AMI-CAD. MINOCA patients have a lower prevalence of traditional CAD risk factors, such as dyslipidemia, hypertension, diabetes mellitus, tobacco abuse, and a family history of myocardial infarction.[6,7]

MINOCA patients represent a conundrum given the complex and multifactorial mechanisms associated with this syndrome. The underlying pathology can be broadly divided into two groups: atherosclerotic vs. non-atherosclerotic causes. The most common atherosclerotic cause of MINOCA is coronary plaque disease, whereas non-atherosclerotic causes include spontaneous coronary artery dissection, coronary artery spasm, coronary microvascular dysfunction, coronary embolism/thrombosis, and supply-demand mismatch.

Cardiac magnetic resonance imaging is recommended as a critical investigation in MINOCA because it provides insights into potential myocardial injury causes.[8] In particular, the presence and pattern of LGE can exclude myocarditis, takotsubo syndrome, and cardiomyopathies, as well as provide imaging confirmation of AMI.

The prognosis is extremely variable, depending on the cause of MINOCA, but is not as benign as previously assumed.[9] A retrospective analysis of patients enrolled in the ACUITY trial showed that patients with MINOCA had a higher adjusted risk of mortality at one year, driven by greater non-cardiac mortality than non-ST-segment elevation myocardial infarction patients and obstructive CAD.[10] The prognosis remains suboptimal even in groups expected to be healthy with few comorbidities–e.g., young women with their first MI.[11]

All MINOCA patients with any evidence of atherosclerosis should be treated aggressively for modifiable CAD risk factors (such as smoking, hypertension, diabetes mellitus, and hyperlipidemia). Patients should receive appropriate secondary prevention therapies including antiplatelets, β-blocker, ACEI/ARB and statins as outlined by current ST elevation and non-ST elevation MI guidelines.[12,13] Therapy should be individualized, and targeted therapies aimed at the specific cause should also be provided.

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Syringomatous Adenoma of the Nipple with Associated Invasive Carcinoma: A Case Report

Dylan Pratt, MD; and Ashwyna Sunassee, MD

Abstract

Syringomatous adenoma of the nipple is a rare benign infiltrative neoplasm that was first described in 1983. At the time of this writing, a literature search revealed no cases of syringomatous adenoma of the nipple in association with invasive carcinoma of the breast. We report a case of syringomatous adenoma of the nipple in a 40-year old female who also had bilateral invasive ductal carcinoma and ductal carcinoma in situ of the breasts. Syringomatous adenomas of the nipple have been postulated to originate from eccrine structures of the nipple due to their microscopic similarity to other tumors of eccrine origin, such as syringomatous carcinoma. However, their exact origin is uncertain. Despite their benign behavior, they usually demonstrate an infiltrative and expansile proliferation into adjacent nipple and breast tissue. They have been confused with tubular carcinoma and low-grade adenosquamous carcinoma of the breast, both clinically and histologically. Complete excision is the therapy of choice, and only incompletely excised lesions have shown recurrence. We present this case to raise awareness that syringomatous adenoma of the nipple may present in patients with a simultaneous invasive carcinoma of the breast.

Introduction

Syringomatous adenoma of the nipple is a rare benign infiltrative neoplasm that was first described in 1983.[1] It is composed of a haphazard and infiltrative proliferation of teardrop or comma shaped, elongated ductules with a two layer epithelium. It is found in the dermis of the nipple areolar complex and does not involve the epidermis.[2] Syringomatous adenomas have been postulated to originate from eccrine structures of the nipple due to their microscopic similarity to other tumors of eccrine origin, such as syringomatous carcinoma. However, their exact origin is uncertain. There are no reports of regional or distant metastases of syringomatous adenoma of the nipple.[3] Despite their benign behavior, they usually demonstrate an infiltrative and expansile proliferation into adjacent nipple and breast tissue. They have been confused with tubular carcinoma and low-grade adenosquamous carcinoma of the breast, both clinically and histologically.[4] Complete excision is the therapy of choice, and only incompletely excised lesions have shown recurrence.[1] At the time of this writing, a literature search revealed no cases of syringomatous adenoma of the nipple in association with invasive carcinoma of the breast. We report a case of syringomatous adenoma of the nipple in a 40-year old female who also had concurrent bilateral invasive ductal carcinomas and ductal carcinomas in situ of the breasts.

Case Presentation

A 40-year-old female with a history of acute myeloid leukemia at age 12 (status post chemotherapy, whole body radiation, and two bone marrow transplants), graft-versus-host disease, and pulmonary scarring with frequent pneumonia. She initially presented for a screening mammogram which revealed bilateral breast masses. Ultrasound-guided biopsies showed invasive ductal carcinoma in the right breast and ductal carcinoma in situ of the left breast. Physical exam after biopsies revealed a subtle mass deep to the nipple-areolar-complex in the right breast, no masses felt in the left breast, and bilateral absence of axillary lymphadenopathy. No comment was made on either nipple in this clinical physical exam. In part due to the patient's history of radiation therapy, patient then underwent bilateral, modified radical mastectomies with axillary lymph node dissections.

Gross exam of the nipples after surgery showed an everted and unremarkable right nipple and inverted left nipple that was 4 cm from the recent ductal carcinoma in situ biopsy site. Pathology on the right breast mastectomy revealed invasive ductal carcinoma, ductal carcinoma in situ, and three benign axillary axillary sentinel lymph nodes. Pathology on the left breast mastectomy revealed a single benign axillary lymph node, ductal carcinoma in situ, and an invasive ductal carcinoma that appeared to be arising in combination with a syringomatous adenoma of the nipple.

Diagnosis of the syringomatous adenoma of the nipple was made morphologically and with the aid of immunohistochemical stains which showed P63 and CK5/6

Figure 1. Low power view of syringomatous adenoma of the nipple(darker staining and curved glands, indicated by block arrow) with adjacent invasive ductal carcinoma(lighter staining with infiltrative pattern, and indicated by arrowhead).

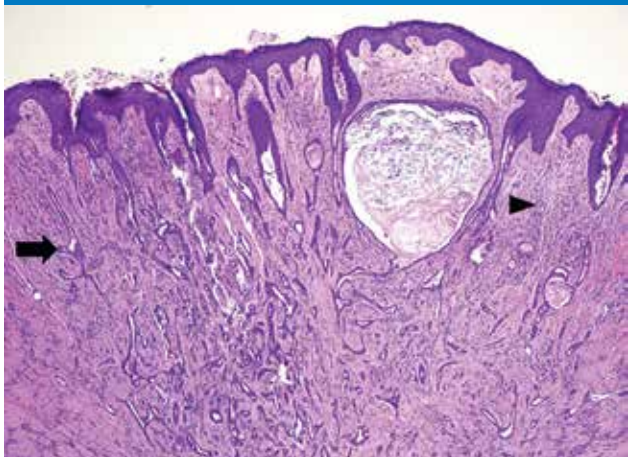


Figure 2. Low power view of syringomatous adenoma with positive P63 staining, no staining for P63 in invasive ductal carcinoma.

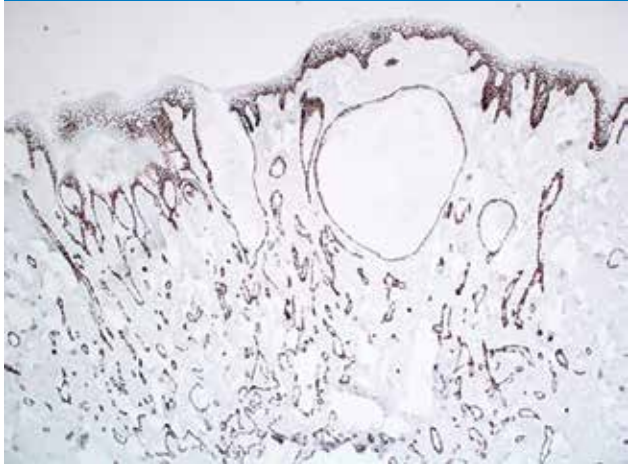
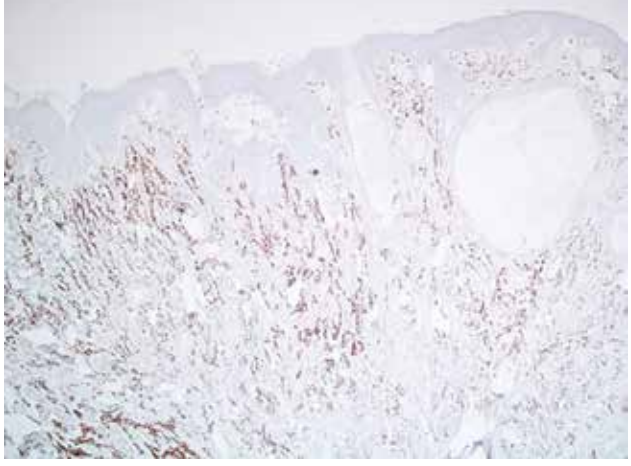


Figure 3. Low power view of invasive ductal carcinoma with positive E R staining, no staining for ER in syringomatous adenoma.



positivity, along with ER and PR negativity within the syringomatous adenoma. The invasive ductal carcinoma in the same breast was positive for ER, PR, and E-cadherin, and negative for P63 and CK5/6. This staining pattern supported the presence of a syringomatous of the nipple in combination with an invasive ductal carcinoma.

Discussion

Syringomatous adenoma of the nipple is characertized by a haphazard and infiltrative proliferation of teardrop or comma shaped, elongated ductules with a two layer epithelium. It is found in the dermis of the nipple areolar complex and does not involve the epidermis.[2] This histological pattern allowed for morphological distinction of the syringomatous adenoma from the adjacent invasive ductal carcinoma, which had an appearance of singly dispersed cells and cells in single file lines (Figure 1).

Immunohistochemical stains also aided in distinction of the syringomatous adenoma from the invasive ductal carcinoma, with the former being positive for P63 and CK5/6 and negative for ER and PR (Figure 2). The invasive ductal carcinoma was negative P63 and CK5/6, and positive for ER and PR (Figure 3). Due to the appearance of invasive cells in single file lines, an E-cadherin stain was performed and confirmed the invasive ductal carcinoma.

At the time of this writing, a literature search revealed no cases of syringomatous adenoma of the nipple in association with invasive carcinoma of the breast. This case brings awareness that these neoplasms can be found simultaneously, and even appearing to arise in association with each other. This is important because syringomatous adenomas can recur if they are incompletely excised, and a missed diagnosis of invasive carcinoma could have dire clinical consequences.

Conclusion

Syringomatous adenoma of the nipple is a rare benign infiltrative neoplasm that was first described in 1983.[1] This is an important case because it is the first described in the literature, as of the time of this writing, of a syringomatous adenoma of the nipple arising simultaneously with an invasive carcinoma of the breast.

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Experience Implementing a Public Health Surveillance System Designed for Fathers of Infants on a South Dakota American Indian Reservation

Sara DeCoteau; Maggie Minett, PhD; Teresa Binkley, PhD; Tianna Beare; and Bonny Specker, PhD

Abstract

Introduction: Paternal behaviors and attitudes during pregnancy are not known. A health survey for fathers of recently born infants was developed to be administered concurrently with a maternal survey to assess parental behaviors and attitudes before, during and after pregnancy.

Methods: Participants were parents of 149 American Indian infants born from April 1 and Dec. 31, 2015 who were recruited prospectively from data of all births in prespecified reservation counties representing Sisseton Wahpeton Oyate of the Lake Traverse Reservation. Data collection was via hard-copy or online survey.

Results: Response rate among mothers was 62 percent (n=92). Of 149 births, 126 listed a father on the birth certificate and 51 percent (n=64) of these completed surveys on average 4.7 months post-birth. Healthwise, 90 percent of fathers reported being overweight or obese, but a small percent visited a health care worker in the previous year to be checked for diabetes (11 percent) or hypertension (14 percent). Among fathers who smoked in the last two years (73 percent), 77 percent of the mothers also smoked compared to 20 percent of mothers smoking if the father did not smoke ($p<0.001$). Nearly three-fourths of fathers were supportive of breastfeeding (70 percent), and mothers whose partners were supportive were more likely to breastfeed than those with unsupportive partners (91 percent vs. 50 percent, respectively; $p<0.001$). The majority of fathers attended prenatal visits (57 percent), the delivery (88 percent), and some or all well-baby checks (73 percent) with the main barrier stated as not being able to take time off work.

Conclusion: Conducting a health survey with both fathers and mothers in a reservation setting is feasible and the father's attitudes and behaviors related to breastfeeding and smoking were associated with maternal health behaviors. Most fathers attended health care visits with the mother, but they were not being screened for health conditions despite a large proportion being overweight and smokers. Prenatal and antenatal visits may provide an opportune time to engage fathers and address paternal health issues.

Introduction

Since a father's involvement in the time before, during and after pregnancy affects the child's health,[1-3] paternal involvement also may be associated with improved maternal pregnancy behaviors and outcomes. Much of the research only considers the couple's marital or cohabitation status as a basis for paternal involvement. However, emphasis on the father's attitudes and behaviors during pregnancy, and how these attitudes align with the mother's own behaviors, may provide valuable information on the father's engagement during the antenatal period and the effects on pregnancy outcomes.

Fathers play a supportive role in reproductive health and pregnancy, yet there has been little focus on how the father's health and behaviors can affect the pregnancy and how prenatal events may affect the fathers' health, especially among American Indian populations.[4] Despite the limited research indicating that positive paternal involvement is associated with positive maternal behaviors such as early and adequate prenatal care, attending childbirth classes, breastfeeding and better health after delivery, there is a lack of paternal data on attitudes and behaviors around pregnancy and the association with maternal attitudes and behaviors.[3,5] Paternal stress during pregnancy, especially in younger fathers, can lead to negative behaviors which can influence maternal behaviors, yet no studies have investigated prenatal stressors that may exist for fathers of American Indian infants.[6] Thus,

strategies need to be developed to study the father's attitudes and behaviors during reproductive periods and how they are associated with the mother's attitudes and behaviors, and determine whether these methods are acceptable among an American Indian population.

One promising approach to studying the fathers' attitudes and behaviors would be to leverage the existing Pregnancy Risk Assessment Monitoring System (PRAMS) survey. PRAMS, developed by the Centers for Disease Control and Prevention (CDC) in 1987, provides state-specific and population-based information for recent mothers of a live birth that ask about attitudes, behaviors, and experiences before, during and shortly after pregnancy. While mothers are asked limited questions regarding fathers, a survey targeted to fathers would provide first-hand knowledge of their thoughts and experiences.[7] The information gathered from this type of survey could increase knowledge and awareness of the distinct issues experienced by fathers during the reproductive period and their level of support for positive maternal health behaviors. Historically the response rate in the PRAMS among mothers of American Indian infants has been low, primarily due to a low contact rate rather than a low participation rate.[8] However, no studies have been done that have determined the response rate to surveys regarding pregnancy among fathers of American Indian infants.

The objective of this project was to develop a paternal PRAMS-like survey and administer it concurrently with a maternal PRAMS-like survey to assess parental behaviors and attitudes among an American Indian population in rural South Dakota. The development of the survey instrument for fathers was designed to mirror the mothers' survey. The methodology used and response rates are described as well as key results.

Methods

All mothers who gave birth to an American Indian infant between April 1 to Dec. 31 of 2015 and resided in a Sisseton Wahpeton Oyate (SWO) of a Lake Traverse Reservation county (Roberts, Marshall, Day or Codington) in eastern South Dakota were included. A data use agreement was established between South Dakota State University (SDSU), which was responsible for data collection and analyses, and the South Dakota Department of Health, and birth certificate data were downloaded monthly.

Parents' names were obtained from birth certificates, and all correspondence was through the mother. Fathers whose names were on the birth certificate were eligible to be contacted via the mother or directly if the father's address was provided by the mother. For fathers whose names were not on the birth certificate, the mother was asked by the Tribal Health coordinator for the father's information, and he was contacted by the mother or directly if the mother consented. Fathers that heard about the study who came forward to complete the survey were eligible.

Data collection was conducted via survey (hard copy or online) and occurred between two to six months postpartum. Initial attempts to contact parents were by letter followed by the mailing of the survey following similar procedures as the CDC PRAMS protocol (www.cdc.gov/prams/methodology.htm). A Tribal Health coordinator was responsible for locating participants and encouraging the parents to complete the surveys. A phone contact was attempted if the mailed survey was not returned within two weeks, and a repeat mailing or a home visit was offered. The coordinator did not ask questions or fill in the survey for the participant; rather, they handed the parent the survey booklet or provided a computer/instruction for the participants to complete the survey online. Completed survey booklets were placed in a pre-paid envelope by the participant and mailed directly to SDSU. Participant identification numbers were assigned allowing the mother's and father's surveys to be linked. Participants received a $20 gift card to Dakota Connection, a Tribal gas station and convenience store, for survey completion. Attempts were made to complete the survey until six months postpartum although surveys received after were used.

The mothers' survey had 101 questions including CDC PRAMS (Phase 6) core questions and supplemental questions. Topics addressed included prenatal care, alcohol and cigarette use, substance abuse, domestic abuse, contraception, maternal stress, depression, health insurance, infant sleep practices, economic status, and adverse childhood experience (ACE) questions.

The father's survey had 66 questions, and topics were similar to the mother's survey with additional questions specifically for the father such as: barriers to attending prenatal visits and delivery, anxiety about labor and delivery, barriers to taking time off after the birth, and attitudes regarding breastfeeding. Anxiety questions were taken from the PRAQ-R2,[9] questions about the attitudes and beliefs concerning breastfeeding were based on a published survey,[11] and depression scores were calculated using the PRAMS-3D[10] that is based on questions related to feeling hopeless, slowed down, and down, depressed or sad. Question completion ranged from

78 percent to 100 percent (average=98 percent). In general, response options were adequate and skip patterns were followed appropriately, in part, due to the majority of surveys being completed online which automates skip patterns. One question had two responses that differed between men who completed by mail vs. online, and these responses related to reasons that prevented the father from going to prenatal visits. These differences may reflect differences in socioeconomic status in both the response to the question and the method of survey completion, as parents responding via computer are likely higher socioeconomic status.

Prevalence rates with 95 percent confidence intervals are given for rates of fathers' health, health-related activities, attendance at health care visits, depression, anxiety, tobacco use and mothers' health and health-related activities. Chi-square analyses were used to determine the associations between demographic characteristics (age, education) and survey completion, and odds ratio for fathers' attitudes toward breastfeeding and breastfeeding rates. Kappa statistics were used to assess agreement between the fathers and mothers with regard to intendedness of pregnancy and contraceptive use, fathers' perception of maternal depression and symptoms of depression as reported by the mother, and reported tobacco use among the father and mother. The study protocol was approved by the SDSU Institutional Review Board, SWO Local Research Review Board, and the Indian Health Service Great Plains Institutional Review Board. The SWO Local Research Review Board reviewed and approved the manuscript.

Results

Of the 149 births during the study period, 92 mothers (62 percent) and 64 of the 126 fathers (51 percent) listed on the birth certificate completed the survey (62 mother-father pairs). Demographic characteristics and method of survey completion for fathers and mothers are shown in Table 1. A greater percent of known fathers who completed the survey were older than 25 years compared to known fathers who did not complete (80 percent vs 56 percent, $p<0.01$). There were no differences in demographic characteristics between mothers who completed and those who did not (data not shown).

Father's Health and Health-related Actions: Ninety percent of

Table 1. Response methods and demographic characteristics of parents completing health survey, 2015.

	Fathers (n=64)	Mothers (n=92)
Response rate	51% (64/126*)	62% (92/149)
Mode of survey completion		
Hard copy (mailed or delivered)	38% (24)	40% (37)
Online	59% (38)	52% (48)
Phone	3% (2)	8% (7)
Reason for non-completion		
Time expired	92% (57)	95% (54)
Could not locate, refused, language barrier	8% (5)	5% (3)
Parental age (years)		
Less than 25	20.3% (13)	48.9% (45)
25 and older	79.7% (51)	51.1% (47)
*Parental education**		
Less than high school	25.4% (16)	30.4% (28)
High school	39.7% (25)	34.8% (32)
Greater than high school	34.9% (22)	34.8% (32)
Parental race		
American Indian	92.2% (59)	95.7% (88)
Other or unknown	7.8% (5)	4.3% (4)

* 126 of the 149 births had a father listed on the birth certificate; educational level was not reported in one father.

Table 2. Percent of fathers and mothers of American Indian infants by body mass index categories, health-related actions, and pregnancy intention, 2015.

	Fathers (n=64)	Mothers (n=92)
Health & health-related actions		
Body mass index (kg/m2)		
Overweight/obese (25 or greater)	90.2% (80.2-95.4)	53.8% (43.7-63.7)
Normal weight/underweight (less than 25)	9.8% (4.6-19.8)	46.2% (36.3-56.3)
At any time during the 12 months before the mother became pregnant:		
Checked or treated for diabetes	10.9% (5.4-20.9)	20.7% (13.5-30.4)
Checked or treated for high blood pressure	14.1% (7.6-24.6)	19.1% (12.3-28.5)
Checked or treated depression or anxiety	6.3% (2.5-15.0)	21.3% (14.1-31.0)
Talked to health care worker about family history	12.5% (6.5-22.8)	22.5% (15.0-32.2)
Had teeth cleaned by dentist/dental hygienist	18.8% (11.1-30.0)	45.6% (35.7-55.8)
Exercised 3+ days/week	29.7% (19.9-41.8)	28.4% (20.0-38.6)
Changed eating habits to lose weight	12.7% (6.6-23.1)	15.7% (9.6-24.7)
Pregnancy Intention		
Just before the pregnancy, how did parent feel about the mother becoming pregnant		
Wanted then or sooner	56.3% (44.1-67.7)	41.8% (32.2-52.0)
Wanted later	26.6% (17.3-38.5)	20.9% (13.8-30.3)
Did not want then or later	17.2% (9.9-28.2)	8.8% (4.5-16.4)
Not sure	Not an option	28.6% (20.3-38.6)
How parent felt when they found out the mother was pregnant:		
Very happy or happy	68.8% (56.6-78.81)	71.9% (62.2-79.9)
Unhappy or very unhappy	6.3% (2.5-15.0)	5.2% (2.2-11.6)
Not sure	25.0% (16.0-36.8)	22.9% (15.6-32.3)

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responding fathers were overweight or obese compared to 54 percent of mothers. When fathers were asked about health-related actions the year before the mother became pregnant less than 15 percent reported a health care visit to be checked or treated for diabetes, high blood pressure, or depression or anxiety or talked to a health care worker about their family medical history (Table 2). Additionally, 19 percent had their teeth cleaned by a dentist/dental hygienist compared to 46 percent of mothers. The most frequent health-related behavior reported was exercising three or more days per week (30 percent) and 13 percent were changing their eating habits to lose weight. In contrast, 28 percent of SWO mothers reported exercising three or more days a week, while 16 percent reported changing eating habits to lose weight.

Pregnancy Intention and Family Planning: When asked how they felt about the timing of the pregnancy, over half of the fathers stated they wanted the mother to be pregnant then or sooner compared to about 42 percent of the mothers (Table 2). Mothers were asked how the father felt about her being pregnant with an additional response that she did not know how the father felt. Among the mother-father pairs, 79 percent of the mothers stated they knew how the fathers felt about the pregnancy, and among these mothers, there was agreement with the fathers (92 percent,κ=0.827, very good agreement). Both the father and mother were asked how they felt when they found out about the pregnancy. The majority of fathers and mothers were very happy or happy (Table 2) and almost three-quarters of the father-mother pairs agreed on how they felt about the pregnancy (74 percent,κ=0.341, fair agreement).

There was good agreement among father-mother pairs on whether birth control was being used at the time the mother became pregnant (83 percent,κ=0.647). Fathers were asked whether the mother was currently using birth control. A few fathers (6 percent) stated they did not know, and 86 percent of the fathers who thought they knew agreed with what the mother stated (κ=0.639,good agreement).

Health Care Visits: One-third of fathers reported attending a health care visit with the mother before she was pregnant where a health care provider talked about how to prepare for a healthy pregnancy (Figure 1). Eighty percent of fathers attended some of the prenatal visits and almost 90 percent attended the delivery. Among fathers who did not attend all prenatal visits, the main reasons for not attending were: the father could not take time off work or school (60 percent), there was no one to take care of other children (41 percent), and there were too many other things going on (26 percent).

More than three-fourths of fathers (77 percent) either took time off from work after the birth or were unemployed or not working at that time. Among those who did not take time off, the stated reasons were that they were too busy at work (50 percent), they could not afford it (50 percent), or the mother had others to help her (44 percent).

Anxiety and Depression: Information on the father's anxiety regarding the pregnancy indicated that the majority of fathers (≥90 percent) were not anxious about the health of the infant, but 80 percent of the fathers indicated that they were anxious about the delivery. Of the fathers, 11 percent scored within the depressed range based on the PRAMS-3D depression scale, compared to 21 percent of the mothers. Fathers were also asked whether the mother experienced feelings consistent with being depressed (feeling down, depressed or sad, hopeless, and slowed down); 16 percent of the fathers thought the mother was depressed. About 76 percent of the time the father's perception of the mother being depressed agreed with what the mother reported based on the depression scale (κ=0.173,poor agreement). More than half of the mothers who had symptoms of depression were not thought to be depressed according to the father.

Breastfeeding: The majority of fathers (70 percent) were

Figure 1. Percentage of fathers attending some or all health care visits with mother with 95 percent confidence intervals.

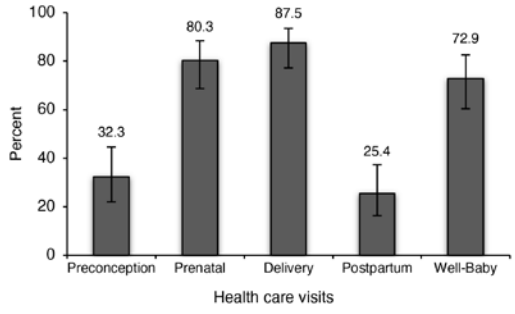
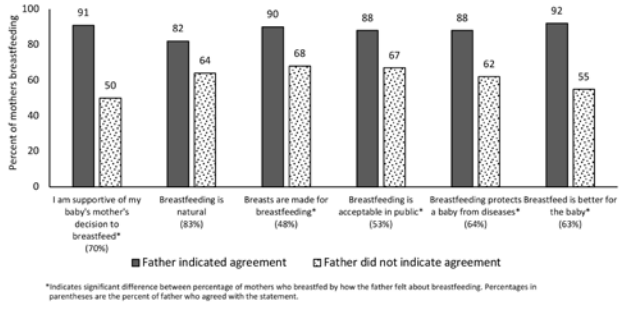


Figure 2. Percentage of mothers who breastfed by father's attitudes towards breastfeeding.



supportive of the mother's decision to breastfeed, thought that breasts were made for breastfeeding, and that breastfeeding was natural, acceptable in public, better for the baby, and protects the baby from diseases (Figure 2). Among father-mother pairs, of those fathers who were supportive of breastfeeding, 91 percent of the mothers breastfed compared to 50 percent of the mothers for whom fathers did not state they were supportive of breastfeeding (OR=9.8[2.4-38.9]). Figure 2 shows the percentage of mothers who breastfed relative to the father's attitudes towards breastfeeding.

Substance Use: Seventy-three percent of fathers smoked cigarettes in the past two years, and of those, 22 percent quit before they found out the mother was pregnant, 22 percent quit smoking around the mother, and 24 percent cut back during the mother's pregnancy. Most fathers (77 percent) reported that they never smoked around the mother while she was pregnant, 97 percent stated that no one was allowed to smoke inside the baby's home, and 90 percent stated that the baby was never in the same room or vehicle with someone who is smoking. Maternal and paternal smoking were associated (κ=0.496,p<0.001); among fathers who had smoked in the last two years, 77 percent of the mothers also smoked compared to 20 percent of mothers smoking if the father did not smoke.

Discussion

The adequate response rates among mothers and fathers of American Indian infants illustrates the feasibility of conducting paired maternal and paternal surveys in a rural minority population that has traditionally been considered hard to survey.[8] The development of a survey aimed at questions designed specifically for fathers such as his health and health-related activities, support of breastfeeding, anxiety about the labor and delivery, and barriers to paternity leave were able to provide important public health information. Additionally, many of the questions were similar for the father and mother which allowed us to evaluate paternal-maternal agreement with regard to pregnancy intention, birth control use, and the father's ability to detect depression among the mother.

Greater engagement of the father is beneficial in mothers seeking early prenatal care[1], obtaining adequate prenatal care, satisfaction with care, having positive labor and delivery experiences[3], and better postnatal health.[3] Fathers frequently attended health visits and were present for the delivery if they could get time off from work and childcare was available for other children. Health care visits are important opportunities to engage the father's participation in his own health as well as the health of the mother and baby. The main barriers for fathers not attending prenatal care visits or staying home after the birth were work-related. This seems consistent across studies and may be related to traditional parental role expectations and socioeconomic status.[12,13] Fathers of low income families may feel more pressure to provide financially and thus, less likely to take time from work especially when paid paternity leave is scarcely provided.[13] Not only does the father miss early quality engagement with the baby, but mothers with multiple children are more likely to suffer from postpartum depression when the father is not present.[13] Overall, similar to other studies, fathers report positive experiences when they feel that they are receiving similar care as the mother and are included in health care discussions.[12] There are opportunities for screening and interventions to address father's health care needs when he accompanies the mother and baby to the clinic using innovative and family-friendly approaches. Fathers may be more open to discuss personal health issues during the transition period into fatherhood or shortly after the birth of a child.[13] For example, fathers who are not being seen for their own well-care visits could be screened for diabetes, cardiovascular disease, oral health, and behavioral health conditions. The current study provides dramatic evidence for this considering 90 percent of the fathers self-reported being overweight or obese; however, less than 15 percent had been recently screened for diabetes, cardiovascular disease, and behavioral health conditions and less than 30 percent were active or changing their eating habits. Incorporating the father into health care visits can also provide key interactions with providers to educate the fathers on the importance of breastfeeding and to assess the father's mental health. Mothers were more likely to breastfeed when the fathers were supportive. Father's attitudes toward the pregnancy and involvement in the antenatal period have been shown to affect whether the mother initiates breastfeeding and length of time breastfeeding.[3,5] New fathers also experience higher rates of depression which can lead to adverse outcomes related to maternal and child health.[12-15] Depressed fathers are more likely to have depressed partners, less likely to read to their children, more likely to use corporal punishment, and more likely to have children that experience anxiety.[14,15]

Screening for maternal depression can occur via the father; however, the father's perception of the mother's depressive symptoms may not be accurate as shown in the present study. More than half of the mothers who were depressed were not perceived so by the father. Therefore, health care visits provide opportunities to communicate early with both

parents and intervene, if necessary. Information regarding stressors such as labor and delivery might be discussed with both parents during prenatal visits. Additionally, there may be contributing reasons for the anxiety and depression that can be addressed including lifestyle changes, role adjustments and preparedness for labor and delivery. The father's mental health and stress can lead to adverse behaviors which can negatively affect maternal health and behaviors. There was a stark contrast in smoking rates between mothers with fathers who did or did not smoke (77 percent vs. 20 percent, respectively). Targeting couples who smoke may be an effective way to reduce smoking among pregnant mothers.

There are several limitations to these data. The majority of questions were not validated specifically in fathers but were modified for paternal use based on CDC PRAMS questions validated for use in mothers. Based on CDC recommended strategies for ongoing evaluation of specific questions (question completion rates, whether skip patterns were followed appropriately, responses of specific question by mode of survey administration, written comments provided) we found that the fathers did not have problems completing this survey. The status of the mother-father relationship is unknown; therefore, we cannot deduce the involvement of the father and/or his behaviors in relation to the status of the parental relationship. Presumably, approaching fathers through the mothers will miss the non-cohabitating and less involved fathers (as well as not contacting fathers not listed on the birth certificate) which may be a higher risk population. Missing data also may be a concern, but question completion rates ranged from 78 percent to 100 percent. In addition, the survey was based on self-report so recall bias or reporting bias are possible. This is particularly relevant to behaviors and attitudes during the year prior to the pregnancy.

In conclusion, having both the mother and father complete a survey related to attitudes and behaviors before, during and after pregnancy is feasible and provides important public health information. Our results indicate that health care visits around the time of pregnancy provide a crucial time to not only address health issues and provide education to the mother but reach the father as well. The father's attitudes, behaviors and experiences regarding pregnancy can provide valuable information on the extent that fatherhood can influence the father's personal health and improve pregnancy, maternal and child outcomes.

Acknowledgements – Tiospaye, or family and kinship, is a powerful element of the Dakotah way of life. On January 14, 2015 the Sisseton-Wahpeton Tribal Council passed Resolution No. SWO-15-007, authorizing a funding proposal to the Sanford Collaborative Research Center for American Indian Health (NIH U54-MD008164) to fund a Pregnancy Health Survey for Parents of Newborns on the Lake Traverse Reservation. The Tribal Council is interested in upstream, population health approaches to wellness. This survey was conducted in partnership with the Ethel Austin Martin Program at South Dakota State University for the purpose of obtaining current, Tribal-specific data from mothers and fathers about the health of their pregnancies and included assistance from the Vital Records Department at the South Dakota Department of Health.

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Acrometastasis of Occult Renal Cell Carcinoma: A Case Report

Jordan A. Dykstra, MD; Matthew C. Anderson, MD; Robert E. Van Demark, Jr., MD; Karah D. White, MD; Meredith Hayes, MD; and Matthew Hayes, MD

Abstract

Renal cell carcinoma is a common malignancy with 30,000 new cases reported annually in the U.S. While bone is one of the most common sites of metastases of renal cell carcinoma, acrometastases are rare with an estimated incidence of 0.1 percent among patients with malignant disease. We present an 89-year-old white male who presented with a painful mass of the left thenar eminence. A preoperative medical evaluation revealed metastatic renal cell carcinoma with lytic infiltration of the diaphysis of the left thumb metacarpal with soft tissue involvement. The patient was treated with two intralesional currettage procedures and later radiation therapy. This approach allowed the patient to maintain functional use of the thumb for activities of daily living.

Introduction

Renal cell carcinoma (RCC) accounts for more than 3 percent of all tumors with more than 30,000 new cases reported annually in the U.S.[1] Due to the asymptomatic clinical course of RCC, between 20-50 percent of patients with RCC present with metastatic disease at the time of initial diagnosis, and among those that have metastatic disease the skeleton is involved in 20-40 percent.[2,3] The skeleton is the third most common metastatic site for all malignancies following lung and liver metastases.[2,4] While metastases to the skeleton are common, metastatic deposits in the bones of the hand are rare with an incidence of 0.1 percent of all malignancies.[5,6] A review in 2008 by Flynn et al. found that there were 257 cases of acrometastases in literature. Of those cases, 113 were of pulmonary origin, 31 were of renal origin and 26 were of breast origin. Kerin found 163 cases of reported acrometastases with a similar distribution for the most common tissue of origin.[6] Both authors found that the distal phalanges are most common site of acrometastasis with men more affected than women (approximately 2:1) with the median age of presentation in the sixth decade.[6,7] It is estimated that 16 percent of cases that present with acrometastasis have a primary tumor that has not been previously diagnosed.[8]

Surgery is often a mainstay of treatment for RCC bone metastases as renal cell metastatic lesions have historically been resistant to both radiotherapy and chemotherapy.[1,9] Surgical strategies for metastases to the appendicular skeleton can include stabilization only, intralesional curettage, or metastasectomy.[1,9] Specific surgical treatment varies and depends on the location and size of the lesion, the presence of other metastatic lesions, presence of a fracture, and overall life expectancy. When planning surgery consideration is given to functionality and survival outcome.[1,9]

Case Report

An 89-year-old white male presented with a mass of the left thenar eminence and a six-week history of increasing left hand pain and swelling. Physical examination revealed a painful mass in the thenar eminence extending into the first webspace. Radiographic (Figures 1a and 1b) and computed tomography imaging revealed a large, extra-articular lytic bone lesion of the thumb metacarpal and surrounding soft tissue involvement measuring 5.1 cm x 3.6 cm. A 3D volume rendered CT of the lesion revealed a large vascular tumor (Figure 2). Subsequent computed tomography imaging of the chest, abdomen, and pelvis revealed a lower pole renal lesion measuring 6.9 cm x 6.1 cm (Figure 3) and a nodular density in the posterior aspect of the left lower lobe of the lung measuring 1.4 cm.

After consultation with the oncology service the patient and his family elected to forego active systemic treatment. The surgical plan of intralesional curettage of the metacarpal tumor was chosen with the goal of preserving thumb function for activities of daily living. Stabilization was not performed so that early motion and weightbearing would be possible. Under general anesthesia the tumor was

Figures 1a and 1b. Anteroposterior and lateral view of the left hand showing an osteolytic lesion of the first metacarpal with surrounding soft tissue swelling.

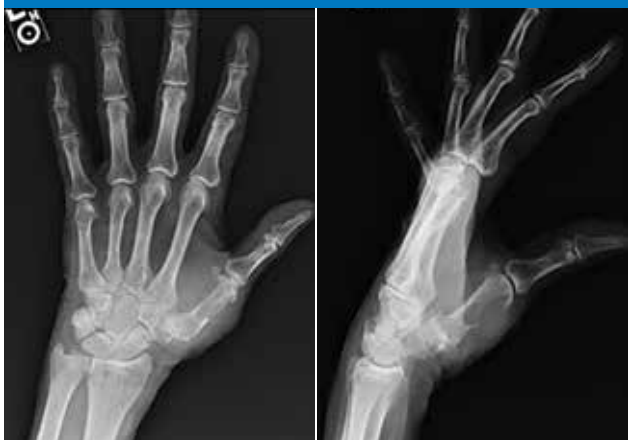


Figure 2. 3D volume rendered CT image shows an destructive vascular mass in the first metacarpal with adjacent soft tissue mass.

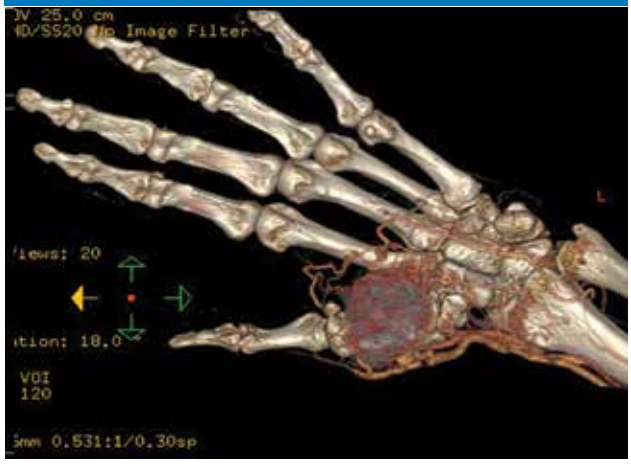


Figure 3. Coronal computed tomography images demonstrates a large vascular exophytic mass of the inferior pole of the right kidney (blue arrow). Left kidney is normal.

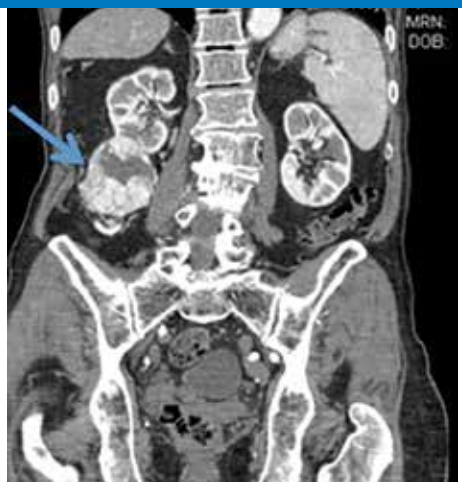
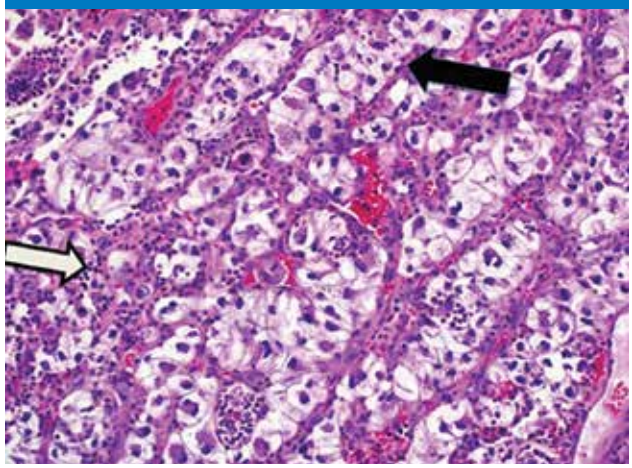


Figure 4. H&E section from the thumb excision demonstrate solid nests of tumor cells separated by delicate, branching fibrovascular septa with a rich vascular network (black arrow). The malignant cells are cuboidal to polygonal with abundant, cleared out cytoplasm. A mixed inflammatory infiltrate is associated with the tumor (white arrow) (200X).



treated with intralesional curettage using a dorsal approach. Histopathological analysis indicated clear cell renal cell carcinoma (Figure 4). The patient was pain free two weeks following surgery and transitioned to a removable splint to use when weight bearing for an additional two weeks. The patient then underwent embolization of the lower pole renal lesion. Five months following surgery, the patient noted increasing pain, swelling and weakness in the hand and also noted right thigh pain. Radiographs of the hand showed increased bone loss from the thumb metacarpal. Imaging of the right femur revealed a lytic lesion in the subtrochanteric area. The patient underwent prophylactic intramedullary nailing of the right femur and a second intralesional curettage of the left thumb metacarpal lesion which measured approximately 3 cm by 2 cm. The patient progressed to a removable splint two weeks following surgery. The patient subsequently underwent a course of palliative external beam radiation therapy to the right femur. Approximately three months later he developed pain in the mid right thigh and underwent embolization of arteries supplying the right femur metastases. Six-and-a-half months following the second intralesional curettage procedure, he noted mild aching in the thumb but continued to use the thumb for daily activities. Radiographs at that time showed loss of the distal 2/3 of the thumb metacarpal shaft. He continued to bear weight with the hand using a wheeled walker until ambulation was limited by right lower extremity weakness. Subsequently the patient developed a metastatic lesion to the cerebellum which was treated with radiation therapy. Eight months following the second intralesional

curettage, the patient received a single dose of radiation to the left hand as part of palliative care as his condition had deteriorated and subsequent surgery was not indicated. The patient died of his metastatic disease 17 months following his initial visit.

Discussion

Acrometastases may mimic common diseases and should be included in the differential diagnosis when evaluating a painful hand lesion. In the most recent review of literature by Rommer et al. in 2013, there were 286 total reported cases of acrometastases.[3] The most common presentation for a metastatic malignancy in the bones of the hand is a singular painful digit that is warm, erythematous and inflamed and because these symptoms are non-specific, misdiagnoses can occur as acrometastases may mimic bacterial infections, gout, rheumatoid arthritis and felons.[4] Imaging of malignant lesions to the hand can show a lytic lesion with cortical and trabecular destruction with sparing of the articular region.[6] Although the mechanism by which the RCC causes lytic disease in bone is well established, the malignant spread to acral regions is not fully understood. Prostaglandins and the reduced velocity of blood flow have been implicated as factors that facilitate metastatic spread to acral regions while the lack of red marrow in the hand has been suggested as a reason why malignancies in this region are rare.[5-7] Prior trauma may also be a predisposition for acrometastasis.[4,5]

Survival times for those with acrometastasis is variable, but it is considered ominous with most succumbing to disease within the first year after diagnosis.[4,7,10] However, there is some evidence that acral metastases of RCC may have a better prognosis. [4,8]

Because the most common site of acral lesions are the distal phalanges, the most common treatment is surgical amputation. For more proximal lesions, treatment options such as radiation, excision and systemic therapy are often appropriate.[6,7]

Surgical approaches to RCC metastases can include stabilization only, intralesional treatment, and metastasectomy.[1,9] There is continued debate with regards to recurrence and overall survival with these different treatments. [1,9] Intralesional curettage was selected for this patient after consideration of the lesion's location, the presence of other metastases, the desire to maintain thumb function and the patient's decision to forego systemic therapy. This approach allowed preservation of the thumb with continued functional use for activities of daily living and weight-bearing even after there had been significant loss of the bony metacarpal. He survived 17 months after initial presentation and maintained functional use of his thumb which had a positive effect on the patient's overall quality of life.

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Keeping baby & mother safe during pregnancy

Navigating high-risk pregnancies at Sanford Health

It was a surprise when Brianna Tillma learned she was pregnant. It was an even bigger surprise when she learned she was having twins. Just as big was the shift from excitement to anxiety when she and her husband learned the pregnancy could bring some complications.

sIUGR diagnosis

Shortly after the Tillmas learned they were expecting, the twins were diagnosed with sIUGR, or selective intrauterine growth restriction. They sought out numerous doctors, with many telling them that cord occlusion was their best option. The logic was that terminating one would mean a safer gestation for the other baby. *"We were never on board with that,"* Tillma said. *"We never found a doctor we were completely on the same page with."* Then they met Dr. Michael McNamara, DO, a maternal-fetal medicine physician at Sanford Health in Sioux Falls, South Dakota. *"From day one, we felt like he heard us. We just appreciated how personable he was and that we were on the same page,"* Tillma said.

Team two babies

From the beginning, Dr McNamara shared the Tillmas' goal: two babies. *"He told us, 'I'm here for you, and I'm going to be team two babies.' That always stuck with me,"* Tillma said. Dr. McNamara specializes in high-risk pregnancies. He said it's his job to inform the family of all possible outcomes, including the Tillmas' high risk of losing both babies if the small baby were to pass away. *"They knew there was a risk, but they were willing to take that chance to save them both,"* he said. Dr. McNamara said that Tillma was diligent in following his recommendations, which ensured both babies stayed healthy. *"She did everything we asked her to do throughout the whole pregnancy. She came in many times to be sure both babies were doing well, and fortunately, we got two healthy babies,"* he said.

Feeling safe

Tillma said she felt safe and understood throughout her entire pregnancy. She trusted the specialists at Sanford Health. So did Brooke Welker, a nurse practitioner at Sanford Health. Welker developed HELLP (hemolysis, elevated liver enzymes and low platelets) syndrome when she was pregnant with her first daughter, Harlow. Because of the complication, Welker had to deliver Harlow four weeks early. *"It was quite scary to go into the hospital feeling sick and delivering early,"* she recalled. Harlow was born healthy. About a year after Harlow was born, Welker learned she was pregnant again. This time, with twins. *"We were traumatized going into the subsequent pregnancy,"* Welker said. *"Coupled with being pregnant with twins, it really gave us a lot of anxiety. But working with Dr. Sierra and Dr. Rodel was excellent. They answered all our questions and made us feel safe along the way."*

Collaborative care

Welker started her care with Anthony Sierra, MD, OB/GYN at Sanford Health. She had worked with him professionally and knew he was a provider she felt comfortable going to. Once she established care with Dr. Sierra and learned she was pregnant with twins, Welker was referred to maternal-fetal medicine for collaborative care. She was referred to Rachel Rodel, MD, who said that the ongoing dialogue between providers and departments at Sanford Health makes its pregnancy care special. *"Because so many things are unpredictable with high-risk pregnancies, our team gets together in large meetings and discusses patients to make their care seamless and give them the best information possible,"* she said. Welker's children are all healthy, and so is she. She said pregnancy is a scary time but that expecting mothers can trust the experts at Sanford Health. *"I would recommend Sanford one hundred percent. I really felt like I had a say in my care while also having providers who were able to confidently execute my wishes within reason."*

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High School Students' Knowledge and Attitudes on Tanning and Sun Exposure Before and After Educational Presentations

Colby Felts, MD; Jack DeMoss, MD; and Scott Kindle, MD

Abstract

Background: Rising rates of skin cancer are a significant medical concern with a nearly 300 percent increase in new melanoma cases since the 1970s. There is a prominent lag time between UV radiation carcinogen exposure primarily in adolescence and pathology presentation primarily in the elderly. Teenagers spend the most time in the sun while paying the least attention to sun protective measures. A potential intervention method is primary prevention in the high school population.

Methods: A local high school was visited by medical student facilitators. Eligible participants of the IRB approved study were students in freshman physical education classes attending class in-person. Participants were given a pre-presentation survey to assess behaviors, knowledge, and attitudes surrounding sun exposure and tanning. A 15-minute educational PowerPoint presentation was given. A post-presentation survey, identical to the pre-presentation survey, was given immediately after.

Results: Overall, 181 freshmen (75.4 percent) participated. Knowledge about sun exposure, UV radiation, and skin cancer was higher post-presentation ($p<0.001$). Additionally, students reported positive attitude changes regarding protecting oneself from UV radiation, perceived risks/benefits of tanning/sun exposure, and perceptions of their future likelihood/concern of developing skin cancer ($p<0.001$).

Conclusions: Our study revealed brief educational presentations can increase knowledge and change attitudes in freshman high school students regarding UV radiation associated with tanning and sun exposure. Given the current rising rates of skin cancer, easy interventions such as the one demonstrated in this study should be part of a likely multi-factorial public health response. Future steps include additional analysis of changes to participants' behavior.

Introduction

Skin cancer is the most common form of cancer in the world.[1] The rates of skin cancer continue to increase, with the rates of melanoma increasing almost 300 percent since the 1970s.[2] Although this condition frequently manifests in the later years of life, much of this damage to our skin via ultraviolet (UV) radiation occurs in our early years with 80 percent of cumulative UV radiation exposure occurring by the age of 18.[3] It is widely accepted that UV radiation from both tanning beds and natural sun exposure is associated with increased risk of developing skin cancer.[1] Despite this knowledge, individuals continue to use tanning beds, and sun protection application is sub-optimal.[4] While 19 states have banned the use of UV tanning devices by anyone under 18 years old, South Dakota does not have any restrictions related to minors and the ability to use tanning beds.[5] In a 2019 survey of South Dakota high school students, 9.2 percent reported using a tanning bed at least once in the past year while only 13.9 percent reported wearing sunscreen (SPF 15 or higher) most of the time when outside for more than one hour on a sunny day.[6]

Lighter skin color increases the risk for skin cancer[7] and the state of South Dakota reports an estimated 84.6 percent of the population identifies as Caucasian based on estimated 2019 statistics from 2010 census data.[8] Additionally, "Experiencing five or more blistering sunburns between ages 15 and 20 increases one's melanoma risk by 80 percent and nonmelanoma skin cancer risk by 68 percent".[9] Compounding this problem is that teenagers are the age group who spends the most amount of time in the sun while paying the least amount of attention to sun protective

measures.[10] This combination of risk factors and behaviors represents an extremely vulnerable population to the future pathology of skin cancer.

There is no consensus educational plan for primary healthcare prevention resulting in behavioral changes regarding skin cancer. Research has shown higher health literacy was associated with lower levels of intentional tanning.[11] However, research has also shown higher health literacy is not associated with increased levels of sunscreen use or decreased sun exposure.[11] Thus, increasing health literacy is not always associated with behavioral changes. Nevertheless, these findings provide some support that a primary prevention intervention can potentially result in behavioral changes. Research regarding online preventative messaging on tobacco does note teens are most receptive to concise, myth-dispelling information which is non-authoritative.[12] This information provides a potential framework for a primary prevention educational session.

There is not a standardized process in place within our target population's education model addressing sun exposure, tanning, and skin cancer. Underlying participant knowledge is estimated to have been acquired variably between education from participants' peers, parents, health care providers, and self-research. Given this current structure or lack thereof, the baseline knowledge regarding sun exposure, tanning, and skin cancer within the target population is unknown and potentially extremely variable. This results in a health system without a specific primary prevention plan targeted to health literacy.

Given the above information, current behavior in South Dakota adolescents is consistent with increased UV radiation exposure which correlates with increased risks of skin cancer later in life, and there is no established process for primary prevention in this population. Our hypothesis is preventative education presentations on tanning and sun exposure to high school students will increase knowledge and change attitudes on the dangers these activities present in respect to their potential long-term health complications.

Methods

The Yankton School District was contacted regarding the potential intervention. Teachers of the freshman physical education class agreed to the proposed intervention after administrative clearance, including school COVID-19 protocols. Yankton High School has 918 total students, 240 students in the freshman class, and a 491:427 (53.5 percent:46.5 percent) male to female. The city of Yankton, based on estimated 2019 statistics from 2010 census data, identifies racially as 90.9 percent Caucasian.[13] Inclusion criteria were any individuals in the freshman grade at Yankton High School taking physical education classes. Exclusion criteria were any individuals who were not willing to fill out the survey and those in tele-learning. In September of 2020, the educational presentation was given to 181 freshman students during their physical education class. Students had not received any formal skin cancer education prior to the presentation.

Participants were seated in a classroom ranging from 10-30 students and were asked to fill out a 12-question survey (see questionnaire at sdsma.org) on paper before the educational intervention began. The survey was initially developed by the authors and modified with the feedback from Dr. James Young and Dr. Scott Kindle. Study development was designed with 4 goals. First was to analyze the study population's baseline behaviors to determine if high risk UV radiation events (tanning beds and peeling sunburns) had occurred. Second was gauging attitudes toward UV radiation with the understanding an individual's attitude has some relationship to behavior. Third was gathering data regarding future predicted behavior, the ultimate goal of such education. Last was assessing if knowledge gains were present following educational presentations. The survey possessed strong content validity as the goals set in study development were assessed. However, stated future behavior does not equal actual future behavior which limits the predictive validity. The exact reliability of the survey cannot be calculated although the authors estimate similar results if given to freshman students in other schools in South Dakota. No pilot study was conducted. Eight Likert scale (1-5) style questions were used to assess attitudes while four true/false style questions were used to assess knowledge. Baseline behaviors and demographic information were also obtained.

A 15-minute 25-slide educational PowerPoint presentation was given (see Appendix at sdsma.org). The presentation highlighted the pathophysiology of skin cancer due to UV, the primary types of skin cancer, skin cancer statistics, preventative techniques (primary, secondary, and tertiary), and safe tanning alternatives. In addition, the presentation also utilized graphic images, videos, and humor. Following review of common skin cancer education presentations available online, the presentation was developed with an original content design to educate students first on the pathophysiology of skin cancer. The authors hypothesized explaining the process of how UV radiation permanently

damages skin cells would help students better understand the connection between UV radiation and skin cancer. The reminder of the presentation followed a commonly used method of skin cancer education including types of skin cancer, statistics, preventative techniques (include ABCDE melanoma screening) and safe tanning alternatives. Immediately after the educational intervention, participants took the exact same survey again. This evaluation technique was chosen in an attempt to isolate the educational presentation as the only variable in differing responses between the before-presentation and after-presentation surveys. Data was entered into the same protected Microsoft Excel spreadsheet by both medical students. The first half of the data was entered by one student and the second half was entered by the other. Each student independently analyzed the data they did not enter to ensure accuracy and consistency throughout. Results with missing data were left blank. Pre-presentation and post-presentation data were analyzed in Microsoft Excel using a two tailed t-test with $\alpha = 0.05$. The data was also stratified and analyzed based on self-identified sex. The primary outcome was changes in answers regarding attitude and knowledge. The secondary outcome was changes in expected future behavior.

The primary ethical consideration for this study was the psychological harm which may have been caused by presenting the negative consequences of tanning and sun exposure to an individual with significant exposure before the presentation. The presentation was initially given as part of a health care quality improvement project. The project was retroactively approved by the University of South Dakota (USD) Institutional Review Board (IRB) with protocol IRB-20-253. While prospective IRB approval would have been ideal, the project was initially developed for the Sanford School of Medicine Healthcare Quality improvement Project (HQIP). Results and conclusions of HQIPs are not required to be generalizable, and hence do not need IRB approval in many cases. Following project completion and analysis, authors decided the project would be of use to public health and academic medicine and sought retrospective IRB approval so that the results may be generalizable. The superintendent of the school district was contacted and gave his consent for potential data publication. USD IRB determined that retroactive parental consent and adolescent assent would be waived for the following reasons cited in Section 3a in the proposal approval: Research did not involve more than minimal risk to the participants, waiver will not adversely affect the rights and welfare of the participants, research could not be practically carried out without the waiver, and the research is not subject to FDA regulation.

Results

The presentation was given 12 times over two days by the same medical students. The participation rate was 181 of the 240 overall freshmen (75.4 percent). Of the 182 freshman students who attended high school in person, one student declined to fill out the survey. The participants self-identified their sex as 104 (57.5 percent) males, 76 (42.0 percent) females, and one other (0.5 percent). They self-identified their race as 164 (90.6 percent) Caucasian and 17 (9.4 percent) non-Caucasian. Regarding baseline behaviors, 9 (5.0 percent) of overall participants reported previous use of a tanning bed. Male participants made up the majority of previous tanning bed use (8, 7.6 percent of males) while only 1 (1.3 percent of females) female reported this behavior. Almost all participants (157, 86.7 percent) reported a history of a peeling sunburn. These results were similar between genders with females (69, 91.4 percent of females) reporting slightly higher rates than males (87, 83.7 percent of males).

Following the intervention, five of the eight attitude questions and the average correct on knowledge questions showed statistically significant changes when assessed using a two tailed t-test with $\alpha = 0.05$. Post-presentation, participants rated protecting their skin from UV radiation was more important ($p<0.001$). Additionally, participants also reported decreased beliefs that the benefits of UV radiation were worth the risk including both indoor tanning ($p<0.001$) and outdoor sun exposure without sunscreen ($p<0.001$). Participants also reported increased perceived risk of skin cancer post-presentation. They believed they were more likely to develop skin cancer ($p=0.008$) as well as increased concern about developing skin cancer ($p<0.001$). Participants showed a significant improvement in their percent correct on knowledge questions ($p<0.001$).

Three of the eight attitude questions did not show statistically significant improvement. There were no changes in the social pressure to fit a particular body image. The average response to "I feel social pressure to fit a particular body image and tan skin helps achieve this image" was 2.60 before and 2.52 ($p=0.430$) after indicating individuals were between disagree and neutral regarding this question. Both questions regarding participant behavior did not show statistically significant changes regarding likelihood to use tanning beds and sunscreen use. The average response to "How likely are you to use an indoor tanning bed?" was 1.53 before and 1.49 ($p=0.430$) after indicating individuals were between very unlikely and unlikely regarding this question. The average

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response to "How likely are you to use sunscreen if you will be sun exposed for 1 hour or more?" was 3.46 before and 3.61 (p=0.152) after indicating individuals were between neutral and likely regarding this question.

When results were stratified by gender, females more frequently responded protecting their skin was important (After: female 95 percent CI = [4.05, 4.27] vs. male 95 percent CI = [3.65, 3.94] and that outdoor sun exposure without sunscreen was not worth the risk (After: female 95 percent CI = [1.91, 2.14] vs. male 95 percent CI = [2.27, 2.52]. Female participants showed non-significant changes regarding the questions "The benefits of indoor tanning (tan skin, mood, etc.) are worth the risks (UV radiation)" (Overall p<0.001, male p=0.002, female p=0.061) and "What do you believe is the likelihood that you will develop skin cancer in the future?" (Overall p=0.008, male p=0.036, female p=0.120). See Table 1, Table 2, and Figure 1 below for full statistical analysis.

Table 1. Baseline demographics and behaviors (n=181).

Sex	Male	104 (57.5%)
	Female	76 (42.0%)
	Other	1 (0.5%)
Race	Caucasian	164 (90.6%)
	Non-Caucasian	17 (9.4%)
Previous tanning bed use	Overall	9 (5.0%)
	Male	8 (7.6%)
	Female	1 (1.3%)
History of peeling sunburn	Overall	157 (86.7%)
	Male	87 (83.7%)
	Female	69 (91.4%)

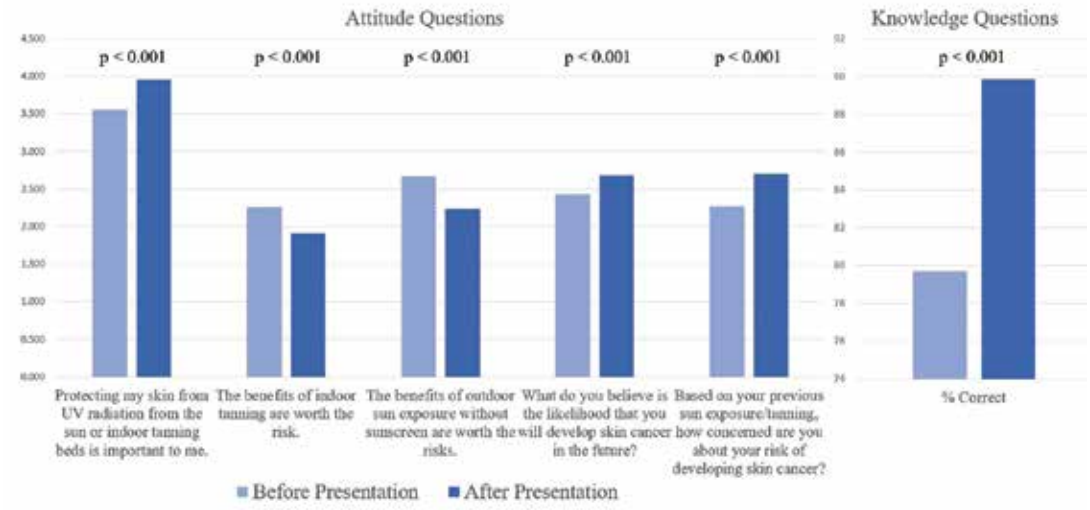
Discussion

It is important to analyze the healthcare process associated with prevention of skin cancer. Given this is the most common cancer in the world[1], it is associated with significant healthcare burden. We must improve our primary prevention strategies to reduce UV radiation exposure, since this is the primary carcinogen implicated in skin cancer. This project attempts to be a part of this solution by utilizing students' current educational structure to add to their healthcare process. The initial hypothesis was that preventative education presentations on tanning and sun exposure to Yankton High

Table 2. Before and after presentation results: attitude and knowledge questions (n=181).

		Before		After		
Question	Group	mean	95% CI	mean	95% CI	p-value
Protecting my skin from UV radiation from the sun or indoor tanning beds is important to me.	Overall	3.56	[3.44, 3.67]	3.96	[3.83, 4.09]	<0.001
	Male	3.42	[3.31, 3.54]	3.80	[3.65, 3.94]	.002
	Female	3.72	[3.62, 3.83]	4.15	[4.05, 4.27]	<0.001
I feel social pressure to fit a particular body image and tan skin helps achieve this image.	Overall	2.60	[2.45, 2.74]	2.52	[2.36, 2.68]	0.430
	Male	2.51	[2.37, 2.65]	2.45	[2.29, 2.62]	0.650
	Female	2.74	[2.59, 2.88]	2.63	[2.48, 2.79]	0.483
How likely are you to use an indoor tanning bed?	Overall	1.53	[1.43, 1.63]	1.49	[1.37, 1.60]	0.430
	Male	1.51	[1.41, 1.62]	1.50	[1.38, 1.62]	0.650
	Female	1.55	[1.46, 1.65]	1.47	[1.36, 1.58]	0.483
The benefits of indoor tanning (tan skin, mood, etc.) are worth the risks (UV radiation).	Overall	2.26	[2.13, 2.39]	1.91	[1.77, 2.05]	<0.001
	Male	2.34	[2.20, 2.48]	1.95	[1.81, 2.10]	0.002
	Female	2.17	[2.05, 2.29]	1.87	[1.74, 2.00]	0.061
How likely are you to use sunscreen if you will be sun exposed for 1 hour or more?	Overall	3.46	[3.31, 3.62]	3.61	[3.47, 3.75]	0.152
	Male	3.34	[3.17, 3.50]	3.59	[3.45, 3.72]	0.078
	Female	3.62	[3.48, 3.75]	3.64	[3.50, 3.79]	0.863
The benefits of outdoor sun exposure (tan skin, mood, etc.) without sunscreen are worth the risks (UV Radiation).	Overall	2.67	[2.54, 2.80]	2.23	[2.11, 2.35]	<0.001
	Male	2.75	[2.63, 2.87]	2.39	[2.27, 2.52]	<0.001
	Female	2.58	[2.45, 2.71]	2.03	[1.91, 2.14]	<0.001
What do you believe is the likelihood that you will develop skin cancer in the future?	Overall	2.44	[2.31, 2.56]	2.68	[2.53, 2.83]	0.008
	Male	2.33	[2.21, 2.44]	2.58	[2.42, 2.73]	0.036
	Female	2.58	[2.44, 2.71]	2.80	[2.67, 2.94]	0.120
Based on your previous sun exposure/tanning, how concerned are you about your risk of developing skin cancer?	Overall	2.27	[2.14, 2.39]	2.70	[2.56, 2.84]	<0.001
	Male	2.28	[2.16, 2.40]	2.69	[2.55, 2.84]	<0.001
	Female	2.24	[2.11, 2.36]	2.71	[2.58, 2.84]	<0.001
Knowledge questions (% correct)	Overall	79.69	[75.97, 83.41]	89.86	[86.62, 93.10]	<0.001
	Male	75.20	[71.71, 78.77]	86.30	[83.09, 89.50]	<0.001
	Female	79.28	[75.89, 82.66]	88.82	[86.34, 91.30]	.004

Figure 1. Participant attitude/knowledge questions showing statistically significant change.



School freshman will increase knowledge and change attitudes on the dangers these activities present in respect to their potential long-term health complications. The statistically significant increase in percent of knowledge assessment questions answered correctly suggests an immediate increase in health literacy surrounding sun exposure, tanning, and skin cancer. The statistically significant difference in attitude assessment questions also suggests an immediate change in attitudes about sun exposure, tanning, and UV radiation. However, the lasting nature of these changes are unclear. The lack of significance in the female gender on two attitude questions which were overall significant is likely attributed to the lack of power in the female group (76 females to 104 males) as well as baseline scores in females already showing healthier attitudes. Additionally, our study population saw a lower percentage of female participants (42.0 percent) comparatively to the overall high school percentage of females (46.5 percent).

While changes in knowledge and attitude were seen, changes in potential behavior patterns were not seen. This lack of changes can possibly be attributed to the pre-presentation responses showing students are already engaging in preventative behaviors. Only 5.0 percent of the overall study sample has used a tanning bed. Additionally, it is difficult to assess future behavior because responses and actual behavior can significantly differ. This study population disagreed that they felt social pressure to fit a certain image with tan skin. However, only including the freshman class could play a large role in these findings and potential differences in responses could be seen in older individuals. Ultimately, these results emphasize how the implementation of a public health education initiative around UV radiation and skin cancer at an early age as part of the healthcare process can be effective in immediately changing knowledge and attitudes albeit with unknown lasting effects. These interventions are even more critical with skin cancer given the significant lag time between the carcinogen exposure and development of skin cancer.

There are multiple strengths to this study. First, the size of the study at 181 students provided strong overall statistical power for analysis. Additionally, these presentations were given in smaller groups multiple times, so it was easier to keep the students engaged compared to a single large presentation. Secondly, the structure of the intervention minimized external variables and attempted to make the presentation the only modifier between pre- and post-presentation results. Thirdly, the study analyzed a variety of areas including baseline behaviors, knowledge, attitudes, and some future expected behaviors. Fourthly, the presentation attempted to explain the dangers of UV radiation, teach how it leads to cancer, and offer safe alternatives in a myth-busting, non-authoritative fashion. Lastly, this study focused on an important topic given the high rates of skin cancer nationally.

There are multiple limitations to this study. One major limitation in the study was the population being limited to the freshman class. This prevented examination of social pressures older students may face, including increased use of tanning around prom season. COVID-19 tele-learning also limited the study population due to some students

not physically attending class. This also played a role in selecting the freshman class given they had the highest percentage of in-person students in the high school. This limitation resulted in decreased power in the female gender analysis which resulted in two insignificant findings that were significant overall. Another limitation was that the initial pre-presentation survey was given after the presenters and topic of presentation had already been introduced, potentially skewing answers. The timing of the intervention in late summer (September) and geographical location also presented a potential limitation. Individuals without year-round exposure to warm weather may have different attitudes toward sun exposure, while September is after the most popular outdoor timeframe in the Midwest and is not near prom, a frequent tanning timeframe. The final and likely biggest limitation was the inability to assess whether the intervention will lead to any behavioral changes given the entire intervention and analysis took place on a single day. The biggest factor in preventing skin cancer is behavioral changes and we were not able to assess if these will occur. Consideration was given to repeating the survey at a later date but was not implemented given the medical students would be leaving the area for their education. However, a potential project for future medical school students has been discussed regarding follow-up surveys to assess if the changes detected in the project are sustained.

There are multiple areas of future research following this study. The two primary focuses of future research should be on expanding the study to more than the freshman class, as well as attempting to assess expected and actual behavioral changes for a sustained period of time. Other research could utilize multiple, temporally spaced educational sessions rather than the single presentation which was given. Finally, research could also be conducted assessing differences in attitudes based on time of year (i.e., prom season, beginning of summer, etc.).

Given the positive trend of our findings, our study suggests changes in knowledge and attitude from our brief interventions. Thus, we would suggest that annual skin cancer educational sessions be instituted with further following of the study population to elucidate the behavioral changes and overall outcome impact.

Conclusion

The data supports the hypothesis that preventative education presentations on tanning and sun exposure to high school students will increase knowledge and change attitudes on the danger of UV radiation presents in respect to their potential long-term health complications. Given the current rising rates of skin cancer, easy interventions such as the one demonstrated in this study should be part of a multi-factorial public health response. Further studies are needed to assess the wide-spread implications of such interventions and their potential impacts on individual's behavior in addition to knowledge and attitudes.

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The Spontaneous Uterine Rupture in Labor: When to Expect the Unexpected

Schae Hanson, MD; Jena Preszler, MD; and Kevin Bray, MD, MJ, FACOG

Abstract

Uterine rupture is a potentially life-threatening complication that is typically seen in pregnant females who have undergone prior uterine surgeries such as cesarean sections. This usually occurs when the uterine myometrium is weakened and thus is more prone to stress during labor. In an unscarred uterus, the incidence of uterine rupture is lower. Risk factors in the unscarred uterus include trauma, obstructed labor, high parity, placental abnormalities, operative deliveries, and imprudent use of uterotonic medications. This case report describes a situation in which uterine rupture occurred in the absence of the common risk factors. With prompt recognition of clinical signs, quick assembly of a team, and emergent interventions, this patient and her infant survived. The goal of this report is to educate clinicians on the occurrence of uterine rupture in an unscarred uterus and how to recognize and manage this complication.

Introduction

Uterine rupture occurs one in every 5,000 to 7,000 births.[1] This event is associated with fetal distress, severe uterine bleeding, expulsion of the placenta or fetus into the abdominal cavity, and results in emergency cesarean section, hysterectomy or extensive uterine repair.[2] Recognizing the signs and symptoms of uterine rupture is important as it can lead to serious morbidity and mortality for both mother and baby.[1]

Two main populations of pregnant women are at risk for uterine rupture: women with a transmyometrial scar from previous surgery, typically a cesarean section, and women with an unscarred uterus and certain risk factors.[1] For women who have a transmyometrial scar, the risk of uterine rupture is increased. The rate of uterine rupture in women with one previous cesarean section is approximately 0.5 to 1 percent, while the risk with greater than one previous cesarean section has been shown to be between 0.9 and 3.7 percent.[3] Uterine rupture in the unscarred uterus is rare and occurs at a rate of approximately one per 10,000 to 25,000 deliveries.[1] Risk factors in the unscarred uterus include: trauma (motor vehicle accidents or external cephalic version), obstructed labor, high parity, placenta percreta, instrument assisted delivery, and imprudent use of uterotonic medications.[4] Although uterine rupture in any case is associated with maternal morbidities such as blood loss and hysterectomy, rupture of the unscarred uterus is associated with a higher rate of maternal morbidity overall due to lower index of suspicion in providers. Fetal adverse outcomes include intraventricular hemorrhage, seizures, and death. These may be higher with unscarred uterine rupture as well due to increased time for diagnosis and intervention.[1]

The purpose of this report is to discuss a unique presentation of uterine rupture in an unscarred uterus. Additionally, the risk factors, clinical presentation, management, and follow-up will be discussed to bring awareness to providers so they will be able to recognize this situation should it arise in the future.

Case Presentation

A 34-year-old Caucasian, G4P2012 female at 40w0d gestation presented to labor and delivery six hours after spontaneous rupture of membranes (SROM) with clear amniotic fluid and some contractions. Her pregnancy had been uncomplicated with consistent prenatal care. She had no recent steroid use, pertinent previous medical history, surgical history, or family history of connective tissue diseases, bleeding disorders, or uterine anomalies.

She was group B Strep-positive with an estimated due date of Oct. 24, 2020 based on LMP and ultrasound. Estimated fetal weight by ultrasound was 2,700 grams (6 lbs). Fetal presentation was vertex and determined by Leopold maneuvers. fetal heart rate (FHR) baseline was at 140 bpm with moderate variability, no decelerations, ACOG Category I with a reactive nonstress test.

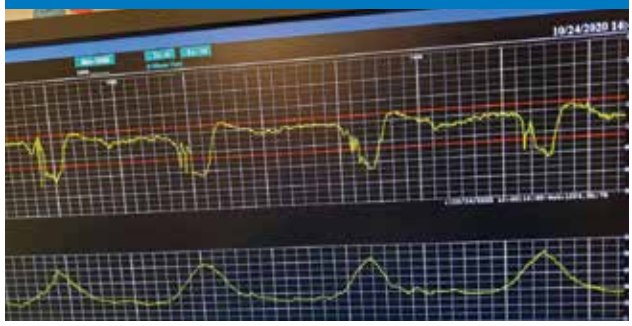
Sterile vaginal exam (SVE) on admission determined her cervix to be mid-position, soft in consistency, dilated to 2 cm with 30 percent effacement. Fetal station was determined to be -1. Contractions were determined by external tocodynamometer with two contractions per 10 minutes and durations of 60-100 seconds per contraction. SVE on Oct. 1, 2020 showed cervix to be 0 cm dilated with fetal station graded at -3. Augmentation of labor was initiated at this time to increase contraction frequency. Her vitals were as follows: temperature: 98.3° F (36.8° C), pulse: 76 bpm, respiratory rate: 20 breaths/minute, blood pressure: 115/86.

After augmentation with Pitocin was initiated, fetal heart tracings were assessed via continuous electronic fetal monitoring and documented as ACOG Category I with variable decelerations and absent accelerations. A small amount of bloody vaginal discharge was noted by her nurse 2.5 hours after her presentation to the hospital. After requesting intervention for pain control, she received an epidural. Pitocin infusion was increased to 8 milliunits (mu)/minute per protocol. A moderate increase of vaginal bleeding was noted again after obtaining an epidural. Uterine tachysystole with absent accelerations and variable and late decelerations were noted 45 minutes post-epidural, so Pitocin was decreased to 3 mu/minute. She was repositioned in the high Fowler's position in bed. Uterine tachysystole lasted for a total of thirty minutes. Sterile vaginal examination revealed her to be dilated to 7 cm. Amniotomy was performed to break the remaining bag of water and a fetal scalp electrode placed. The vaginal bleeding stopped after this.

The patient was repositioned, alternating between right and left lateral position due to FHR tracings showing variable decelerations down to 80 bpm with returns to baseline of 135 bpm with the thought of possible cord compression (Figure 1). Maternal blood pressure was 95/54 mmHg. 10 mg of ephedrine, an IV fluid bolus and 10 L O2 via face mask were initiated at this time to see if placental perfusion would improve. FHR tracings showed persistent bradycardia at 60 bpm with no return to baseline even with the attempts made by the nurses to reposition her (Figures 2 and 3). Sterile vaginal exam was 8 cm with baby still vertex. It was at this point that we made the decision for a stat cesarean section.

She was taken into the operating room (OR) for an emergency cesarean section. Due to a dense epidural, we were able to proceed without general anesthesia. After entry into the peritoneum, the baby's face was visualized with the umbilical cord and placenta with the vertex still in the vaginal canal. The infant was delivered and found to have

Figure 1. FHR tracings showing variable decelerations down to 80 bpm with returns to baseline of 135 bpm.



Figures 2 and 3. FHR tracings showed persistent bradycardia at 60 bpm.

Figure 3.

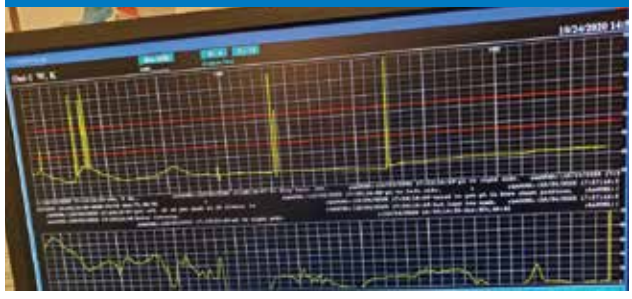
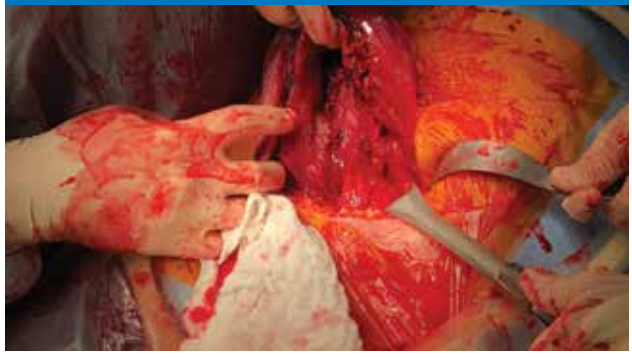


Figure 4. After delivering the infant and placenta, a long uterine defect was discovered from just below the left cornu to the upper part of the cervix past the uterine vessels on the same side with persistent bleeding at the lower segment.



low FHR, hypotonia, and no respiratory effort. The cord was clamped and cut and the placenta delivered easily as it was free-floating in the peritoneal cavity.

After delivering the infant and placenta, we discovered a long uterine defect from just below the left cornu to the upper part of her cervix past the uterine vessels on the same side with persistent bleeding at the lower segment (Figure 4). After placing multiple figure-eight sutures to obtain hemostasis and closing the uterine defect similar to a classical scar, there was no more significant bleeding. 10 ml bupivacaine 0.25 percent was used to infiltrate fascia and skin. Usual closure was done. Estimated blood loss after this procedure was 1,500 mL.

Immediately after delivery, the infant underwent newborn resuscitation protocols of positive pressure ventilation via mask, chest compressions, intubation, and placement of an umbilical vein catheter with good heart rate response at 140 bpm after 2.5 minutes of CPR. Apgar scores were 1, 2, 8 at 1, 5, 10 minutes respectively with a normal hemoglobin of 20.0. The infant weighed 7lbs 1oz with no birth defects noted at this time. The infant was flown to a facility equipped with a newborn intensive care unit (NICU) to continue care. There, the infant had an uneventful 20-day stay in the NICU before being discharged home.

Post-operatively in the recovery room, persistent vaginal bleeding occurred even after giving tranexamic acid 1,000 mg with sodium chloride 0.9 percent IV solution 50 ml, rectal misoprostol 800 mcg, and an intramuscular injection of carboprost tromethamine 250 mcg. She lost an additional estimated 600 mL post-operatively.

We counseled the patient and her husband on the necessity of hysterectomy to avoid further bleeding and increased morbidity and mortality. She was taken back to the OR for a supracervical hysterectomy with bilateral salpingectomy where her uterus was found to be boggy with surrounding edematous tissue. She had an estimated blood loss of 200 mL during this procedure.

Massive transfusion protocols were initiated after the cesarean section. She received 4 units of packed red blood cells (PRBC), 5 percent albumin 500 ml given through her IV, Pitocin, and methylergonovine maleate 0.2 mg intramuscular injection (IM) during the cesarean section/correction of her uterine rupture. In total, after both of her procedures and her two-day hospital stay following, total quantitative blood loss was estimated to be 2,500 mL. She received 8 units of PRBC, 4 units of fresh frozen plasma (FFP), 6 packs of platelets, and cryoprecipitate in total.[5] Her hemoglobin upon admission was 13.4 g/dL. It decreased to 7.5 g/dL 3.5 hours after her procedures and 5.2 g/dL the next morning. By the time she was discharged on postoperative day two, her hemoglobin was up to 7.3 g/dL.

The placenta was sent to pathology, and there was no histological abnormality found.

Our patient recovered well and was hemodynamically stable following her procedures, but the outcome of losing her reproductive organs was not anticipated and came as a shock. In her subsequent postpartum visits, she describes her mood and feelings being improved overall and being thankful that the situation ended the way it did for both her and her baby.

It was extremely fortunate and crucial that the OR team was still in the hospital after performing other emergent surgical cases. If it had been a typical weekend in this rural health facility, assembling a surgical team would have taken approximately 15 - 20 minutes. It was the timely response by hospital staff that ensured the outcome for this patient and her baby.

Discussion

Presentation of uterine rupture has been studied as a way to intervene and prevent life-threatening complications for both the infant and mother. Antepartum presentation of acute abdominal pain was found to be most common in cases of uterine rupture. Intrapartum presentation includes fetal distress, loss of station, cessation of contractions, abdominal pain with uterine tenderness, changing of uterine shape, hemodynamic changes, vaginal bleeding.[3,6] Fetal heart rate abnormalities are the most common indication of uterine rupture, occurring in up to 70 percent of cases.[3] Postpartum signs included continued vaginal bleeding. The only telling sign of uterine rupture in our patient was fetal distress exhibited by the fetal heart tracings and minimal-modest amount of vaginal bleeding during labor. She experienced no abdominal pain after receiving an epidural.

Our patient did not have significant risk factors for uterine rupture. She is a multiparous female who did receive uterotonic agents during labor, which does increase the risk, but the doses were low. She has never had prior uterine surgeries, notably no previous cesarean sections in her other pregnancies.

Management of uterine rupture is done by repairing the defect or performing a hysterectomy. In the case of our patient's continuous postpartum hemorrhage, we decided to ultimately perform a supracervical hysterectomy with

bilateral salpingectomy after spending hours prior correcting her uterine defect in the hopes of stabilization without the need for this subsequent procedure. The decision between repairing the uterus vs. hysterectomy is based on hemodynamic stability of the patient, the desire for future pregnancies, the extent of damage, and the surgeon's ability to correct it. If correcting the rupture, the major consequence is increased risk of complications in subsequent pregnancies.[7]

For a patient considering pregnancy after a uterine rupture, a complete obstetric history should be reviewed to determine the circumstances of the previous rupture as well as the optimal course of action for the future pregnancy. A clinical report from Larrea and Metz in 2018 outlined the most reasonable course of action for women with a history of uterine rupture.[8] Women with a history of uterine rupture should not undergo vaginal delivery in subsequent pregnancies. The American College of Obstetricians and Gynecologists recommends that women in this population undergo cesarean section at 36+0 to 37+0 weeks gestation to avoid complications.[3] Delivery can occur earlier if there is also a history of preterm labor. If delivery occurs before 37 weeks gestation, antenatal corticosteroids should be administered 48 hours before planned delivery to reduce the risk of neonatal respiratory complications. Suspected recurrent uterine rupture warrants emergency cesarean section based on assessment of maternal hemodynamic stability and fetal status.[8]

Conclusion

Uterine rupture in the unscarred uterus is a tragic event that can lead to maternal and fetal morbidity and mortality. Although rare, it is important that physicians and clinicians have knowledge of the presentation and management of this condition and are able to distinguish it from other obstetrical emergencies. Delayed recognition and intervention in this type of situation leads to increased risk for mortality for both mother and infant. While the result of this case was not ideal for the patient, the health and well-being of both the mother and the infant were prioritized, and the case ultimately ended favorably. This case report was intended to provide insight into how seemingly rare events can present in patients who appear to be low-risk. Close supervision of patients in labor by nursing staff and a low threshold for intervention by obstetricians for patients with a similar presentation will result in better outcomes and lower risk of maternal and fetal complications.

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Clinical Evidence for the Use of Sodium-Glucose Co-transporter 2 Inhibitors in Heart Failure with Preserved Ejection Fraction

Joseph Berendse, PharmD, BCACP, BCPS; and Lindsay Newenhouse, PharmD

Heart failure continues be a significant health and economic burden in the U.S. Current trends diverge with respect to the two main heart failure categories: there is a growing incidence of heart failure with preserved ejection fraction (HFpEF), yet a decreasing incidence of heart failure with reduced ejection fraction (HFrEF).[1] Approximately 50 percent of those with heart failure now have HFpEF.[2] The growing rates of HFpEF can be attributed to a variety of factors, including increased life expectancy, greater comorbidities, increased recognition of heart failure, and a paucity of targeted medication therapies for HFpEF.[3]

HFrEF can be defined as a structural or functional dysfunction of the left ventricle associated with a left ventricular ejection fraction (LVEF) of ≤40 percent, whereas patients with HFpEF show signs and symptoms of heart failure with a LVEF ≥50 percent.[1] Whether or not a patient has HFpEF or HFrEF yields different approaches toward management. Standard management of HFrEF involves the initiation and titration of guideline-directed medical therapies with proven mortality benefit; these agents include mineralocorticoid receptor antagonists (MRAs), angiotensin receptor-neprilysin inhibitors (ARNi), beta-blockers, and sodium-glucose cotransporter-2 inhibitors (SGLT2i).[1]

In contrast, there are few medications proven to reduce mortality among patients with HFpEF. For the treatment of HFpEF, the ACCF/AHA guidelines have traditionally focused on appropriate management of comorbidities known to worsen cardiac function, such as atrial fibrillation and hypertension. Additionally, select agents – such as MRAs – could be considered to reduce hospitalizations but not mortality.[4]

However, the newest 2022 AHA/ACC/HFSA guidelines for HFpEF have incorporated a recommendation for the use of SGLT2i, stating: "SGLT2i can be beneficial in decreasing [heart failure] hospitalizations and cardiovascular mortality."[1] Although SGLT2i have been recognized as a component of HFrEF management for several years, their recent inclusion in the HFpEF guidelines warrants further investigation.[4] Thus, the goal of this article is to present two large-scale clinical trials underlying the new recommendation for SGLT2i in patients with HFpEF; the two clinical trials to be reviewed are the EMPEROR-Preserved trial for empagliflozin and the DELIVER trial for dapagliflozin.

Mechanism of Action and Available Agents

The mechanism of action of SGLT2i for heart failure involves a reduction in sodium reabsorption and increased delivery to the distal convoluted tubule which may contribute to lowered preload and afterload on the heart while downregulating sympathetic activity.[5,6] The potential cardiovascular (CV) benefits of SGLT2i in heart failure are extensive and include lowered blood pressure, diuresis, weight loss, reduced cardiac remodeling, reduced hyperuricemia, and more.[7]

There are two primary SGLT2i agents utilized for heart failure: empagliflozin (Jardiance) and dapagliflozin (Farxiga). Empagliflozin was initially approved in August 2014 for the treatment of type 2 diabetes; dapagliflozin was initially approved for this same indication in January 2014. Both agents are now also FDA-approved for HFrEF, whereas dapagliflozin alone has an additional indication for chronic kidney disease (with or without type 2 diabetes).[5,6]

EMPEROR-Preserved Trial (Empagliflozin)[8]

The EMPEROR-Preserved trial was a randomized, double-blind, placebo-controlled phase 3 trial that evaluated the effects of empagliflozin on heart failure outcomes in those with HFpEF. Patients were included in the trial if they were 18 or older, had a LVEF >40 percent with structural heart disease or prior hospitalization due to heart failure, and had an elevated beta-natriuretic peptide level. Important exclusion criteria included uncontrolled hypertension or atrial fibrillation, and an estimated glomerular filtration rate (eGFR) <20 mL/min/1.73 m^2.

A total of 5,988 patients were randomly assigned in a 1:1 ratio to receive 10 mg of empagliflozin or placebo in addition to background therapy. At baseline, nearly half the patients had diabetes, and half also had an eGFR <60 mL/min/1.73 m^2; around two-thirds of patients had a LVEF >50 percent.

The primary outcome was time-to-first CV death or hospitalization for heart failure. Secondary outcomes included total rates of hospitalizations for heart failure (first and recurrent events) and rate of decline in eGFR during treatment. Patients were followed for a median duration of 26.2 months.

Overall, the primary outcome (CV death or hospitalization for heart failure) occurred in 13.8% of patients in the empagliflozin group and 17.1 percent in the placebo group, yielding a significant reduction (hazard ratio [HR]=0.79; p <0.001); the calculated number needed to treat was 31.[8] Hospitalizations for heart failure occurred in 8.6 percent of patients in the empagliflozin group compared to 11.8 percent in the placebo group (HR=0.71; 95 percent CI: 0.6-0.83). Death from CV causes occurred in 7.3 percent and 8.2 percent of patients in the empagliflozin and placebo groups, respectively; this difference was not found to be statistically significant.[6] Thus, the primary composite outcome appeared to be driven by an overall reduction in hospitalizations for heart failure.

Regarding secondary outcomes, there was a significantly lower rate of hospitalizations for heart failure (first and recurrent events) among those in the empagliflozin group (HR=0.73; p <0.001). Empagliflozin was also shown to produce a slower annual rate of decline in eGFR compared to placebo (-1.25 vs. -2.62 mL/minute/1.73 m^2 annually; p <0.001). Serious adverse events occurred in 47.9 percent of empagliflozin patients and 51.6 percent of placebo patients, with uncomplicated genital and urinary tract infections being more common in the empagliflozin group.[8] As outlined, the EMPEROR-Preserved trial demonstrated significant benefit in multiple primary and secondary outcomes when empagliflozin is added as therapy for HFpEF.

DELIVER Trial (Dapagliflozin)[9,10]

The DELIVER trial is an ongoing randomized, double-blind, placebo-controlled, event-driven phase 3 trial evaluating the use of dapagliflozin in heart failure patients with HFpEF. Patients are included in the trial if they are 40 or older and have a LVEF >40 percent, structural heart disease, and an elevated beta-natriuretic peptide level. Important exclusion criteria include type 1 diabetes, uncontrolled hypertension, and an eGFR <25 mL/min/1.73 m^2. Patients are continued on standard-of-care HFpEF therapy and randomized in a 1:1 ratio to add either dapagliflozin 10 mg or placebo once daily to their regimen.

The primary endpoint is time-to-first CV death or worsening heart failure, which the authors defined as either a hospitalization or urgent care visit due to heart failure. The trial aims to observe 1,117 primary events; randomization concluded in January 2021 with a total of 6,263 patients randomized to either arm. The anticipated follow-up time will be 27 months. Secondary outcomes include total number of heart failure events and CV deaths, death from any cause, and changes in the total symptom score of the Kansas City Cardiomyopathy Questionnaire (KCCQ) at eight months.[9]

Although full results have not yet been published, AstraZeneca – the manufacturer of Farxiga (dapagliflozin) – recently released a press statement in which they mention that dapagliflozin "reached a statistically significant and clinically meaningful reduction in the primary composite endpoint of CV death or worsening heart failure."[10] It remains to be seen whether this composite endpoint was driven primarily by a reduction in heart failure hospitalizations, as was observed in the EMPEROR-Preserved trial. The press statement adds that safety and tolerability were consistent with previous trials, and that "regulatory submissions will be made in the coming months."[10]

Cost and Coverage

One final consideration to be evaluated is the cost and coverage of these agents. As of May 31, 2022, the average wholesale price (AWP) of empagliflozin 10 mg (single tablet) is $22.82, whereas the AWP of dapagliflozin 10 mg (single tablet) is a comparable $21.95.[5,6] There have been no direct comparisons between the cost-effectiveness of these agents.

Two of the large third-party payers within our state include Wellmark Blue Cross Blue Shield of South Dakota and DAKOTACARE. Both payers include empagliflozin and dapagliflozin as "Tier 2" agents for type 2 diabetes, requiring trials of other antidiabetic agents prior to approval.[11,12] Their formulary status when used for the treatment of heart failure – either HFrEF or HFpEF – is unknown at this time.

Conclusion

The SGLT2i represent a new option in the management of patients with HFpEF, which is a disease state with relatively few targeted medications. Although neither empagliflozin nor dapagliflozin has demonstrated an overt reduction in CV mortality alone, the ability to significantly reduce HF hospitalizations should not be overlooked. Empagliflozin has demonstrated this via the EMPEROR-Preserved trial, whereas we still await full results of the DELIVER trial for dapagliflozin. Although these agents are relatively inexpensive, their status on third-party payer formularies may prove to be a barrier to some. Providers should consider the SGLT2i – alongside MRAs and the treatment of pertinent comorbidities – in the management of HFpEF.

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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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For more information, visit sdstate.edu/pharmacy-and-allied-health-professions/pharmacy-practice.

Member News

Visit www.sdsma.org for the latest news and information.

Congratulations to the 2022 SDSMA Award recipients

The SDSMA presented its 2022 awards to recipients at the SDSMA's annual banquet on June 3 at the Hilton Garden Inn Downtown Sioux Falls.

- The SDSMA's **Distinguished Service Award** recognizes a physician or lay person who has been of outstanding service to the medical profession in South Dakota. This year the Distinguished Service Award recipient is **Tom J. Huber, MD**.
- The **Outstanding Young Physician Award** was presented to **Mandi Greenway Bietz, MD**. This award is given to a young physician under 40 or within the first eight years of professional practice after residency and fellowship training. This physician is recognized for outstanding achievements, dedication and service to the community and the SDSMA at the local, state and national levels.
- The SDSMA's **Community Service Award** is presented each year to a physician who separates himself or herself through outstanding work in the area of community affairs. This year the award was given to **David Basel, MD**.
- **The Prairie Docs – Andrew R. Ellsworth, MD; Kelly M. Evans-Hullinger, MD; Debra J. Johnston, MD** and **Jill Kruse, DO** – received the SDSMA's **Richard P. Holm, MD, Media Award**. The Richard P. Holm, MD, Media Award recognizes those who have helped promote the medical field and medical issues.
- The **Young at Heart Award** is presented to a physician who has inspired young physicians as a mentor, role model and leader. This year's recipient is **Laurie B. Landeen, MD**.
- **Benjamin C. Aaker, MD**, received the SDSMA's **Past President's Award**. This award is presented each year to the immediate past president of the SDSMA in recognition of their many years of work and dedication to organized medicine.
- **Mary S. Carpenter, MD,** received the **Special Presidential Award**. This award is chosen by the SDSMA president to recognize the recipient's contributions to the medical profession.
- The **Friend of Medicine Award** was presented to **Blake Curd, MD**. This award is given in recognition of contributions serving as an effective advocate for health care and the medical profession.
- The **COPIC Humanitarian Award** honors a physician for volunteer medical services and contributions to their community. **Tim Irwin, MD,** is the recipient of this year's award. The award aims to recognize individuals who unassumingly volunteer outside the spectrum of their day-to-day lives. The recipient of the award designates a $10,000 donation from COPIC to be provided to a health care-related 501(c)(3) organization in South Dakota. Dr. Irwin has chosen Servant Hearts Clinic in Yankton as the donation recipient.
- Six physicians were recognized with the SDSMA's 50-Year Award for medical practice in South Dakota. These physicians have been practicing medicine for a half-century and have contributed greatly to the medical profession: **Frank Alvine, MD; Bernie H. P. Hanson, MD; Donald Kelley, MD; Tom Looby, MD; Mike Pekas, MD;** and **John Sabow, MD**.

Award recipients at the SDSMA annual banquet. Left to right: Laurie Landeen, MD; Tom Huber, MD; David Basel, MD; Benjamin Aaker, MD; Andrew Ellsworth, MD; and Mary Carpenter, MD

Tom Looby, MD, receiving his 50-Year Award at the SDSMA annual banquet.

SDSMA Elects 2022-23 Board of Directors

Lucio N. Margallo II, MD, speaking at the annual banquet as the newly sworn in SDSMA president.

The Board of Directors members for the 2022-23 year are:

- President – **Lucio N. Margallo II, MD**
- President-Elect – **Denise S. Hanisch, MD**
- Vice President – **Jennifer J. Tinguely, MD, MPH**
- Secretary-Treasurer – **Susan M. Anderson, MD**
- Immediate Past President – **Kara L. Dahl, MD**
- At-Large Director – **Mark C. Ballard, MD**
- At-Large Director – **Lisa B. Brown, MD**
- At-Large Director – **Keith A. Hansen, MD**
- Policy Council Chair – **Heather L. Preuss, MD**
- SDSMA Delegate to the American Medical Association – **Mary S. Carpenter, MD**
- SDSMA Delegate to the American Medical Association – **Robert L. Allison, MD**
- SDSMA Alternate Delegate to the American Medical Association – **Robert J. Summerer, DO**

Learn more about Board of Directors members at sdsma.org.

2022 Annual Leadership Conference addresses social determinants of health, ethics/professionalism in medicine

Left to right: Jennifer Tinguely, MD; Teresa Bormann, MD; Mary Carpenter, MD, Leonard Egede, MD; Secretary of Health Jane Adam.

At the 2022 SDSMA Annual Leadership Conference June 3 in Sioux Falls, attendees heard from experts on the topics of social determinants of health and ethics. Leonard Egede, MD, a nationally recognized health disparities researcher and professor at the Medical College of Wisconsin, addressed the social determinants of health and reducing inequities to make a lasting difference in the well-being of patients.

A panel discussion, moderated by Joan Adam, South Dakota Department of Health Secretary, focused on ways physicians can improve the health of all South Dakotans by addressing health disparities, and how to better understand factors that may impact patient populations. Participants in the panel discussion were Jennifer Tinguely, MD, MPH; Teresa Bormann, MD; Mary Carpenter, MD; and Leonard Egede, MD.

Ann Freeman Cook, PhD, presented on ethics and professionalism in medicine, and keeping the ethical foundations of the medical profession in sharp focus despite outside influences on medicine, individuals and the patient-physician relationship.

The American Medical Association (AMA) president, Gerald Harmon, MD, and the AMA's Director of Congressional Affairs, Jason Marino, opened the conference and spoke at the SDSMA PAC lunch, respectively. They provided information and insights about the federal and state legislative arenas and the value of physicians being advocates for their profession.

SAVE THE DATE! Join us next year for the 2023 SDSMA Annual Leadership Conference on Friday, June 3. Location TBD

Member News

Medical student poster session

Tim Ridgway, MD, Dean of USD SSOM, gives an update on medical school happenings and announces the medical student poster session.

Attendees of the SDSMA 2022 Annual Leadership Conference on June 3 had the opportunity to see medical student posters on display and talk with students about their projects. A special thank you to Keith Hansen, MD, for organizing the poster session. The winning project was "A Survey of Eye Care Needs among Community Health Patients in Western South Dakota," by Derek Rohlf, MS IV; Adam Bleeker, MD; Carson Eisenbeisz, MD; and Ryan Scarborough, OD. Derek presented his work to the SDSMA Council of Physicians.

Medical student poster session.

SDSMA Foundation scholarship recipients announced

The SDSMA Foundation scholarships for the 2022-23 school year have been awarded to the following medical students at the University of South Dakota Sanford School of Medicine. The recipients were recognized at the SDSMA Annual Leadership Conference on June 3.

Brittany Bamberg - Yankton District Medical Society Scholarship,

Mason Blue - Avera Health Plans Scholarship - First Year

Madisyn Braun - Herbert A. Saloum Memorial Scholarship

Ashley Durant - SDSMA Past Presidents' Scholarship

Zachary Fleming - Wulbers Scholarship

Kennedy Forest - Black Hills District Medical Society Scholarship

Meghan Grassel - Richard P. Holm, MD Prairie Doc Memorial Scholarship

Kirby Hora - Howard and Mary Ann Saylor Scholarship

David Jensen - Avera Health Plans Scholarship - Third/Fourth Year

Joseph Kelly - J. Michael McMillin Scholarship

Maria Koenen - Howard and Mary Ann Saylor Scholarship

Lindsay Larson - Yankton District Medical Society Scholarship

Danielle Mack - Black Hills District Medical Society Scholarship

Tory Makela - SDSMA Senior Scholarship

Katherine Nielson - Pierre District Medical Society Scholarship

Ethan Noble - SDSMA Freshman Tuition Scholarship

Emily Petersen - Pierre District Medical Society Scholarship

Christian Pollema - SDSMA Past Presidents' Scholarship

Joshua Schumacher - J. Michael McMillin Scholarship

Luke Smith - J. Michael McMillin Scholarship

Annika van Oosbree - SDSMA CEO Memorial Scholarship

Amber Veldman - Avera Health Plans Scholarship - Third/Fourth Year

Mykayla Vollmer - T.H. Sattler Memorial Scholarship

2022-23 scholarship recipients at the SDSMA annual banquet. Back row, left to right: Josh Schumacher, Mason Blue, Brittany Bamberg, David Jensen, Luke Smith, Zachary Fleming, Ethan Noble. Front row: Tory Makela, Lindsay Larson, Madisyn Braun, Maria Koenen, Emily Petersen, SDSMA Foundation Chair Jennifer May, MD.

Physician leadership program now accepting participants

The SDSMA Health Leadership Institute (HLI) is now accepting participants for the 2022-23 cohort!

The HLI helps physicians balance life and work, sharpen their skills in practice management, and train for future leadership positions.

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

Six monthly sessions will be held with courses beginning in October.

How to apply – Those interested in participating may contact Barb Smith at 605-336-1965 or bsmith@sdsma.org. Learn more at sdsma.org.

SDSMA CENTER FOR PHYSICIAN RESOURCES
Health Leadership Institute

New Legal Brief - Medical Cannabis

Given recent changes to medical marijuana regulations, the SDSMA has updated its legal brief on medical cannabis, which is now available to members at sdsma.org. The two primary changes reflected in the latest update are: (1) physicians are authorized to access the registry of cardholders to determine if a person in the physician's care engages in the medical use of cannabis; and (2) physicians are no longer required to certify the need for patient cultivation of cannabis. Legal briefs are free for SDSMA members and available for non-members to purchase.

SDSMA encouraging physicians to join in the effort to promote colorectal cancer screening

The SDSMA is encouraging every physician to visit the American Society for Gastrointestinal Endoscopy (ASGE) 'Colorectal Cancer Screening Appropriate Use' webpage ASGE.org/home/crc-screening---for-medical-professionals to download patient education resources, including a printable office/practice poster, patient letter templates (for positive and negative test results), and an article for local newspapers.

More than 30 percent of U.S. adults aren't getting screened for colon cancer. It has a 90 percent survival rate when detected early.

Physicians are encouraged to help their patients understand which colorectal cancer screening option is appropriate for them, keeping in mind that this can vary for each individual based on their history and risk factors.

Colorectal cancer screening is recommended to begin at 45 years of age and screening options include colonoscopy, fecal immunochemical test (FIT) and MT-sDNA (Cologuard).

ASGE recommends that patients of any age who are exhibiting symptoms or who are high-risk or whose family has a strong history of colorectal cancer, should talk to their gastroenterologist or primary care physician about the need for a colonoscopy.

Visit ASGE.org/Screening-Physicians to download ASGE's 'Colorectal Cancer Screening Appropriate Use' resources for physicians. Physicians can refer their patients to ASGE.org/Screening for an easy-to-understand infographic on the appropriate screening test.

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Here Comes the Sun

Jill Kruse, DO

Summer and warm days outside in the sunshine are here. This is the perfect time to remember the importance of sunscreen. The number of sunscreens has increased over the years and the plethora of options can make it confusing when shopping for one that works best for you and your family.

There are two main categories of sunscreen: chemical and physical. Each type has its own list of pros and cons. Where you are going, how long you are going to be outside, and what you are doing may factor into which type is right for you.

Chemical sunscreens are probably more common to most consumers. They absorb UV rays and convert them into heat energy before they can damage the skin. These sunscreens are easy to find and relatively inexpensive in the form of lotion, gel sticks, and spray. Main ingredients include avobenzone, octinoxate, and oxybenzone.

Chemical sunscreens must absorb into your skin to work properly. They work best when applied 20-30 minutes before you go outside in the sun. They spread on easily and last long. You want to apply generously, but in general, less of this product is needed to get good coverage when compared to physical sunscreens.

Due to absorption into the skin, chemical sunscreens are not recommended for infants under six months. This type of sunscreen can also run the risk of causing allergic reactions, especially those with sensitive skin or conditions such as eczema or atopic dermatitis. Some ingredients in chemical sunscreens can cause damage to coral reefs and are banned in many places such as Hawaii, Key West, parts of Mexico, several Caribbean islands.

The other type of sunscreens available are physical sunscreens. These sit on top of the skin and provide a physical barrier to the UV rays, reflecting them away from the body. The main ingredients are titanium dioxide and zinc dioxide. Physical sunscreens are usually sold in the form of a white, thick paste. Some are available in fine powders than can be brushed on like makeup. Paste is more difficult to rub onto the skin compared to lotion and must be reapplied more frequently as it can be easily rubbed off especially when the skin is sweating. It may leave a film, and if you miss a spot, that area is not protected.

Whichever type of sunscreen you use, look for one that blocks both UVA and UVB rays. Remember to reapply often, even on cloudy days and limit exposure to the sun between 10 am and 2 pm when the UV rays are at their peak. Enjoy the sun and summer but do so safely. Your skin will thank you.

Jill Kruse, DO is part of The Prairie Doc® team of physicians and currently practices as a hospitalist in Brookings, South Dakota. Follow The Prairie Doc® at www.prairiedoc.org and on Facebook featuring On Call with the Prairie Doc®, a medical Q&A show celebrating its twentieth season of truthful, tested, and timely medical information, broadcast on SDPB and streaming live on Facebook most Thursdays at 7 p.m. central.

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