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South Dakota medicine

THE JOURNAL OF THE SOUTH DAKOTA STATE MEDICAL ASSOCIATION

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THE REAL BENCHMARK FOR YOUR PORTFOLIO:
YOUR REQUIRED RATE OF RETURN

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ZACH DALLUGE, CFP®, CKA®, Lead Advisor

When people talk about investing and developing an investment strategy, the conversation often centers around performance. Did the market go up or down? Did your portfolio beat the market? These questions are natural, but they don't always point to the most important measure of success.

At Foster Group, we often remind clients that investment success isn't about beating the market. It's about earning the return you need in order to achieve your goals.

Three Key Factors Behind Your Portfolio Allocation Strategy

1. How much of the portfolio needs to be preserved? Some assets may be earmarked for short-term spending or important goals, protecting those dollars from large market swings becomes a priority.
2. Your required rate of return, the long-term return your portfolio needs to generate in order for your financial plan to succeed.
3. Your tolerance for risk. Even if the math suggests a certain allocation or range of allocations, it still needs to be something you're comfortable sticking with during market ups and downs.

All three of these considerations matter in selecting your asset allocation. The most misunderstood factor is often the required rate of return.

What Does "Required Rate of Return" Actually Mean?

Your required rate of return is simply the rate of growth your investment strategy may need to support your financial plan. It's influenced by a number of factors, including your savings rate, your spending goals, your time horizon, other sources of income (such as Social Security or pensions), and inflation assumptions.

When these variables are modeled together in a financial plan, they produce a target return that helps determine how much growth the portfolio needs. This number doesn't predict exactly what markets will do in any given year. Instead, it helps answer a much more important question: How much risk does your portfolio actually need to take?

The Surprising Part: It's Often Lower Than You Think

When we run the numbers for a financial plan, we often find that a moderate, disciplined long-term return may be sufficient for many goals. Consistent saving, a long investment horizon, and thoughtful spending assumptions could all lower the return a portfolio actually needs to generate. That realization could change how investors think about risk. If your plan only requires a moderate return to succeed, pursuing significantly higher returns may not improve the outcome. Instead, it may introduce more volatility than your plan really needs.

Why This Matters for Your Portfolio

Understanding your required return helps define the minimum level of investment risk necessary for your plan. For some investors, the required return may call for a portfolio with a significant allocation in stocks in order to pursue long-term growth. For others, the math might show that a more balanced allocation is sufficient to stay on track.

The key point is that portfolio design shouldn't start with market predictions or performance comparisons. It should start with your plan.

A Better Way to Measure Investment Success

The financial media often frame investing as a competition against the market. In reality, the most meaningful benchmark isn't an index; it's your financial plan. If your portfolio is earning the return necessary to support your goals while allowing you to stay disciplined through market cycles, that's a successful investment strategy.

To see how your required rate of return shapes your investment decisions, reach out today. At Foster Group, truly caring for our clients means taking the time to learn what's in their hearts and helping them pursue their goals. Together, we can review your plan and explore an investment approach aligned with what matters to you.

"Fair Winds, and Following Seas"

Keith Hansen, MD
Editor, *South Dakota Medicine*

It has been an honor and privilege to serve as the 144th president of the SDSMA. After completing my term at the Annual SDSMA Leadership Conference I find myself reflecting on the past year and the work that the SDSMA does in advocating on behalf of all South Dakota physicians, their patients and the public at large on a local, regional and national level. First, it has been a year marked by change with a new CEO, Tammy Hatting; new executive services manager, Kayla Keeler; and new office space on Minnesota Avenue. With all of these modifications our team ensured that the day-to-day operations of the SDSMA continued to maintain and improve our organization and the practice of medicine in South Dakota. I was very impressed at the dedication, enthusiasm and work ethic of the small staff of Justin Ohleen, Elizabeth Reiss, Kira Gravatt, and Kayla Keeler under the leadership of Tammy Hatting.

Your support and membership in the SDSMA enables this organization to move forward, makes our voice heard and allows us to continue to advocate for medicine. One of the highlights for me this past year was visiting many of our districts across the state. As an obstetrician/gynecologist, born in the Kadoka Hospital (forceps delivery by Dr. Sundet) and raised in rural communities, the importance of rural health including maternity care is clear. It is wonderful to meet so many dedicated physicians and discuss the great work that is happening across the state. It was also clear that we have a shortage of physicians in our rural communities and maternity deserts throughout the state.

It was a challenging legislative session, primarily due to the make-up of the health committees and high number of bills brought to each committee. In 2026, there were 580 bills introduced with 72 touching healthcare in some fashion. We successfully struck down Ivermectin, anti-vax bills and increased penalties for abortions. We appreciate the strong efforts from our lobbyists, Dean Krogman and Justin Bell, as well as the increased presence at the Capitol by our CEO, Tammy Hatting. With the assistance of AMA grant funds our lobbying team was able to get Senate bill 233 introduced and supported it through the legislative process. Senate Bill 233 would have made it so insurance providers could not levy penalties on hospitals for using out of network providers. Senate bill 233 did not pass; however, we were able to lay the groundwork for next session. We must continue to provide education to our legislators and work on building trust in a world where mistrust seems to be the norm.

The SDSMA is as strong as ever and will continue to work hard for you, your patients and the practice of medicine in the state of South Dakota. Dr. Ben Meyerink was inaugurated as the 145th president of the SDSMA at the annual meeting. Dr Meyerink is a family medicine physician with emotional intelligence, integrity, curiosity and a commitment to growth and development. I look forward to watching him lead us through the coming year. He also has a dynamic and involved Board of Directors and Policy Council to help him in his mission. He will be working alongside Tammy who has paved the way for a new and visible SDSMA. I have no doubt that the two of them will lead us into a new era with competence, fresh ideas and success.

"Fair Winds, and Following Seas" is a nautical saying to acknowledge a major change in one's life and wish the person good luck and smooth progress in their new endeavor.

Thank you for your support and commitment to this organization. Please continue to stay engaged and know that the SDSMA is here for you.

President's Comments

A Strong History Carried Forward by New Leaders

Ben Meyerink, MD
President, South Dakota State Medical Association

I think many of our SDSMA members do not realize the storied history of our state association. In true South Dakota fashion, we have never had the largest medical association in the country, but we have punched above our weight for over a century now. Not only have we been advocating at a state level since 1881, before South Dakota was even granted statehood, we also have had numerous physicians over the years represent us nationally. While we may not always see eye to eye with every piece of legislation, our reputation in Pierre remains as strong as ever. Most importantly, our state association has always represented a large majority of physicians throughout our state and has maintained deep ties to our medical school. With all of the changes that have occurred throughout our state over time politically and medically, our state association has still stood strong for 145 years.

As the new president of the SDSMA and the youngest to serve in this role in quite some time, I do feel a tremendous responsibility and pressure to carry on this rich history. Since my time as a medical student at USD, I have learned from and witnessed a number of great leaders in our state association. This list of names is endless, but I know many of them have impacted your lives and practices as well. I would not be in this position if it was not for them. These leaders sacrificed an infinite number of hours outside of clinic, trips to Pierre, and personal time to further medicine in our state and be a voice for their fellow physicians and patients. They served as my primary source of mentorship, taught me how to advocate for evidence-based medicine, and gave me the confidence to serve in this role.

Our current board of directors is also filled with a great variety of young leaders with this same background. You will find physicians from family medicine, internal medicine, general surgery, dermatology, psychiatry, and obstetrics and gynecology composing our current leadership. Just as important, we touch a variety of geographical settings, health systems, independent practices, and backgrounds to help represent the variety of patients and communities that make up our state. On every single issue that we discuss, we collectively share insight and expertise that provides a balanced perspective that I think represents well the medical community of South Dakota.

As many of you know, another major step in our state association's history occurred last year as longtime CEO Barb Smith retired. One year in and I can confidently say that Tammy Hatting, our new CEO, is the best leader to take over and lead a new era for our SDSMA. She has brought new energy, new ideas, and even a new building within a year of her leadership. The latter change was not a small step either financially or logistically but has now given our state association physical visibility on one of the busiest streets in all of South Dakota and is directly situated between our state's two largest hospital facilities. If you are in Sioux Falls at any point, I encourage you to stop in and see this exciting space that we want our physicians to utilize and call their own.

Medicine, politics, and our world are full of constant change. Some institutions last, some do not. I am proud to be a member of the SDSMA that has now been here since the founding of our state and is still standing strong. I am grateful for our past leaders who have shaped myself and many others who now try to carry their legacy forward and advocate for medicine in South Dakota. However, we need *all* of you to help us continue to do this. Our association will only remain strong for another 145 years when we all are involved together to use our various experiences, backgrounds, and expertise to create a unified voice. I look forward to serving you all in the year ahead and welcome you to help me continue moving our association ahead for years to come.

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Emily's Hope Upper Elementary School Substance Use Curriculum: Knowledge, Attitude and Perception Outcomes – a Cross-Sectional Study

Grace Caldwell, MD; Phil Dohn, MD; Minga C. Vargas, MPH; and Vivek Anand, MD, FASAM, DFAACAP

Abstract

Background: Substance use severely harms health, mental health, and is a leading cause of preventable morbidity and mortality. To help prevent substance use, developmentally appropriate educational interventions during elementary school are much needed.

Methods: An evidence-based and age-appropriate substance use prevention curriculum targeted at upper elementary school students (4th and 5th grades) was developed by a multidisciplinary educational committee. The curriculum was administered to 514 upper elementary over the 2023-2024 school year.

Results: A pre-curriculum baseline knowledge survey was administered to 274 students in 4th grade and 240 students in 5th grade over the 2023-2024 school year. At the end of the school year, following instruction of the curriculum, the survey was re-administered post-curriculum (n=158 in 4th grade; n=162 in 5th grade) with student retention rates of 58% and 68%, respectively. This pilot study demonstrated increased knowledge, changes in attitude, and improved perceptions about health promotion and substance use prevention in both 4th and 5th grade students.

Conclusion: These results support well-designed and age-appropriate curriculum as effective prevention programs that would ideally mitigate risk and reinforce protective factors. It further suggests that elementary school-based prevention programs are likely to be successful, which could help reduce exposure to substances during middle and high school.

Introduction

Substance use severely harms health, increases risk of chronic diseases, mental health conditions, and is a leading cause of preventable mortality. It places a burden on the individual, their families, and their communities. The percentage of adolescents reporting any illicit substance use remains a concern. According to the Monitoring the Future study, 10.9% of 8th graders, 19.8% of 10th graders, and 31.2% of 12th graders reported illicit drug use in 2023.[1] Substance use can significantly disrupt normal brain development, potentially leading to lasting cognitive and behavioral issues.[2] The brain continues to develop until the mid-20s, with the prefrontal cortex, responsible for higher-level executive functions, being one of the last regions to mature. Additionally, the epigenetic changes from adverse childhood experiences and impaired childhood mental health can further increase vulnerability for substance use.[3] The likelihood of developing a substance use disorder increases significantly when individuals initiate substance use during adolescence. Youth who begin drinking before age 15 have four to six times the rate of lifetime alcohol dependence than those who remain abstinent from alcohol use until age 21. Most people with a substance use disorder started using before age 18, and developed substance use disorder by age 20, underscoring the need to prevent youth substance use/experimentation.[4] Multiple individual, family, peer, school, and community related intervention targets have been identified by various studies. Much emphasis has been paid to adolescents, but targeting students during upper elementary school years with educational interventions may cultivate and foster lifelong understanding surrounding personal health, brain function, safe medication use, and harms from substance use. Many children have their first encounter with substances in middle school due to being exposed to new social situations and stressors related to adolescence.[5] The upper elementary school-based setting would be an ideal environment to pursue this important goal of prevention by promoting general wellbeing, health, school connectedness, and parent engagement. The present times need valid, preventative, and educational interventions

in upper elementary school level aimed at enhancing protective factors and decreasing risk factors to reduce initiation of substance use and improve social-emotional-psychiatric-substance use-economic outcomes. These targeted interventions may alleviate emotional dysregulation, academic failure, peer rejection, access to substances, and medication misuse while fostering coping skill building to channel emotions/impulses positively, improving parental monitoring, facilitating academic competence, and cultivating peer and family cohesion.

Fear based educational programs delivered in a didactic form, like Drug Abuse Resistance Education (DARE), have struggled to achieve desired prevention outcomes among youth.[6] The *Emily's Hope* substance use prevention curriculum was designed with the help of local educators, school administrators, school counselors, addiction medicine specialists, addiction psychiatrists, and local physicians to address growing concerns surrounding substance use and overdose in the upper Midwest. A previous study, piloting *Emily's Hope* curriculum, in a third-grade student body (n=324), demonstrated statistically significant gains in third grade students' knowledge about the brain and its function, attitudes toward substance use, and harm perception, the curriculum was expanded to upper (4th and 5th) elementary school grades.[7] This study was aimed at evaluating the effectiveness of a pilot health promotion and substance use prevention curriculum introduced at upper elementary school grade level.

We assembled a multidisciplinary educational committee, including experts from child psychiatry, psychology, addiction studies, education, and school administration, with the goal of developing an evidence-based elementary school substance use prevention curriculum that can be utilized by schools locally and beyond. A pilot version of the *Emily's Hope* substance use prevention program was administered to 4th and 5th grade students (n=514) in 14 different school districts over the 2023-2024 school year, and students completed baseline knowledge surveys prior to receiving the curriculum. After a year of instruction, the survey was re-administered, and students demonstrated significant improvements regarding body functions, safety, and substance use.

Methods

A multidisciplinary educational committee developed an upper elementary school health promotion and substance use prevention curriculum. The school administrators obtained consent from guardians at the beginning of the school year to allow the administration of our curriculum in the classroom. The curriculum committee conducted orientation sessions for educators and counselors involved in the study. The schools were provided with required teaching aids and other equipment. The accompanying lesson books, tailor-made for each grade level, were developed to present educational content in an age-appropriate manner. Each lesson incorporates interactive elements such as group activities, discussions, and student-driven interactions to ensure active engagement. To further augment learning, animated videos, narrated stories, and quizzes are also incorporated. The students complete lesson-based surveys after lesson completion. Additionally, each lesson has an exit ticket to assess student learning. Students fill out exit tickets that then gauge responses regarding whether they gained knowledge from the material. These assessments are usually to analyze student learning, improve lessons, and help clarify contents that students may have struggled with. The curriculum was administered to more than five hundred students in upper elementary school, defined as 4th and 5th grades. The curriculum lessons are based on age-appropriate general themes intended for students to have repeated longitudinal exposure to prevention content over subsequent elementary grades. The curriculum focused on body systems, brain anatomy, impact of drug use on the body, reward pathway, neuronal signaling, assertive communication, medication safety, substance use disorder and its progression, emotional regulation, and brain recovery. The pre- and post-curriculum survey data were analyzed using ANOVA and repeated measures t-test in SAS. Nonparametric tests, including the Kruskal-Wallis and Wilcoxon tests, were used for non-normal data.

Results

Five-hundred and fourteen students in 4th and 5th grade from 16 school districts in 4 different upper Midwest states participated in the study. The median class size was 30.5 and 30 students in 4th and 5th grades. The curriculum's efficacy was assessed via pre- and post-curriculum surveys to estimate changes in knowledge, attitude, and perceptions about health promotion, healthy behaviors, body systems, brain health, medication safety, and substance use. The multiple-choice survey was designed by the education committee, focusing on basic concepts from the curriculum. The instrument was administered via Google Forms at the start of the academic year, capturing baseline data from 274 and 240 students from 4th and 5th grade, respectively, across the participating schools. All surveys were completed voluntarily, and no identifying information was collected. The initial survey was

re-administered at the conclusion of the academic year. Of the initial late elementary school cohort, 158 and 162 in 4th and 5th grade students participated, for student retention rates of 58% and 68%. The data were analyzed using SAS.

Both 4th and 5th grade students demonstrated gains from the curriculum, as measured by the difference between correct post- and pre-curriculum responses. The mean improvement in knowledge ranged from 8.6% in 4th grade to 7.6% in 5th grade ($p<0.05$). The 4th grade showed improvement in knowledge about body systems (Δ =12%), adverse impact of substances (Δ=5%), Fentanyl as a "dangerous" drug (Δ= 12%), and consequential thinking "Pause-Think-Act" (Δ=31%) (Fig. 1). In fifth grade, significant changes were seen in cause-and-effect reasoning (Δ=48%), impact of substances on neuronal communication (Δ=10%), medication safety (Δ=17%), and impact of substance use disorder (Δ=16%) (Fig. 2). The results indicate increased knowledge, changes in attitude, and improved perceptions about body function, healthy behaviors, substance use and its impact, substance use disorder, and medication safety.

Conclusion

The study results showed an increased understanding of body systems, nervous system, impact of substance use on body systems and brain function, personal self-management, general social skills, medication safety, problem solving skills, and drug resistance. Our post-curriculum survey indicated an overall enhancement in the percentage of correct answers for most questions when compared to the pre-curriculum baseline. The differences between the pre-curriculum and post curriculum were statistically different for both 4th and 5th grade students, indicating knowledge gains from the provided course content. This study highlights that a well-structured curriculum can promote upper elementary school students' understanding about physical health, mental health, brain function, impact of substance use, and medication safety. This improvement suggests that the

Figure 1. 4th grade results: mean improvement in knowledge was 8.6% ($p<0.05$).

Question no.	Question (answer)	Baseline % correct (N = 274)	Post-curriculum % correct (N = 158)	Difference	P-value
1	What does the cardiovascular system do? (pumps blood)	56.93%	68.35%	**+11.42%**	**p = 0.02**
2	What system is the brain a part of? (nervous system)	53.65%	65.82%	**+12.17%**	**p = 0.01**
3	Drugs affect different systems in the body. (true)	93.43%	98.73%	**+5.30%**	**p = 0.01**
4	What system carries messages from the brain to other parts of my body? (nervous system)	73.36%	68.35%	-5.00%	p = 0.27
5	Information from the brain reaches the body through _____. (nerves)	74.82%	81.01%	+6.19%	p = 0.14
6	Who should I take medication from? (a trusted adult)	81.39%	82.91%	+1.52%	p = 0.69
7	What part of the brain reacts when there is danger? (amygdala)	38.83%	50.63%	**+11.81%**	**p = 0.02**
8	Fentanyl is an opioid that is _____. (dangerous)	81.75%	93.67%	**+11.91%**	**p = 0.0006**
9	Drugs affect the prefrontal cortex by lowering impulse control and making it difficult for people to stop using the drug. (true)	85.40%	91.14%	+5.74%	p = 0.08
10	It is okay to take someone else's prescription medication. (false)	92.70%	91.77%	-0.93%	p = 0.73
11	People are more susceptible to developing a substance use disorder if _____. (all of the above)	39.78%	51.90%	**+12.12%**	**p = 0.015**
12	What does PTA stand for? (Pause-Think-Act)	51.10%	82.23%	**+31.18%**	**p < 0.0001**
Mean totals		68.60%	77.22%	8.62%	p < 0.0001

4th grade significant areas of improvement: knowledge about body systems (Δ =12%), adverse impact of substances (Δ=5%), Fentanyl as a "dangerous" drug (Δ= 12%), and consequential thinking "Pause-Think-Act" (Δ=31%).

Figure 2. 5th grade results: mean improvement in knowledge was 7.6% ($p<0.05$).

Question no.	Question (answer)	Baseline % correct (N = 240)	Post-curriculum % correct (N = 162)	Difference	P-value
1	What does PTA stand for? (Pause-Think-Act)	41.00%	88.89%	**+47.88%**	**p < 0.0001**
2	Who should I take medication from? (a trusted adult)	85.83%	85.19%	-0.65%	p = 0.86
3	Drugs and alcohol hurt _____. Multiple correct answers. (nervous system, respiratory system, circulatory system, muscular system)	27.08%	33.33%	+6.25%	p = 0.18
4	Which system works when we are eating? (digestive system)	87.50%	88.89%	+1.39%	p = 0.67
5	What is the last part of my brain to develop? (prefrontal cortex)	36.25%	45.68%	+9.43%	p = 0.0588
6	The amygdala is the brain's alarm system, alerting us to things and situations that seem threatening. (true)	82.50%	86.42%	+9.43%	p = 0.29
7	Match the lobe to its function. TOTAL	11.25%	12.35%	+1.10%	p = 0.74
7a	Parietal lobe. (processes sensory information)	30.42%	32.72%	+2.30%	p = 0.63
7b	Frontal lobe. (processes coordinating movements and problem solving/thinking)	39.17%	40.12%	+0.96%	p = 0.85
7c	Occipital lobe. (processes visual information coming into the brain)	28.33%	37.04%	+8.70%	p = 0.07
7d	Temporal lobe. (processes auditory information)	42.44%	37.04%	-5.40%	p = 0.28
8	The 4 lobes of the brain work together. (true)	80.33%	78.40%	-1.94%	p = 0.64
9	Neurons of the brain talk to each other using _____. (neurotransmitters)	66.25%	74.70%	+8.44%	p = 0.07
10	Drugs activate neurons because of the chemical structure neurotransmitters. Because drugs mimic neurotransmitters, they can _____ the messages in the brain. (mimic & disrupt)	57.92%	67.90%	**+9.98%**	**p = 0.04**
11	When you call 911, you should _____. (identify yourself, identify the emergency, identify where you are, who needs help, and remain on the line)	84.17%	89.51%	+5.34%	p = 0.13
12	A key difference between prescription medication and over-the-counter medication is _____. A key similarity between prescription medication and over-the-counter medication is _____. (one can only be obtained from a doctor, dentist, or other medical practitioner; they are both dangerous)	31.25%	48.15%	**+16.90%**	**p = 0.0006**
13	Prescription and over-the-counter medications are dangerous to misuse or abuse. (true)	71.67%	76.54%	+4.88%	p = 0.28
14	Substance use disorder can cause _____. (all of the above)	54.17%	70.99%	**+16.82%**	**p = 0.0007**
15	When a person experiences an addiction, they need more of the drug to produce the same effect as before. When the person tries to stop using, they may experience withdrawal symptoms such as _____. (all of the above)	65.00%	74.07%	+9.07%	p = 0.0548
		53.82%	61.47%	+7.65%	p < 0.0001

5th grade significant areas of improvement: cause-and-effect reasoning (Δ=48%), impact of substances on neuronal communication (Δ=10%), medication safety (Δ=17%), and impact of substance use disorder (Δ=16%).

curriculum effectively conveyed the information that the educational committee postulated. These findings show that targeted and age-appropriate educational interventions can positively impact students' knowledge base, attitudes, and perceptions surrounding general health, brain function/health, emotional regulation, medication safety, substance use, substance use disorder, health advocacy, and recovery. Our study strengths include broad curriculum implementation across diverse settings, ranging from rural school districts to small urban towns. The study included a considerable sample-size across many schools in the Midwest. Additionally, the completion of lessons by all curriculum providers highlights the program's feasibility and ease of implementation in school settings.

An effective prevention program would ideally mitigate risk and reinforce protective factors in schools, families, and communities, to decrease risk of substance use. Elementary school-based prevention programs are likely to be successful with increased focus on peer relationships, self-control, positive coping skills, health-promoting behaviors, social and academic skills, and drug refusal skills. This pilot study involving upper elementary school students supports that a well-designed age-appropriate curriculum can significantly enhance knowledge, attitudes, and perceptions about physical health, brain functions, medication safety, emotional recognition/regulation, substance use, health advocacy, substance use disorder, and brain recovery. Given the promising results, we have expanded the availability of our curriculum to multiple schools in several states including South Dakota, North Dakota, Minnesota, Iowa, and Indiana.

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An Evaluation of Emily's Hope Substance Use Prevention Curriculum Among Early Elementary School Students: Preliminary Indications of Effectiveness – a Cross-Sectional Study

Maria Villarroel Pinell, MD; Phil Dohn, MD; Minga C. Vargas, MPH; and Vivek Anand, MD, FASAM, DFAACAP

Abstract

Introduction: Substance use is a major cause of preventable morbidity and mortality, and national data show that many adolescents initiate use by middle school. Earlier prevention is critical, yet traditional approaches. There is growing recognition of the need for school-based strategies that are interactive, developmentally appropriate, and culturally relevant to promote healthy decision-making from an early age.

Methods: An age-appropriate substance use prevention curriculum targeted at early elementary school students (KG, 1st and 2nd grades) was developed by a multidisciplinary educational committee. The curriculum was administered to 662 early elementary students in 16 school districts in South Dakota, North Dakota, Minnesota, and Iowa over the 2023-2024 school year.

Results: All grades displayed statistically significant gains in awareness about body systems as measured by post-curriculum survey responses. Early elementary school students demonstrated an increased understanding of brain function, physical health, emotional regulation, and medication safety.

Conclusion: This study highlights that a well-structured substance use prevention curriculum can promote early elementary school students' understanding about personal health, brain function, and safe medication use.

Introduction

Substance use disorders remain a critical area of concern among youth. Substance use is a leading cause of preventable morbidity and mortality. In 2023, data from the Monitoring the Future study indicated that 11% of 8th graders, 20% of 10th graders, and 31% of 12th graders reported any illicit drug use in the past year.[1] The brain undergoes continuous development from prenatal period through mid-20s, and exposure to substances during this crucial period can influence brain development. Adverse childhood experiences and impaired childhood mental health negatively impact brain development and increase vulnerability for substance use. Early substance use/experimentation is associated with greater risk of developing a substance use disorder.[2] Early prevention interventions aimed at enhancing protective factors and decreasing risk factors can reduce initiation of substance use and improve social-emotional-psychiatric-substance use-economic outcomes. The existing times need substance use prevention interventions which have been tested in the real-world setting. A major focus is needed to understand how prevention programs can strengthen students' protective factors or intervene to reduce vulnerability long before problem behaviors develop.

The elementary school-based setting would be an ideal environment to pursue this important goal of prevention by promoting general wellbeing, health, school connectedness, and parent engagement. Such school-based strategies are needed to help prevent substance experimentation, medication misuse, and eventual development of substance use disorders. Early elementary school educational interventions may cultivate and foster lifelong understanding surrounding personal health, brain function, safe medication use, and potential harms from substance use. Risk or fear based educational programs delivered in a didactic form, like Drug Abuse Resistance Education (DARE), have struggled to achieve desired prevention outcomes among young people.[3] To address better decision making to help prevent substance use, early educational interventions are much needed.

To address this need, we assembled an educational committee with the goal of developing an evidence-based elementary school substance use prevention curriculum that can be utilized by schools locally and beyond. The *Emily's Hope* substance use prevention curriculum was designed with the help of local educators, school administrators, school counselors, addiction medicine specialists, addiction psychiatrists, and local physicians to address growing concerns surrounding substance use and overdose in the upper Midwest. *Emily's Hope* substance use prevention program is designed to address risk and protective factors for substance use and other healthy behaviors. The program is designed to encourage healthy habits, healthy eating, exercise, emotional identification, emotional regulation, and education about harmful effects of substances on the body. This school-based curriculum provides opportunities for hands-on engagement that involves educational videos, books, and group activities, along with continued engagement with teachers. The program is tailored to meet developmental age in each grade to improve social skills, emotional regulation, self-management, and resistance to substance use. The program focuses on promoting healthy coping skills, positive self-esteem, child-development, decision-making skills, goal setting, peer bonding, and effective communication in an educational environment.

A previous study, piloting *Emily's Hope* curriculum, in 3rd grade student body (n=324), demonstrated statistically significant gains in 3rd grade students' knowledge about the brain and its function, attitudes toward substance use, and harm perception, the curriculum was expanded to early (kindergarten through 2nd grade) grades.[4] This study was aimed to evaluate effectiveness of a pilot health promotion and substance use prevention curriculum introduced at kindergarten to 2nd grade level.

Methods

The school administrators gathered consent from parents at the beginning of the school year to allow the administration of *Emily's Hope* curriculum in the classroom. The curriculum committee conducted orientation sessions for educators and counselors involved in the study. Schools were finally equipped with the necessary teaching aids, including lesson books, lesson plans, models, and video animations. The accompanying books, tailor-made for each grade level, were developed to present educational content in an age-appropriate manner. Each lesson incorporates interactive elements such as group activities, discussions, and student-driven interactions to ensure active engagement. To further augment learning, animated videos, narrated stories, and quizzes are also incorporated. The students complete lesson-based surveys after lesson completion. Additionally, each lesson has an exit ticket to assess student learning.

A pilot version of the *Emily's Hope* substance use prevention program was administered to early elementary school students (n= 662) from kindergarten through 2nd grade in 16 different school districts over the 2023-2024 school year. The students completed baseline knowledge surveys prior to receiving the curriculum. During kindergarten, the curriculum focused on basic concepts like my body, my health, emotional recognition. In 1st grade, the added lessons include medication safety and emotional regulation. During 2nd grade, assertive communication skills, coping skills to deal with peer pressure, and health advocacy to peers, were included. After a year of instruction, the survey was re-administered, and students demonstrated significant improvements regarding knowledge of physical health, brain function, emotion identification, emotional regulation, medication safety, and effective decision making.

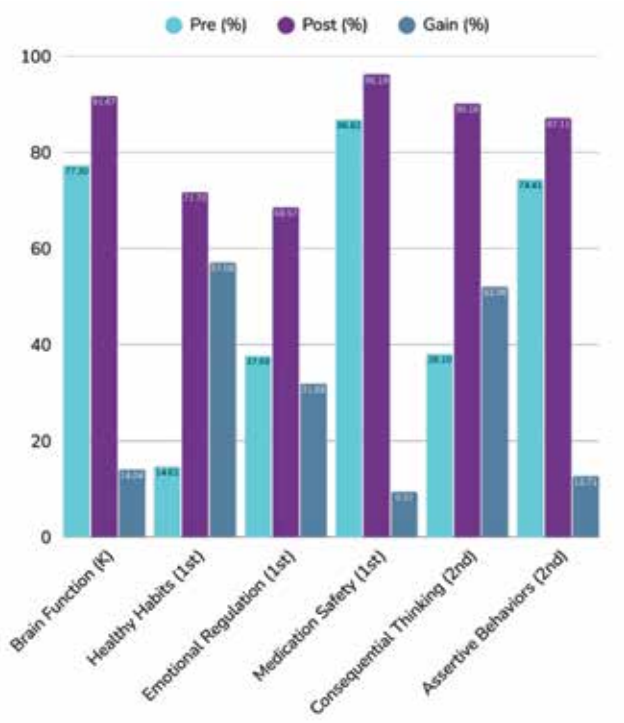
School students from multiple districts in South Dakota, North Dakota, Minnesota, and Iowa participated in the study. The curriculum's efficacy was assessed via pre and post curriculum surveys evaluating students' knowledge of curriculum content. The median class size was 33, 36, and 33 students in kindergarten, 1st, and 2nd grades, respectively. The survey instruments were administered via Google Forms at the start of the academic year, capturing baseline data from 152, 130, and 380 students from kindergarten, 1st, and 2nd grades, respectively. All surveys were completed voluntarily, and no identifying information was collected. The curriculum was delivered over the course of the 2023-2024 academic year, with educators given the flexibility to pace lessons according to their classroom dynamics. Each lesson took roughly 30 minutes to complete. All school districts reported completion of all lessons in the curriculum. The initial survey was re-administered at the conclusion of the academic year. Of the initial early elementary school cohort, 72, 106, and 195 students in kindergarten, 1st, and 2nd grades completed surveys at the end of school year, for student retention rates of 47%, 82%, and 51% respectively.

The pre- and post-curriculum survey data were analyzed using ANOVA and repeated measures t-test on SAS. Nonparametric tests, including the Kruskal-Wallis and Wilcoxon tests, were used for non-normal data.

Results

All grades displayed statistically significant gains in awareness about body systems as measured by difference between correct post- and pre- curriculum survey responses (Figure 1). The knowledge gain ranged from 5% in kindergarten, 28% in 1st grade, and 7% in 2nd grade. The kindergarten students were able to comprehend brain function better (Δ =14%). The first-grade students showed considerable improvement in brain function (Δ=13%), body function (Δ=23%), healthy habits/behaviors (Δ=57%), medication safety (Δ=9%), and skills to regulate emotions (Δ=30%). In 2nd grade, significant gains were seen in consequential thinking "Pause-Think-Act" (Δ=52%) and assertive behaviors (Δ=12%). The results support enhanced knowledge and improved perceptions towards body function and brain health, with marked improvement in consequential thinking to help prevent substance experimentation and use in future.

Figure 1. Skill gains.



Discussion

An important goal of prevention is to alter the balance between risk and protective factors so that protective factors outweigh risk factors leading to substance use. This pilot study involving early elementary school students affirms that a well-designed age- and developmentally- appropriate substance use disorder prevention curriculum can significantly enhance understanding of personal health, brain function, medication safety, and emotional recognition/regulation. The curriculum participation led improved knowledge and better perception thereby increasing protective factors that can suppress escalation to substance experimentation and use. Early educational interventions are pivotal and need to be reinforced during each grade level during early elementary years to help build effective foundation for better coping strategies and drug refusal skills, leading to decreased exposure to substances during middle and high school.

Our post-curriculum survey indicated an overall enhancement in the percentage of correct answers for all questions when compared to the pre-curriculum baseline. These findings show that targeted, age-appropriate educational interventions can positively impact students' knowledge base surrounding general health, brain function, emotional recognition/regulation, and medication safety, thereby strengthening protective factors to positively impact substance-use refusal skills, decreasing substance experimentation and use. Our study strengths include broad curriculum implementation across diverse settings, ranging from rural school districts to small urban towns. The study included a considerable sample-size across many schools in the upper Midwest.

Table 1. Kindergarten results – curriculum group.

Question	Question (answer)	Baseline correct (N = 152)	Post-curriculum correct (N = 72)	Difference
1	My brain works even when I'm sleeping. (True)	77.63%	91.67%	**+14.04% (p = 0.01)**
2	Click on how you can keep your body healthy? Multiple correct answers. (Washing hands, Brushing teeth)	71.71%	79.17%	+7.46% (p = 0.24)
3	Click on the person who is feeling unhappy. (Emily)	78.29%	75.00%	-3.29% (p = 0.59)
4	Who should I take medication from? (A trusted adult)	78.95%	80.56%	+1.61% (p = 0.78)
Mean totals		**76.64%**	**81.60%**	**+4.95% (p = 0.047)**

Table 2. 1st grade results.

Question	Question (answer)	Baseline correct (N = 130)	Post-curriculum correct (N = 106)	Difference
1	My brain looks like a _____ (walnut)	41.54%	69.81%	**+28.27% (p < 0.0001)**
2	Match your internal body parts to their functions			
2a	Lungs _____ (help you breathe)	70.77%	94.17%	**+23.40% (p < 0.0001)**
2b	Heart _____ (pumps blood)	70.77	86.41%	**+15.64% (p=0.005)**
2c	Brain _____ (controls body)	79.23%	92.31%	**+13.08% (p = 0.005)**
3	Click on all the ways to protect your brain. Multiple correct answers. (sleeping, washing hands, eating vegetables, riding a bike)	14.62%	71.70%	**+57.08% (p <0.0001)**
4	Who should I take medication from? (A trusted adult)	86.82%	96.19%	**+9.37% (p = 0.013)**
5	Who is not a trusted adult? Multiple correct answers. (a kid/peer, a stranger)	10.08%	45.71%	**+35.63% (p < 0.0001)**
6	I need to be careful around harmful substances like poison. (yes)	93.85%	90.57%	-3.28% (p = 0.35)
7	When I have emotions that feel too big to handle, I can _____. Multiple correct answers. (close eyes, count to 10, talk to an adult)	37.69%	68.57%	**+30.88% (p < 0.0001)**
Mean totals		**51.15%**	**79.49%**	**+28.34% (p <0.0001)**

Table 3. 2nd grade results.

Question	Question (answer)	Baseline % correct (N = 380)	Post-curriculum % correct (N = 195)	Difference
1	Match the sense to the body part. (Total)	85.00%	85.64%	+0.64% (p = 0.84)
1a	Taste (mouth)	96.05%	96.92%	+0.87% (p = 0.60)
1b	Touch (hand)	94.74%	95.85%	+1.11% (p = 0.56)
1c	Smell (nose)	92.84%	92.27%	-0.57% (p = 0.81)
1d	Hear (ears)	92.80%	95.26%	+2.46% (p = 0.26)
1e	See (eyes)	92.57%	92.23%	-0.35% (p = 0.88)
2	Who should I take medication from? (a trusted adult)	87.86%	83.85%	-4.01% (p = 0.19)
3	The neocortex is my _____, (thinking brain)	76.78%	74.35%	-2.44% (p = 0.52)
4	The limbic system is my _____. (feeling brain)	58.05%	64.74%	+6.69% (p = 0.12)
5	My brain looks like a _____. (walnut)	56.08%	74.23%	**+18.14% (p < 0.0001)**
6	What does PTA stand for? (Pause-Think-Act)	38.10%	90.16%	**+52.06% (p < 0.0001)**
7	Sometimes, being assertive can help you stay safe. (yes)	74.41%	**87.11%**	**+12.71% (p = 0.0004)**
Mean totals		**78.77%**	**86.05%**	**+7.28% (p<0.0001)**

In addition, the completion of lessons by all curriculum providers highlights the program's feasibility and ease of implementation in school settings.

Given the promising results, we have expanded the availability of *Emily's Hope* curriculum to multiple states. During the 2023-2024 school year, schools in 4 states participated (South Dakota, North Dakota, Minnesota, and Iowa). During the 2024-2025 school year, there were participating schools in 5 states (South Dakota, North Dakota, Minnesota, Iowa, and Indiana). Additionally, one elementary school in Uganda also adopted *Emily's Hope* curriculum during 2024-2025. Initially launched in the 2023-2024 school year, *Emily's Hope* kindergarten-5th grade substance use prevention curriculum intends to address unique needs of young students, delivered in age-appropriate content within school setting to address risks and protective factors for substance use and other health behaviors. The *Emily's Hope* educational committee plans to continue evolving the elementary school curriculum into middle and high school years.

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Adenoid Cystic Carcinoma of the Lip: A Case Report

Sarah J. Lane, MD; and Skye K. Lawlor, MD

Abstract

Adenoid cystic carcinoma (ACC) is an uncommon malignancy arising from secretory glands. While most commonly involving the parotid and submandibular glands, it can arise from any of the minor salivary gland tissue in the upper aerodigestive tract. This report features a more uncommon presentation of ACC in a 69 y.o. gentleman with a mass in his upper lip. Initial CT scan with contrast was concerning for an invasive lesion which subsequently led to a guideline-driven workup including fine-needle aspiration that was concerning for suspected salivary gland malignancy, most likely ACC. Pre-treatment chest CT was negative for metastatic disease. The patient underwent surgical excision followed by radiation therapy for definitive treatment. Surgical pathology confirmed a diagnosis of ACC with perineural invasion. The patient was treated with radiation therapy to minimize risk of tumor recurrence. Due to high prevalence for late recurrence and lung metastasis in patients with adenoid cystic carcinoma, the patient will be seen for ongoing surveillance including imaging. This case report looks to describe a more uncommon presentation of ACC and reviews the literature for management of ACC involving the minor salivary glands.

Introduction

Adenoid cystic carcinoma (ACC) is a rare tumor arising from secretory glands, most commonly salivary glands. It typically occurs in the head and neck but only accounts for about 1% of head and neck malignancies, highlighting its rarity.[1] An incidence of approximately 4.5 cases per 100,000 persons has been reported, while another source estimates about 1,200 new cases annually in the U.S.[2,3] ACC can occur in major salivary glands like the parotid and submandibular glands, but can also occur in any minor salivary gland tissue.[4,5] ACC typically presents as a slow growing, hard painless mass and can be associated with paresthesia or paresis due to its high tendency for perineural invasion.[6,7] ACC has a high rate of recurrence, showing a 5 to 10- year recurrence rate around 75%, with some patients having late recurrence up to 20 or more years after primary treatment.[8] ACC also has a high rate of distant metastasis through hematogenous spread, most frequently to the lungs.[6,9,10]

Risk factors for development of ACC are not well-established.[4,11] ACC shows a slight female predominance, with approximately 60% of cases occurring in women.[2] Most ACC develops in patients between the ages of 50-70 years.[11] Alcohol and tobacco use have not been associated with development of ACC.[12,13]

Workup of suspected ACC typically includes imaging with either CT or MRI to characterize tumor location and invasion, aiding in staging.[7] Fine needle aspiration (FNA) is an important diagnostic tool which is sensitive (87.5%) but not highly specific (66.67%) for ACC.[14] Definitive diagnosis of ACC is established via histopathological examination.[4] ACC has three histologic subtypes including tubular, cribiform, and solid. Single tumors may show mixed features of the various subtypes.[15] Overall cribiform is the most common subtypes and the solid subtype is considered the highest grade and confers a poorer prognosis.[15, 16] 5-year survival is about 75% but only 20% at 10 years. Factors associated with poorer prognosis include age greater than 45 years old, high-grade solid subtype, positive margins, and spread to lymph nodes.[17]

The minor salivary glands of the oral cavity and major salivary glands are the most common locations for ACC to develop.[4] However, ACC of the lip is rare, with estimates around 5%.[18] The authors have identified nine reports of ACC of the lip published between the years 1976 and 2023.[19-27] This case describes a 69-year-old male patient who was found to have an ACC of the left upper lip.

Case

Initial Presentation

A 69-year-old male initially noticed a mass on his left upper lip located superficial to the left maxillary canine and first premolar (Figure 1) and presented to a dermatologist for

evaluation who then referred him to his local otolaryngologist. He noted the mass about 6-9 months prior to presentation. The mass was causing him some mild discomfort but was otherwise asymptomatic. Physical exam shows a 2-3 cm lesion involving the mucosa of the upper lip without involvement of the gingiva or gingivobuccal sulcus. No overlying skin changes were noted. Differential diagnosis for this mass included mucocele, traumatic (irritation) fibroma, vascular lesions, squamous cell carcinoma, and salivary gland neoplasms including both benign tumors (e.g. pleomorphic adenoma) and malignant tumors (e.g. mucoepidermoid carcinoma, acinic cell carcinoma and ACC).[28]

Figure 1. Clinical photograph of initial lip lesion located on the left upper wet lip.

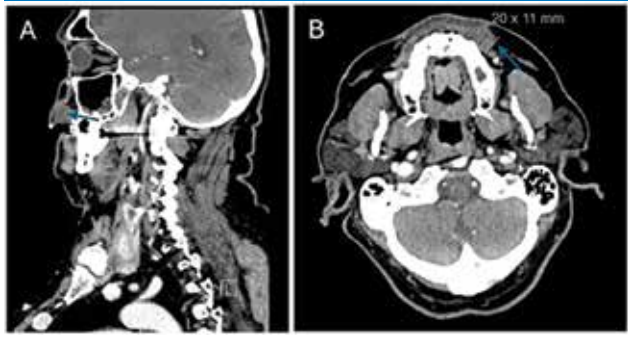
Workup

A CT soft tissue neck with IV contrast was completed which showed an indeterminate mass involving the mucosa of the upper lip measuring 19 x 11 x 15 mm (Figure 2) with concern for involvement of surrounding musculature. No bony involvement was noted and no lymphadenopathy seen.

Due to the concerning findings on CT, an ultrasound guided FNA was performed, which was concerning for salivary gland malignancy. A predominance of cribiform architecture was noted. The pathologist noted these findings as suspicious for ACC and cytologic review was suspicious for malignancy (Milan category V).

A chest CT showed a few noncalcified pulmonary nodules, including a 7.8 mm pulmonary nodule in the right upper lobe. A 3–6-month follow-up scan was recommended based on these findings, but no definitive evidence of metastatic disease was noted.

Figure 2. "A" depicts the sagittal view and "B" depicts the axial view of the lesion, as indicated by the arrows, on CT with IV contrast.



Due to the concern for malignancy and the size of the lesion, possibly necessitating complex reconstruction, the patient was referred to a tertiary care center for surgical resection.

Treatment

The patient underwent resection of lesion at a tertiary care center through an intraoral approach. There was involvement of the orbicularis, but they were able to preserve the external skin. The final defect after removal of the lesion was 3 x 4 cm. Buccal fat advancement was then performed and mucosal edges were tacked down onto this resulting in a residual defect size of 2 x 1 cm that was left to heal by secondary intention.

Final surgical pathology confirmed diagnosis of ACC that was 1.9 cm in greatest dimension and featured predominantly tubular and cribiform patterns. Perineural invasion was noted to be present. Immunohistochemical stains performed on the surgical specimen were positive for keratin AE1/AE3, SOX10, CAM 5.2, p63, and p40. Margins were negative, with the closest margin being 1 mm laterally. Per AJCC, 8th edition, the tumor was staged as pT1.

Following surgical excision, the patient experienced some expected numbness of the surgical site but otherwise no facial weakness, cosmetic concerns, or constitutional symptoms. He was then seen by Radiation Oncology who recommended 6 weeks of conventionally fractionated radiation targeting the tumor bed and adjacent neural pathways.

Follow-up

At the completion of radiation treatment, the patient will be monitored for tumor recurrence with a combination of

serial exams initially at 3-4 months intervals and surveillance imaging of the head, neck, and chest.

Discussion

The above report describes a case of ACC located on the left upper lip of a 69-year-old patient who underwent surgical resection with adjuvant radiation therapy. This case serves to contribute to the body of literature on ACC of the head and neck and to review the updated practice guidelines for treatment of ACC.

Diagnosis of ACC can be challenging with cross sectional imaging followed by tissue sampling (typically FNA) being the initial workup of choice. There are many nuances of salivary gland FNA and the Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) has been a useful tool in guiding appropriate management. This system includes seven categories with higher grades showing more features of malignancy.[29]

ACC unfortunately remains a difficult malignancy to treat with frequent local and distant recurrent disease, including late recurrence up to 20 years or more after primary treatment. Factors that may contribute to a better prognosis include negative margins after tumor resection, cribriform pathologic subtype, and absence of distant disease at time of presentation.[17] The use of adjuvant radiation therapy has been found to decrease rates of local recurrence.[30] Unfortunately, no significant impact of radiation on overall survival in the setting of ACC has been identified.[31]

Standard treatment for ACC includes surgical resection with negative margins followed by radiation therapy. Neck dissection is indicated only in cases of positive lymph nodes. If unresectable, radiation therapy alone may be considered but combination has been found to be superior. Chemotherapy is not a standard treatment for ACC due to lack of efficacy thought to be related to the indolent nature of the disease.[4,32] Investigation of additional treatments for ACC is ongoing. Experimental treatments include targeted therapies such as VEGFR2 tyrosine kinase inhibitors like Apatinib, immunotherapy, advanced particle radiation therapy, and novel therapies such as antibody-drug conjugates (ADCs).[33,34]

There is also investigation on the role of genetic workup in evaluation of ACC. Alterations in MYB, MYBL1, and NFIB are seen in nearly 90% of cases of ACC.[35] MYB-NFIB fusion is considered a hallmark genetic mutation for ACC. Alterations in PI3K/AKT and NOTCH pathways, if identified, are associated with poor prognosis.[36]

The American College of Radiology notes that chest CT with IV contrast is important for screening for ACC metastasis to the lungs and should be used to aid in ongoing surveillance. Radiologic findings associated with ACC can be challenging to interpret and can be nonspecific.[37] For this reason longitudinal imaging to look for radiographic changes can be helpful in monitoring disease status. Surveillance imaging (CT/MRI) of both the primary site and the chest should be done every 6-12 months over the first two years, with continued yearly follow-up after that. Long term surveillance remains important due to late recurrence. [4,38]

ACC remains a challenging subtype of salivary gland malignancy to treat and future research to develop novel therapeutic strategies remains important, especially due to the high propensity for late local and distant recurrence of this disease.

Conclusion

This report describes a case of an ACC of the upper lip. ACC remains a challenging subtype of salivary gland malignancy to treat with traditional standard of care being surgical resection, if possible, followed by adjuvant radiation therapy to decrease rates of local recurrence. Late local recurrence and metastatic disease to the lungs remains a significant challenge emphasizing the importance of long-term surveillance and the need for research into novel therapeutic approaches for this disease.

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BELIEVE IN BETTER

Mind Matters: South Dakota's Public Health Response to Dementia

Justin Persson, MD; and Grace Geffre, MS IV

Abstract

Alzheimer's disease and related dementias pose a growing health and societal challenge in South Dakota, where dementia ranks as the fourth leading cause of death. The burden extends beyond patients to families and caregivers, many of whom report significant emotional, financial, and physical strain.

In response, the South Dakota Department of Health introduced the South Dakota Healthy Brain Initiative. This statewide effort aims to improve brain health across the lifespan, promote earlier detection, strengthen caregiver support, and prepare the state's workforce to better respond to the needs of people living with dementia. The initiative promotes routine cognitive assessment, distributes clinical toolkits to assist with diagnosis and care planning, and expands access to community-based services.

A core focus of the initiative is health equity, particularly for rural, tribal, and underserved communities that face significant barriers to care. Through strengthened partnerships among public health, healthcare systems, and aging services, the Healthy Brain Initiative seeks to reduce disparities, support caregivers, and improve outcomes for individuals and families affected by dementia across South Dakota.

Introduction

Alzheimer's disease and related dementias (ADRD) present an increasingly significant public health challenge in South Dakota. As of 2025, an estimated 18,700 South Dakotans aged 65 and older are living with dementia, and more than 11% of adults report subjective cognitive decline—a potential early sign of impairment.[1] Dementia is now the fourth leading cause of death statewide and the third leading cause of death among adults aged 80 and older.[2]

To address this growing challenge, the South Dakota Department of Health (SD DOH), in partnership with the South Dakota Department of Human Services (SD DHS), has launched the South Dakota Healthy Brain Initiative (SD HBI). Funded through the Centers for Disease Control & Prevention (CDC) Building Our Largest Dementia Infrastructure (BOLD) Public Health Program, the initiative aims to reduce the burden of ADRD by promoting brain health, early detection, caregiver support, and workforce readiness[3]. With nearly 60% of caregivers reporting emotional stress and dementia-related Medicaid expenditures projected to surpass $230 million in 2025, the SD HBI provides practical tools and strengthened public health infrastructure to assist clinicians and improve outcomes for individuals and families affected by dementia across the state.[1]

In January 2025, the SD DHS submitted its Annual Report on Improving Alzheimer's and Related Dementia Services to the South Dakota Legislature.[2] The report highlighted significant interagency progress, including:

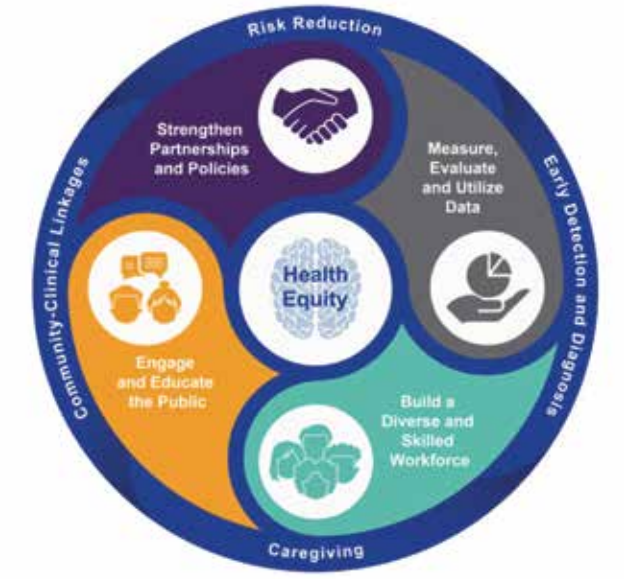
- Expansion of adult day services through grant-funded projects in rural communities.
- Statewide implementation of Trualta, a free, on-demand caregiver education platform.
- Training for Emergency Medical Service (EMS), Community Health Workers (CHW), and long-term care staff through the Dementia Dialogues program.
- A Guide to Navigating Dementia has been developed in collaboration with the SD DOH to support patients, caregivers, and clinicians.

The SD HBI builds on these efforts by integrating a strengthened public health infrastructure with evidence-based clinical practice. Guided by the CDC's Healthy Brain Initiative Road Map (2023–2027), the initiative adopts a life-course approach to cognitive health, prioritizes equitable access to services, and advances coordinated action across healthcare, public health, and aging services.[3,4]

Program Framework

The SD HBI aligns with the CDC's four-domain public health framework (Figure 1), providing a structured framework for coordinating dementia response strategies. These domains—partnership and policy development, data-driven action, workforce training, and public engagement—serve as key operational pillars. Grounded in a life-course perspective, the framework underscores that cognitive health is shaped not only by genetics and biology but also by modifiable risk factors and social determinants accumulated across the lifespan.

Figure 1. CDC four-domain public health framework.



Key Strategies and Clinical Implications

1. Early Detection and Diagnosis

Routine cognitive screening during Medicare Annual Wellness Visits remains an underused opportunity for identifying patients with early impairment. The SD HBI clinical toolkit will provide diagnostic aids, CPT code guidance, referral templates, and education materials to support screening, documentation, and follow-up workflows.

Early detection enables proactive care planning, better management of comorbidities, and timely connection to community resources.[5] Nearly 75% of adults would want to know early if they had Alzheimer's disease, interest that has grown with the availability of disease-modifying therapies.[6] Nonetheless, awareness and consistent use of screening tools (MoCA, MMSE, SLUMS) remain limited. The SD HBI aims to reduce this gap by equipping clinicians with practical, workflow-friendly supports.

2. Workforce Development

South Dakota's dementia-care workforce faces persistent shortages, particularly in rural areas with limited access to dementia-capable nurses, health workers, and providers.[1] The SD HBI addresses this gap through:

- Expanded dementia-focused training for primary care providers via Project ECHO and CME offerings.
- Promotion of dementia-care certification across long-term care, home health, and community-based programs.
- Training for EMS, CHWs, and public safety personnel to strengthen recognition and response to cognitive impairment.
- Standardized dementia-capable core competencies and improved access to clinical tools and decision supports.
- Community-engaged, equity-focused training to reduce stigma and support culturally responsive care.

These efforts can help reduce diagnostic delays, improve care coordination, and enable timely support for people living with dementia (PLWD) and their caregivers.

3. Caregiver Support

Dementia caregivers provide an average of 27 hours of care per week, equivalent to a part-time job.[3] Nearly 60% of caregivers for people living with dementia in South Dakota report substantial emotional strain, and many also experience physical, financial, and social burdens.[1] Caregivers are essential partners in dementia care, especially in rural regions with fewer formal support options.

The SD HBI and SD DHS advance caregiver support through:

- **Dementia Dialogues** statewide training for community members, EMS, CHWs, and civic organizations.
- **Trualta**, a free, on-demand platform providing evidence-based education on communication, safety, and self-care.
- Expansion of respite, adult day services, and in-home supports in underserved areas.
- Development of memory cafés and peer support programs.
- Enhanced navigation and referral systems, including care coordinators and neuro navigators, to reduce fragmentation and improve access to resources.

These efforts aim to reduce caregiver burden, extend the

ability to maintain home-based care, and delay unnecessary institutionalization.

Brain Health Promotion

Chronic conditions such as hypertension, diabetes, obesity, and depression significantly influence cognitive health.[5] Approximately 45% of dementia cases are attributable to modifiable risk factors.[5] Integrating brain-health messaging into chronic disease management and health-promotion campaigns expands prevention opportunities across the lifespan.

Results from the U.S. POINTER randomized clinical trial further validates multidomain lifestyle interventions. Structured programs incorporating physical activity, nutrition, cognitive and social engagement, and cardiovascular risk monitoring produced greater improvements in global cognition than lower-intensity, self-guided approaches.[8] Building on this evidence, the SD HBI promotes lifestyle-based strategies to reduce dementia risk as core components of brain-health messaging across statewide clinical and community settings.

Surveillance and Evaluation

Effective implementation requires continuous learning. Integrating cognitive decline and caregiver modules into the BRFSS enables real-time tracking of cognitive health trends and disparities. Supplemental data streams, including Medicaid utilization patterns, provider readiness surveys, and community input, support evaluation of system capacity and emerging gaps.

Together, these surveillance efforts guide strategic adjustments, ensure accountability, and maintain the initiative's focus on equitable access to dementia care and prevention services across SD.

Coalition Building and Implementation

The South Dakota Healthy Brain Coalition, established in 2024, coordinates cross-sector planning and implementation. Members include SD DOH, SD DHS, healthcare systems, tribal health partners, community organizations, and aging services. The coalition advances shared priorities, identifies regional needs, and supports alignment between clinical care and public health action.

Recommendations for Clinicians

Clinicians play an essential role in advancing early detection and improving dementia outcomes. Recommended practices include:

- Incorporating brief cognitive assessments into Medicare Annual Wellness Visits and routine care with high-risk patients.
- Referring patients and caregivers to evidence-based resources such as Trualta and Dakota at Home (SD's Aging and Disability Resource Center).
- Participate in continuing education focused on dementia screening, diagnosis, and culturally responsive care through platforms such as Project ECHO.
- Adopt tools from the SD HBI clinical toolkit (forthcoming) to improve workflows, facilitate documentation, and align with statewide dementia care priorities.

Integrating these practices into routine care improves timely diagnosis, supports caregivers, and strengthens statewide dementia preparedness. Public support for early detection remains high, offering clinicians a critical opportunity to meet patient and family expectations.[9]

Conclusion

The South Dakota Healthy Brain Initiative represents a coordinated, evidence-based public health response to the growing impact of dementia across the state. By integrating clinical care with community resources, raising public awareness, and developing the workforce, the initiative establishes a sustainable model to reduce dementia risks and support caregivers. Its focus on equity ensures that rural, tribal, and underserved populations are not neglected. As South Dakota faces a rising tide of dementia, this model may serve not only as a response to a pressing public health issue, but as a foundation for building age- and brain-friendly communities for decades to come.

HEAD FORWARD SOUTH DAKOTA
Supporting Your Brain Health Journey

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Whole Blood Transfusion in Air Medical Transport: The First Five Years

Abigail Polzin, MD; Rylee Honomichl, MS III; and Tanner A. Smith, MS III

Abstract

Introduction: Prehospital blood transfusion is increasingly used in emergency medical transport, particularly for trauma-related hemorrhage. Whole blood (WB) has shown advantages over component therapy, i.e., packed red blood cells (PRBC), but data on its use for civilian indications remains limited.

Study Objective: This retrospective analysis reviewed air medical transport cases over a five-year period from 2019 to 2024 in which blood products were administered.

Methods: Data were compared between patients who received WB versus PRBCs, including patient demographics, transfusion indications, Rh status, and outcomes. Statistical analyses included chi-squared tests for categorical variables and Mann-Whitney U tests for continuous variables, with significance set at $p<0.05$.

Results: The groups were demographically similar, and no transfusion-related complications were recorded. WB was significantly more likely to be used in trauma indications, while PRBC predominated in gastrointestinal (GI) bleeds and anemia. Of six Rh-negative women of child-bearing potential (under the age of 50) who received transfusions, two received WB, with one subsequently receiving Rh immunoglobulin. Mortality was higher in the WB group, most likely due to the severe nature of trauma cases.

Conclusion: The findings suggest that WB transfusion is an appropriate and effective option in air medical transport, particularly in trauma scenarios. The risk of alloimmunization appeared minimal, supporting the use of WB when Rh matching is not feasible. Further research is needed to assess the role of WB transfusion in non-trauma scenarios.

Introduction

In the field of emergency medical transport, prehospital blood transfusion programs are increasing.[1] Hemorrhage is a major contributor to preventable pre-hospital death,[2] and an estimated 54,000–900,000 patients annually could benefit from blood products before reaching definitive care.[1] In cases of hemorrhagic shock, it is well-established that early blood product administration is recommended,[3-6] with the most evidence in trauma. Blood product resuscitation demonstrates greater than predicted survival with a 37% reduction in 30-day mortality among affected trauma patients.[3-5,7,8] Implementation of programs has been shown to be both safe and efficacious,[9] particularly benefiting populations facing disparities in trauma care, such as geographical distance.[10] For non-trauma bleeding (e.g., obstetric hemorrhage), evidence is promising but limited, underscoring the need for further study.[11,12]

Among prehospital blood products, O-positive whole blood (WB) is of particular interest relative to component therapy, such as packed red blood cells (PRBC). In trauma indications, WB has been associated with approximately 48% reduction in mortality compared to component therapy.[13] Civilian air medical interest also derives from military data showing lower early mortality,[14,15] and fewer total units needed when using WB.[15] In acute settings where crossmatching is impractical, WB has been linked to improved survival and reduced subsequent product utilization.[8,16]

Air medical transport often moves patients from rural facilities over long distances to tertiary centers when ground options are limited. Transport teams often may be the sole source of blood and typically carry a single product type due to storage constraints. Programs therefore rely on low-titer O-positive WB to minimize plasma incompatibility and accommodate a restricted donor pool. WB has a shorter

shelf life than PRBC but can be spun into PRBC at 14 days to limit waste; units are typically 450–500 mL and contain plasma, clotting factors, and red blood cells, with the benefit of a single storage mode.[17] Among females of child-bearing potential, use of low-titer O-positive WB raises concern for Rh alloimmunization and possible effects on future pregnancy.[11]

This study aims to describe the first five years of experience in using WB in a hospital-based air medical transport program. This program was limited to the use of low-titer type O-positive WB due to storage constraints and the limited availability of low-titer type O-negative WB. The study site is a Level 1 Trauma Center with a large catchment area and a major referral facility for the region. The air ambulance program, based out of southeastern South Dakota, services a multi-state region throughout the Midwestern U.S. The objective of this study was to compare patient characteristics and early outcomes between air medical transport patients receiving low-titer type O-positive WB and those receiving PRBC, with particular attention to the use of whole blood in Rh-negative women of child-bearing potential.

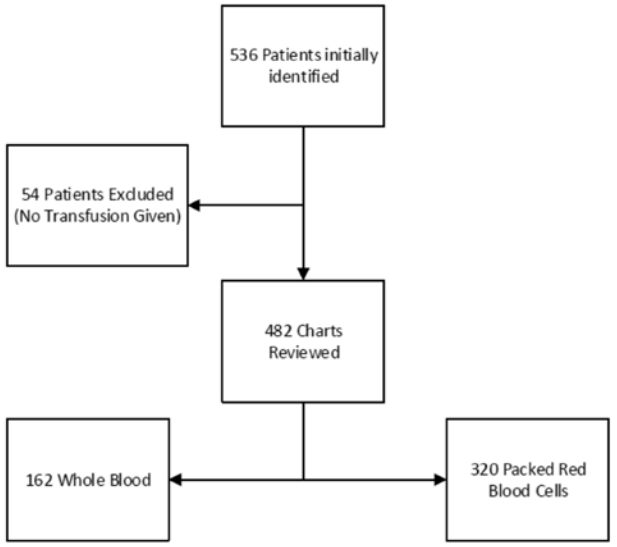
Methods

This study retrospectively reviewed air-transported patients who received blood products between October 1, 2019, and October 1, 2024. Dates were identified from air medical transport records (ImageTrend, Inc., 2024, Lakeville, MN), and Epic Hyperspace, 2024, Madison, WI), using the search, "blood product administered." Three investigators independently abstracted data on demographics, transfusion details, and outcomes. Any discrepancies were adjudicated by the lead author and resolved by consensus. Categorical variables were compared with chi-squared testing and age distribution with the Mann–Whitney U test, with significance set at $p<0.05$. Further analyses were stratified by trauma vs non-trauma indication.

Results

On initial search, 536 patients were identified; however, 54 were found to not have received any blood products and were excluded (Figure 1). The remaining 482 charts were reviewed. Categorical data are shown in the tables; no significant categorical differences were observed between WB and PRBC recipients. The PRBC and WB groups were demographically similar by sex ($p=0.615$), age ($p=0.726$), and race ($p=0.873$) (Table 1). Rh status also did not differ significantly ($p=0.251$); in the WB cohort, 9 patients (5.56%) were Rh-negative and 17 (10.49%) had unknown Rh status

Figure 1. Case selection flowchart.



(Table 2). Out of the Rh-negative patients, 6 were females under the age of 50.

WB volumes administered in transport exceeded PRBC (450 mL vs 250 mL; $p<0.0001$), though total in-hospital transfusion volumes post-transport were not collected. When additional products were required during transport, patients tended to receive the same product type as initially administered ($p<0.001$), whereas post-arrival hospital product type administration did not significantly differ between groups ($p=0.971$) (Table 2).

Transfusion indications differed significantly ($p<0.001$), as trauma was more common in the WB group (43.83% WB vs 15.31% PRBC), whereas GI bleed (52.19% PRBC vs 34.57% WB) and anemia (18.13% PRBC vs 8.02% WB) were more common in the PRBC group (Table 3). Overall, GI bleed was the most frequent indication (46.27%), followed by trauma (24.9%), and anemia (14.73%). However, for non-trauma indications, the choice of blood product appears less distinct with no significant differences between the WB and PRBC groups ($p=0.086$). The WB group showed higher mortality across all time points and disposition categories (Table 4). No transfusion-related complications were recorded.

Discussion

One of the concerns with using WB was the administration of O+ blood to Rh-negative patients of child-bearing potential. Among six Rh-negative females under 50, two received WB, and of these, one received Rho(D) immunoglobulin, consistent with prior reports.[11] One patient who received

Table 1. Demographics.

	All patients		PRBC		WB		
	n	%	n	%	n	%	p value
	482		320		162		
Sex							0.615
Male	269	55.81	176	55	93	57.41	
Female	213	44.19	144	45	69	42.59	
Age*							0.726
Min	0		0		0		
Max	96		96		95		
Median	61		64		53.5		
Race							0.873
Caucasian	320	66.39	213	66.56	107	66.05	
Black	7	1.45	5	1.56	2	1.23	
Asian	6	1.24	5	1.56	1	0.62	
American Indian	105	21.78	67	20.94	38	23.46	
Other	44	9.13	30	9.38	14	8.64	

*Mann-Whitney U Test (Z = -0.352)

Table 2. Blood product administration.

	All patients		PRBC		WB		
	n	%	n	%	n	%	p value
Patient blood type							0.642
O	220	45.64	146	45.63	74	45.68	
A	173	35.89	114	35.63	59	36.42	
B	35	7.26	27	8.44	8	4.94	
AB	10	2.07	6	1.88	4	2.47	
Not available	44	9.13	27	8.44	17	10.49	
Rh status							0.251
Positive	398	82.57	262	81.88	136	83.95	
Negative	40	8.30	31	9.69	9	5.56	
Not available	44	9.13	27	8.44	17	10.49	
Immunoglobulin administered							0.14
Yes	4	0.83	1	0.31	3	1.85	
No	435	90.25	293	91.56	142	87.65	
Not available	43	8.92	26	8.13	17	10.49	
Volume of blood administered (mL)							<0.0001
Min	50		50		50		
Max	1400		1400		1400		
Median	310		250		450		
Further blood during transport							<0.001
Yes - PRBC	77	15.98	66	20.63	11	6.79	
Yes - WB	73	15.14	26	8.13	47	29.01	
No	332	68.88	228	71.25	104	64.20	
Additional blood products at hospital							0.971
Yes	293	60.79	194	60.63	99	61.11	
No	128	26.56	86	26.88	42	25.93	
No information	61	12.66	40	12.5	21	12.96	

Chi-Square testing performed for all variables.

Table 3. Indication for transfusion.

	All patients		PRBC		WB		
	n	%	n	%	n	%	p value
Indication							<0.001
Trauma	120	24.90	49	15.31	71	43.83	
Gastrointestinal bleed	223	46.27	167	52.19	56	34.57	
Anemia	71	14.73	58	18.13	13	8.02	
Obstetrics/gynecology	22	4.56	12	3.75	10	6.17	
Other	46	9.54	34	10.63	12	7.41	
Non-trauma indication							0.086
GI bleed	223	61.60	167	61.62	56	61.54	
Anemia	71	19.61	58	21.40	13	14.28	
OB/GYN	22	6.08	12	4.43	10	10.99	
Other	46	12.71	34	12.55	12	13.19	
Non-trauma total	362		271		91		

Chi-Square testing performed for all variables.

Table 4. Mortality.

	All patients		PRBC		WB		
	n	%	n	%	n	%	p value
Alive at hospital arrival							0.0329
Yes	475	98.55	318	99.38	157	96.91	
No	7	1.45	2	0.63	5	3.09	
Alive at six hours							0.0005
Yes	448	92.95	307	95.94	140	86.42	
No	19	3.94	8	2.5	11	6.79	
No information	15	3.11	5	1.56	11	6.79	
Alive at 24 hours							0.0001
Yes	432	89.63	300	93.75	132	81.48	
No	35	7.26	15	4.69	20	12.35	
No information	15	3.11	5	1.56	10	6.17	
Disposition							0.0004
Discharged from ED	5	1.04	3	0.94	2	1.23	
Deceased after admission	66	13.68	34	10.63	32	19.75	
Survival to discharge	393	81.54	277	86.56	116	71.6	
No information	18	3.73	6	1.88	12	7.41	

	Trauma		Non-trauma		
	n	%	n	%	p value
Disposition mortality					0.023
Discharged from ED	1	0.83	3	0.83	
Survival to discharge	87	72.5	306	84.53	
Deceased	24	20	43	11.88	
No information	8	6.67	10	2.76	

Chi-Square testing performed for all variables.

PRBC also received Rho(D) immunoglobulin but was later found to be Rh positive, and the indication was unclear. These 6 female patients account for 1.24% of all transfused patients in the first 5 years. This risk is considered acceptable when WB is administered to all patients in the referral area. When possible, Rh-matched blood should be provided to women of child-bearing potential; however, it is often not feasible for transport services to carry more than one blood product.[2]

The difference in median volume administration for WB and PRBC is consistent with standard unit sizes (Table 2). When patients received additional blood products during transport, they were more likely to receive the same type of product as initially administered. This could be attributed to the availability of products during transport, as multiple units of PRBC are often released with patients for transport, whereas transports for patients who received WB were less likely to have PRBC available. Patients who received WB were more likely to receive additional blood during transport compared to those receiving PRBC, however, there was no significant difference in hospital blood product administration after arrival between patients who received WB or PRBC (Table 2).

WB was used disproportionately for trauma, and PRBC less than predicted for trauma indications. After removing trauma indications, WB vs PRBC administration did not differ significantly, likely due to similar clinical needs or protocols. This suggests that the overwhelming use of WB in trauma scenarios skews the difference in transfusion indication for WB and PRBC. Literature-supported trauma protocols, structured decision-making for trauma transports, less consideration of Rh status in trauma settings, and product availability may drive WB use in trauma. When responding to trauma, there is a chance that air transport will be the first provider on site, and WB is the only product available.

The increase in WB group mortality likely reflects its greater use in trauma cases (Table 4). Although few deaths at hospital arrival limit inference at that time point, the 6- and 24-hour trends are robust, supporting that WB was given to more critical patients rather than indicating product-related harm. Given limited research and the absence of significant differences between WB and PRBC in non-trauma settings, transfusion decisions likely reflect protocols and product availability rather than demonstrated superiority. Further research is also required to investigate the use of WB in non-trauma patients. Larger, adequately powered studies with comprehensive outcome measures are needed to refine non-trauma indications for WB and to assess long-term safety in populations at risk for alloimmunization.

Limitations

The retrospective design introduces several limitations. Missing data (e.g., Rh status) for some patients may affect the validity of conclusions, and outcomes for multiple patients were unavailable due to transport to out-of-system hospitals. The analysis does not adjust for confounders, such as pre-existing comorbidities, anticoagulation, injury severity scores, or total in-hospital blood product administration, that could influence outcomes. The small sample of Rh-negative females of child-bearing potential limits the generalizability of safety findings in this subgroup. Finally, results from a single Level 1 Trauma Center with a large rural catchment area may not reflect practices or outcomes in other settings.

Conclusion

This study highlights the logistics and benefits of using WB in a hospital-based air medical transport program. WB transfusion offers significant advantages, particularly for indications of trauma. The risk of Rh alloimmunization in Rh-negative females of child-bearing potential appears minimal, suggesting that the benefits of emergent WB transfusion outweigh potential risks in critical situations, especially in rural settings where medical transport units may be the primary source of blood products. Expanding research in this area will help optimize prehospital transfusion programs and patient outcomes across diverse clinical scenarios and patient populations.

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Clostridium innocuum Bacteremia: Case Report and Systematic Review

Carla de Matos-Konrad, MD; Nneka Chima, MD, MPH; and Mark K. Huntington, MD, PhD

Abstract

Clostridium innocuum is an anaerobic gram-positive spore-forming bacteria, a commensal member of the human gut microbiome. We encountered a case of bacteremia with this organism as a complication of a foot ulcer in a middle-aged patient with diabetes, end-stage renal disease, and malnutrition. A systematic review of the limited number of previously reported cases of *C. innocuum* bacteremia is presented, along with a brief narrative review the organism's association with other diseases, ranging from diarrhea and local infections to modulating inflammatory bowel disease and kidney disease.

Introduction

Clostridium innocuum is an anerobic gram-positive spore-forming bacteria. It is a commensal member of the human gut microbiome. Clinical infections are uncommon. We present here a case of bacteremia in an immunocompromised patient.

Case Presentation

A 54-year-old female presented with worsening of a chronic right foot wound. Her history is significant for type 2 diabetes mellitus (insulin-requiring, complicated by severe neuropathy), prior myocardial infarction, recurrent diabetic foot ulcers (with prior toe amputations on the left foot), end-stage renal disease (ESRD) on hemodialysis, hypertension, hyperlipidemia, more than 200 pack-year smoking history, and malnutrition. In spite of frequent antibiotic use, she never experienced *Closteroides difficile* colitis.

The wound had been present for approximately one month, with onset of drainage at the beginning of the month. She was initially seen in clinic, where inpatient admission was recommended. She declined admission and was prescribed a one-week course of doxycycline 100 mg orally twice daily plus a total of three doses of amoxicillin-clavulanate 250mg-125 mg orally after dialysis, which was on alternating days. Despite treatment, the wound continued to drain and progressively worsened.

On the day of admission, the patient returned to clinic reporting increased drainage from the right foot. For her previous foot ulcers, the patient had been prescribed a controlled ankle movement boot for off-loading but admitted to noncompliance. She reported no abdominal pain, nausea, or diarrhea, but was experiencing ongoing chills (she did not measure her temperature), malaise, and increased foot pain. For the latter, her use of as-needed hydrocodone-acetaminophen (5-325 mg) was increasing.

Examination showed she was alert, in no acute distress, afebrile, not toxic appearing or diaphoretic, but malnourished. Her heart sounds were normal with no murmurs and pulmonary exam was normal. Her left foot had previously amputated great and fifth toes and her right foot had prior amputation of the second and fourth digits to the distal metatarsals. The right foot also demonstrated a 2 cm necrotic, dark-colored ulcer on the plantar surface of the forefoot at the level of the metatarsal heads medially, with surrounding ecchymosis and a central wound draining yellow purulent material. No peripheral edema was noted. There was a concerning probe-to-bone finding, raising the possibility of underlying osteomyelitis. After counseling, she agreed to proceed to the hospital for admission.

In the emergency department, laboratory evaluation revealed no leukocytosis. C-reactive protein was elevated at 7.5 mg/mL. Hemoglobin was 10.3 g/dL (her chronic baseline was 9.9 g/dL), with mildly decreased platelets. Renal function tests were consistent with her ESRD. MRI of the right foot showed no evidence of acute osteomyelitis or abscess. MRI is >90% sensitive at detecting osteomyelitis, so the less-sensitive deep wound cultures were not obtained;[1,2] superficial cultures were also forgone, as they offer limited value in antibiotic choice for diabetic foot ulcers.[3] Blood cultures were obtained, she was admitted to the hospital for observation and empirically

received a one-time dose of vancomycin 1500 mg IV and cefepime 2000mg, followed by ciprofloxacin renally dosed at 500 mg PO every 24 hours.

Podiatry was consulted and saw the patient on hospital day 2, following superficial debridement, recommending discharge with oral ciprofloxacin for 10 days; no further surgical intervention was indicated. Throughout her brief stay at the hospital, patient was hemodynamically stable, afebrile. She received hemodialysis and diabetes management with insulin.

Just prior to discharge, blood culture results were reported positive for gram positive rods in one of the two anaerobic bottles. The patient was counseled regarding the significance of bacteremia and the need for ongoing inpatient monitoring; however, she elected to leave against medical advice prior to final culture results. The final culture grew *Clostridium innocuum.* She was subsequently contacted with the results and oral metronidazole 500 mg daily for 10 days was added. At the attending physician's request, the laboratory confirmed the identification by polymerase chain reaction. While the culture technology employed by the hospital laboratory is accurate enough to direct clinical treatment, molecular techniques are more specific in confirming the organism in this unusual presentation.

Two days after she left the hospital against medical advice, she was contacted to verify how she was doing. She stated she was overall feeling well. She had not picked up the prescription. She was again advised to pick up medication, educated on side effects and a subsequent clinic appointment was scheduled. She did pick up the metronidazole three days later; she did not attend the clinic visit, but continued to attend her scheduled dialysis sessions. During dialysis, she did not report any new concerns. No further documentation regarding the lower extremity wound was made during these sessions.

Discussion

Clostridium innocuum is an anerobic gram-positive spore-forming bacteria. Originally describe in 1962, its lack of virulence compared to C. *difficile* and C. *perfringens* prompted its species name, derived from "innocuous".[4] Ironically, C. *innocuum* infection has a higher inpatient mortality that C. *perfringens, C. septicum, and* C. *sordellii* in one small study.[5] Its taxonomical classification has been challenged in recent years, citing 5S rRNA similarities to mycoplasma and lipid composition similarities to *Streptococcus* and *Lactobacillus,* with some taxonomist suggesting an entirely new phylogenetic family.[6]

A search of PubMed using the term "Clostridium innocuum" yielded 163 citations; filtering these results to "human", this decreased to 87. Adding the term "bacteremia" resulted in a total of 6 publications, including both case reports and case series.[5,7-11]

Although not a common clinically isolated species of *Clostridium*, resistance to penicillins, cephalosporins, and vancomycin is typically seen.[12] There have been emerging reports attributing to it antibiotic-associated diarrhea, yet it is more commonly isolated from asymptomatic individuals than those with suspected antibiotic-associated diarrhea.[13,14] Interestingly, the organism appears to facilitate *healing* in Crohn's disease, but its presence is associated with *worse* outcomes in ulcerative colitis.[15,16] As a commensal inhabitant of the human gastrointestinal tract, it has been included in a number of studies of the gut microbiome's effects on a wide variety of medical conditions.[17]

More significant than its potential gastrointestinal pathology, though still historically rare, C. *innocuum* has been reported in extraintestinal infections such as bacteremia – including polymicrobial bacteremia, endocarditis, osteomyelitis, peritonitis, biliary tract infection, skin and soft tissue infections, genital infections, and necrotizing fasciitis.[12,18,19] These are generally encountered in the context of compromised hosts, with comorbidities including chronic hepatitis C, post-transplant, AIDS, leukemia and other malignancies, diabetes, and Takayasu arteritis.[11,19-21] In at least some cases, C. *innocuum* bacteremia has developed following oral vancomycin treatment of C. *difficile* colitis.[9,10] C. *innocuum* bacteremia may be isolated, or part of polymicrobial bacteremia, with a sight preponderance of the latter in one study.[11] Mortality of extraintestinal infection by this organism is 30%, though a portion of this may be attributable to the underlying comorbidities rather than directly to the infection.[12]

In our case, the patient had several comorbidities which contributed to an immunocompromised status, increasing her risk for C. *innocuum* infection: poorly-controlled type 2 diabetes, malnutrition, and end-stage renal disease on dialysis.

How the bloodstream infection was acquired remains enigmatic. It is conceivable that the patient's poor nutritional status have compromised integrity of the intestinal lining allowing the organisms to enter the blood stream from the environment in which it is a commensal organism.

An intestinal source is most common in bacteremia cases where the source is identified.[8] Another possibility is fecal contamination of her chronic diabetic foot ulcers, with the vancomycin treatment facilitating the C. *innocuum* proliferation with diminished competition from other pathogens or skin flora in the wound. Skin as a source has also been reported.[8] Culture of the diabetic ulcer in our patient was not obtained during this hospitalization, so this cannot be confirmed.

A strength of this report is the use of molecular methods for the identification of the pathogen. This ensures great confidence in the identification of the organism; more commonly used clinical identifications have a higher rate of misidentification.[12] A limitation of our report is that our literature search included only PubMed; other relevant literature not indexed by PubMed, and reports in the gray literature, may have been missed by this search strategy.

Conclusion

Clostridium innocuum, though uncommon, is a potential emerging infection; most commonly seen in patients with immunocompromising comorbidities. Bacteremia by this organism is significant due to its resistance to many first-line antibiotics used for bloodstream infections.

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Concordance Between Radiologist and AI-based Volumetric Breast Density Assessments: Clinical and Economic Implications – A Retrospective Cohort Study

Jacob R. Devine, MD; Alexander DM Withrow, MS IV; and Sabina Choudhry, MD

Abstract

Background: Radiologists classify breast density using the Breast Imaging Reporting and Data System (BI-RADS) as required by the 2024 Mammography Quality Standards Act (MQSA), which mandates disclosure of breast density in all mammography reports. FDA-approved AI software now provides objective, reproducible breast density assessments to improve workflow and guide supplemental screening. This study examines concordance between AI-based systems (Volumetric density measurement by Volpara/Lunit) and radiologist assessments and explores potential clinical and economic implications.

Materials and Methods: A retrospective cohort study with IRB approval was conducted at Avera Health using 54,819 mammograms between February 2024 and June 2025. Radiologists assessed breast density with the option to override AI-generated assessments. Density classifications were compared and categorized as "agreement" or "substantial change." Effects on Tyrer-Cuzick (TC) lifetime risk scores, patient referrals, and prospective healthcare costs were analyzed.

Results: Overall, AI and radiologist assessments had agreement rates of 92–97% for BI-RADS B and C and 85–90% for A and D. Most discrepancies involved BI-RADS B and C categories, leading to misclassification of breast density and potential repercussions for patient care. Overestimation resulted in unnecessary procedures, radiation, costs, and anxiety, while underestimation risked delayed detection of aggressive cancers.

Conclusion: Current AI software demonstrates concordance with radiologist assessments, though notable variability persists at critical diagnostic thresholds. Utilizing standardized protocols, periodic AI model updates, and radiologist oversight are crucial to minimizing misclassification, enhancing workflow efficiency, optimizing patient outcomes, and fostering trust in AI-assisted breast imaging.

Introduction

Breast density is a critical component of breast cancer risk assessment and detection sensitivity. Women with dense breasts categorized as BI-RADS C and D experience reduced cancer detection sensitivity and increased relative risk of 1.4–1.5 due to tissue masking effects.[1,2] In September 2024, the MQSA mandated standardized breast density reporting and all mammography reports.[3]

Radiologists assess breast density subjectively using BI-RADS categories, with variability between radiologist interpretations remaining prevalent.[4,5] FDA–approved AI-based volumetric tools provide objective, reproducible breast density assessments. Despite this, concerns remain regarding their reliability and concordance with radiologists' assessments.[6-8]

This study examines concordance between AI–based and radiologist breast density classifications at Avera Health and discusses clinical and economic implications of misclassification.

Materials and Methods

This retrospective cohort study with IRB approval was conducted at Avera Health under HIPAA compliance. Data were obtained from the Avera Health and Volpara Health databases and included mammograms performed between February 26, 2024, and June 28, 2025. A total of 63,296 mammograms had density data available. Of the 63,293 mammograms available, 95% were identified to have a final BI-RADS density recorded, resulting in 54,819 mammograms

considered for analysis in this study. Mammograms were obtained primarily via 3D tomosynthesis, and 90% of mammograms with a final BI-RADS density were screening studies. Radiologists independently assigned BI-RADS breast density grades while being aware of the AI-generated density scores. Their assessments were then compared with the AI-based volumetric results, with radiologists retaining authority to override AI classifications. Within the study, 35 Radiologists determined the BI-RADS breast density grade.

For comparative analyses, breast density grading was categorized into two groups: agreement, which represented concordant AI and radiologist classifications, and substantial change, which was defined as a shift between nondense (A, B) and dense (C, D) categories, and discordance between AI and radiologist classifications. Further analysis was conducted to determine the impact of imaging quality on agreement rates, categorizing images as Perfect, Good, Moderate, or Inadequate.

Agreement rates were calculated, and discordant cases were examined for their impact on Tyrer-Cuzick (TC) lifetime risk scores, which estimate a woman's risk of developing breast cancer by integrating breast density with established factors including family history, reproductive history, BMI, prior breast biopsies, and genetic background, to evaluate potential differences in high-risk clinic referrals. Downstream healthcare costs from over- or underestimation of density were estimated using Medicare reimbursement rates.

Results

The cohort represents a diverse population, characterized by variation in age, breast density distribution, and clinical risk factors. Approximately 30% of patients were categorized as BI-RADS C or D by either radiologist or AI assessments. Study agreement rates vary considerably between radiologists, from 99.7% to 64.6%. Across 35 radiologists, 9 displayed agreement rates less than 90%, while 18 displayed agreement rates above 95%.

Overall concordance between radiologist and AI–based volumetric assessments was 92-97% for B and C grades, and 85-90% for A and D, suggesting strong agreement for a majority of cases (Fig. 1). It was determined that concordance declined for categories A and D due to a tendency for the AI software to over-classify dense breast tissue. However, most disagreements involved transitioning between BI-RADS B and C, as 87% of AI-designated B grades were upgraded to C by radiologists, and 86% of AI-designated C grades were downgraded to B by radiologists (Fig. 2).

Figure 1. Confusion matrix of BI-RADS density classification from 54,819 mammograms, demonstrating the highest agreement rates for B (97%) and C (95%) grades and comparatively lower agreement rates for A (89%) and D (90%) grades.

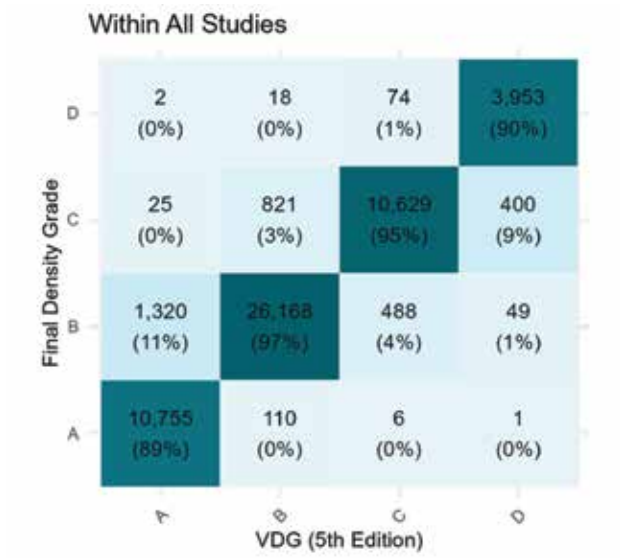
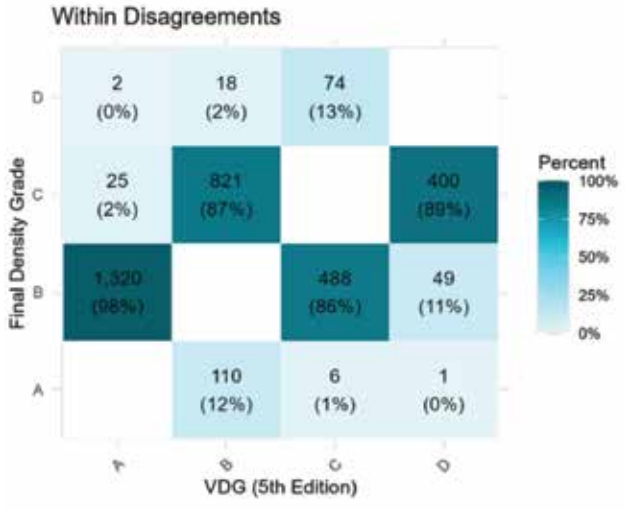


Figure 2. Confusion matrix of BI-RADS density classifications disagreements, depicting 87% of AI-based B grades were reclassified as C by radiologists, and 86% of AI-based C grades were reclassified as B by radiologists.



Agreement rates were shown to be affected by positioning score, with a general decrease in agreement rates being seen with a decreasing positioning score (Fig. 3). With >99% studies having a positioning score of Good or Moderate, over 6% did not agree, indicating that poor positioning may contribute to a potential inconsistency when evaluating breast density grading. Reclassification significantly altered the TC lifetime risk estimate, affecting patient referrals to high-risk

Figure 3. Table demonstrating agreement rates using AI-based scores on overall positioning using the Perfect, Good, Moderate, and Inadequate scale.

PGMI	Agree	Disagree	Agreement Rate (%)	Total Studies
P	326	15	95.6	341
G	23,939	1,506	94.1	25,445
M	26,565	1,736	93.9	28,301
I	159	13	92.4	172

clinics. Patient care was also implicated as overestimation of breast density resulted in increased supplemental screenings and unnecessary biopsies and procedures, unnecessary cost, and reduced trust for patients.

Model data suggests that discordant density assessments could increase annual costs, primarily due to unnecessary serial imaging and biopsies. Improved concordance between AI and radiologist assessments, particularly between the B and C categories, could reduce costs for supplemental imaging and downstream treatment, while maintaining early detection benefits.

Discussion

This study demonstrates generally high concordance between AI and radiologist breast density assessments, but notable variability persists at the threshold for BI-RADS B and C. These categories are clinically significant, as BI-RADS C or higher classification and the TC score together guide referrals for supplemental screening, high-risk clinics, and preventive interventions among women with a lifetime risk greater than 20%.[9] Therefore, misclassification remains prevalent, with issues arising from both overestimation and underestimation.

Overestimation of density carries clinical and economic consequences, including increased procedures, biopsies, radiation exposure, and healthcare costs.[10-12] This overestimation contributes significantly to healthcare spending, as diagnostic workup for false-positive findings from screening mammography alone accounts for an estimated $1 billion annually for payers such as Medicare in the US, and supplemental screening further increases these costs.[13]

Underestimation risks delayed detection of aggressive cancers and adverse outcomes.[14,15] These clinical implications are further reflected in economic analyses, as cost-effectiveness modeling demonstrates that density-stratified screening is optimal, with annual screening for women with dense breasts yielding an incremental cost-effectiveness ratio of $36,200 per QALY compared to biennial screening, but misclassification undermines these benefits.[16] Ultimately, these risks underscore the consequences of discordance between AI and radiologists, particularly in terms of healthcare costs, patient trust, and cancer detection.

AI tools provide objective and reproducible assessments, but their effectiveness is limited by several factors, including the training data used to develop the software, their generalizability across populations, and their ability to incorporate clinical context into the overall assessment.[17-19] These limitations reinforce the need for radiologist oversight to ensure each breast density classification is interpreted with consideration of the patient's history and risk.

Furthermore, implementation of standardized protocols aimed at minimizing discordance between AI and radiologists could reduce variability and enhance patient trust.[20,21] Establishing such protocols could improve workflow and maintain diagnostic accuracy, while staying in compliance with MQSA requirements.

By balancing these clinical, economic, and workflow considerations, further integration of AI into breast density grading assessments may contribute to a more sustainable and patient-centered approach for breast imaging in the future.

Conclusion

The study highlights the clinical relevance of accurate breast density assessments and the potential for AI–based volumetric tools to enhance diagnostic accuracy and radiologist workflow. By improving concordance with radiologist grading assessments, integrating AI software may decrease unnecessary interventions and healthcare costs, while optimizing an innovative approach to patient-centered care.

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A Rare Case of Squamous Cell Carcinoma of the Colon

Michael Roberts, MD; Tate Blankespoor, MD; Hareem Tahir, MD; Rafia Irfan Waheed, MD, and Mamoon Ahmed, MD

Abstract

Squamous cell carcinoma (SCC) of the colon is a rare malignancy. Unlike colonic adenocarcinomas, it lacks defined risk factors or established treatment guidelines. We describe a case of metastatic squamous cell carcinoma of the colon in a 77-year-old male with ulcerative colitis. The patient presented with abdominal pain and had labs that revealed transaminitis with conjugated hyperbilirubinemia. Imaging showed a large irregular mixed hyperechoic mass with fluid collection in the liver along with retroperitoneal lymphadenopathy concerning infection/abscess or malignancy. This was initially treated as an infection with broad-spectrum antibiotics and drain placement, but it failed to improve. Biopsy of the liver revealed carcinoma with squamous cell differentiation. In order to look for the primary site, the patient underwent a colonoscopy and esophagogastroduodenoscopy (EGD). EGD was negative, and colonoscopy revealed a mass at the hepatic flexure of the colon with pathology consistent with SCC. PET scan did not reveal any other sites suspicious for primary malignancy. Tempus tumor of origin testing was inconclusive. Hence, colon was thought to be the primary site for SCC with direct extension to the liver. Unlike colonic adenocarcinoma, colonic SCC lacks standardized treatment guidelines. Prognosis is also worse, especially in advanced stages. Surgical resection is preferred for localized disease, but evidence supporting systemic therapy is limited to case reports. The patient was not a surgical candidate and was initiated on FOLFOX (folinic acid, fluorouracil, and oxaliplatin) chemotherapy. This case overall highlights a rare case of colonic SCC and the need for more evidence to guide treatment.

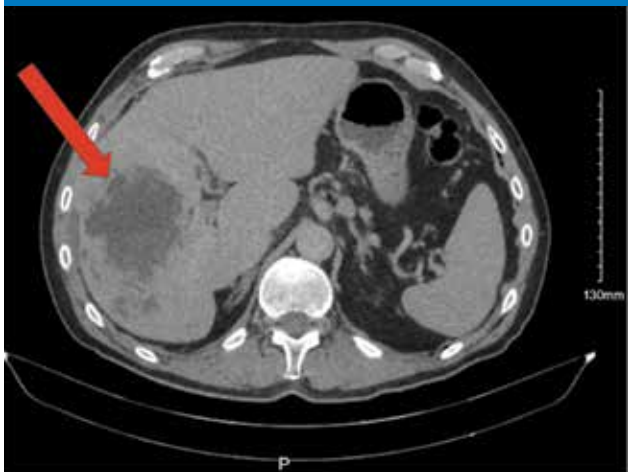
Introduction

Among all colorectal cancers, the incidence of squamous cell carcinoma (SCC) in the colon is estimated to be between 0.25% and 0.85%, making SCC a rare malignancy.[1] Within SCC, malignancy most commonly occurs in the rectum (70%).[2] Clinical presentation often includes abdominal pain, gastrointestinal bleeding, nausea, vomiting, and weight loss.[2] Since there have been limited number of reported cases, the pathogenesis of this disease is still unknown.[3] Prognosis of this malignancy is thought to be worse than adenocarcinoma of the colon.[4] Treatment of SCC of the colon includes surgical resection with or without chemotherapy and radiation; however, guidelines and consensus continues to be absent due to the rarity of the disease.[4] Here, we present a case of metastatic SCC of the colon in a 77-year-old male.

Case Presentation

The patient, a 77-year-old male with a past medical history of ulcerative colitis and chronic transaminitis, presented to his primary care provider (PCP) for concerns of "intermitted right lower rib pain over a few months that worsened with deep breaths." He denied experiencing any fevers, nausea, vomiting, and diarrhea. However, he reported night sweats, a loss of 10-15 pounds, and a persistent productive cough in the last few months. Physical examination was negative for abdominal tenderness in all quadrants. Initial workup included a right upper quadrant ultrasound, CT abdomen and pelvis with contrast, a complete blood count (CBC), and comprehensive metabolic panel (CMP). Ultrasound showed a 10.6 cm irregular mixed hyperechoic and fluid collection in the right hepatic lobe. CT of the liver showed a large heterogeneous mass in the right inferior liver that was poorly defined, measured 11.2 cm and is concerning for malignancy. This is seen in Figure 1. The adjacent hepatic flexure of the colon also demonstrated wall thickening and enhancement with loss of fat plane between the colon and liver. Multiple lymph node enlargement with mass effect and possible invasion of the superior mesenteric artery and left renal vein was also seen. CBC returned with an elevated white blood cell count (WBC) of 11.9 $x10^9$/L (baseline 4 - 11 x 10^9/L) and elevated absolute neutrophil count of 7.82 $x10^9$/L (baseline 2.5 - 7.7 x 10^9/L). CMP showed elevated creatinine of 1.4 mg/dL (baseline 0.74 – 1.35 mg/dL), elevated total bilirubin of 1.3 mg/dL (baseline 0.1 – 1.2 mg/dL), and elevated aspartate aminotransferase (AST) of 67 U/L (baseline 8 – 53 U/L), alanine aminotransferase (ALT)

Figure 1. Triphasic CT of the liver. Large heterogenous mass in the right interior liver that is poorly defined, measuring at least 11.2 cm, and concerning for malignancy.

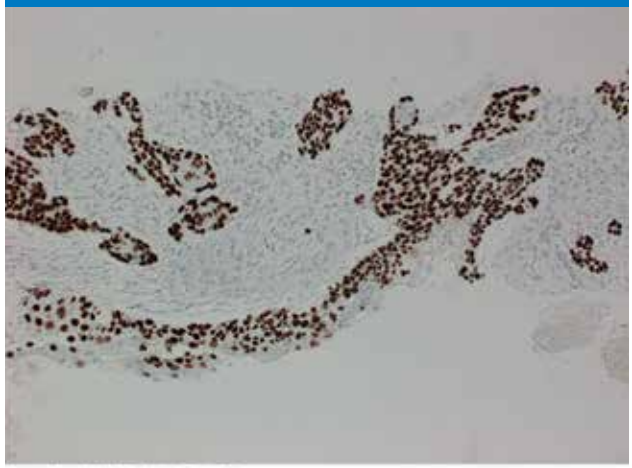


of 74 U/L (baseline 4 – 56 U/L), and alkaline phosphatase of 584 U/L (baseline 44 – 147 U/L). His C-reactive protein was also elevated at 4.9 mg/dL (baseline < 0.5 mg/dL). Based on these findings, differential diagnoses included an abscess versus a tumor. Interventional Radiology (IR) was consulted who recommended admission for empiric IV antibiotics for potential liver abscess (ciprofloxacin and metronidazole) prior to CT-guided liver biopsy. He was transferred and admitted to the hospital. Antibiotics were continued for 24 hours with plans for liver biopsy, and Infectious Disease (ID), IR, Medical Oncology and Hepatology teams were consulted.

The hepatology team reported a concern for malignancy and obtained further workup that showed carcinoembryonic antigen elevated at 47.6 ng/mL (baseline 0 – 3 ng/mL), carbohydrate antigen 19-9 elevated at 121 units/mL (baseline 0 – 37 units/mL), and alpha fetoprotein that was within normal limits. Hepatitis B surface antibody, core total antibody, and hepatitis C antibody were all negative. The patient was noted to have declined a recommended liver biopsy by his hepatologist about five years ago for his chronic transaminitis. The oncology team agreed with a high concern for malignancy and recommended drainage and biopsy. The ID team discontinued ciprofloxacin and metronidazole and started IV piperacillin–tazobactam. The patient underwent biopsy of right liver lobe lesion and drainage by IR. Although pathology and cultures from the biopsy were pending, the patient was discharged with plans for outpatient follow-up.

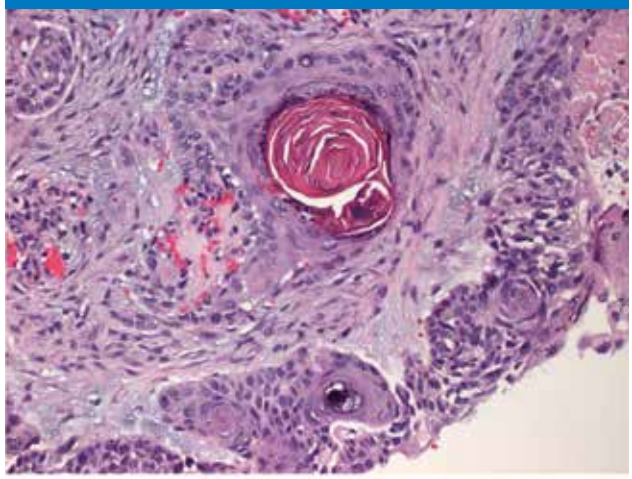
The patient presented to his PCP 5 days later with concerns of "feeling warm, lightheaded, and increasing jaundice." His drain was noted to produce about 240 cc per day. He continued to report pain along the right lower rib cage and was prescribed hydrocodone for pain management. His total bilirubin continued to be elevated at 5 mg/dL. Biopsy pathology had returned positive for squamous carcinoma of uncertain origin. Figure 2 and 3 highlights the histology of the liver biopsy. Fluid culture was found to be non-infectious. He was scheduled to start chemotherapy in a few weeks (consideration for a modified FOLFOX regimen (folinic acid, fluorouracil, and oxaliplatin), gemcitabine and cisplatin therapies). Genomic sequencing of the biopsy (through Tempus) showed a tumor with microsatellite stability, low tumor mutational burden, ERBB2 alteration, and PD-L1 expression with a combined positive score of 1.

Figure 2. An immunoperoxidase stain for p40 highlights the malignant cells, supportive of squamous differentiation.



Picture obtained with help of Dr. Erin Quist, MD

Figure 3. Liver parenchyma invaded by malignant squamous cells with keratin pearl formation, morphologically similar to those seen in the colonic biopsies. (20X).



Picture obtained with help of Dr. Erin Quist, MD

Around 20 days later (prior to chemotherapy), the patient presented to the emergency department by instruction of his oncologist for an elevated bilirubin of 14.2 mg/dL. He was noted to have elevated WBC at 13.6 x10^9/L, hemoglobin of 10.7 g/dL (baseline 13.5 – 17.5 g/dL) and platelets of 517,000 platelets/microliter (baseline 150,000 – 400,000 platelets/microliter). Elevations of AST at 143 U/L, ALT at 142 U/L and alkaline phosphatase at 464 U/L were seen. The patient denied experiencing any abdominal pain at this time. He was admitted for a positron emission tomography (PET) scan and port placement. Based on the liver function tests, the hospitalist team was concerned for possible obstruction (intrahepatic vs. extrahepatic). The gastroenterology team was consulted for endoscopic retrograde cholangiopancreatography evaluation, and colonoscopy and esophagogastroduodenoscopy to evaluate for possible primary tumor. They did agree that obstruction was likely; however, the tumor was not amenable to stenting as it took up the entire right hepatic lobe. Oncology recommended starting a modified FOLFOX regimen while inpatient. PET scan did not reveal any other sites suspicious for primary malignancy. Biopsy of the gastroesophageal junction showed no signs of malignancy. However, colonoscopy revealed a mass in the hepatic flexure of the colon as seen in Figure 4. Figure 5 and 6 shows the biopsy findings that showed moderate to poorly differentiated squamous cell carcinoma.

Figure 4. Colonoscopy findings that revealed a mass in the hepatic flexure of the colon.

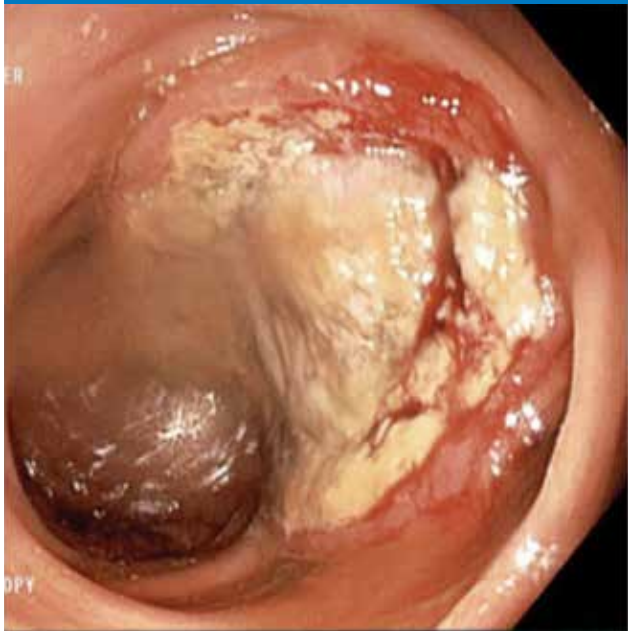
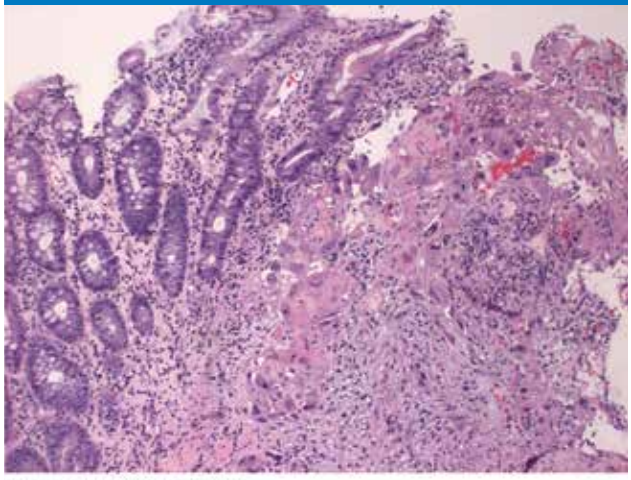
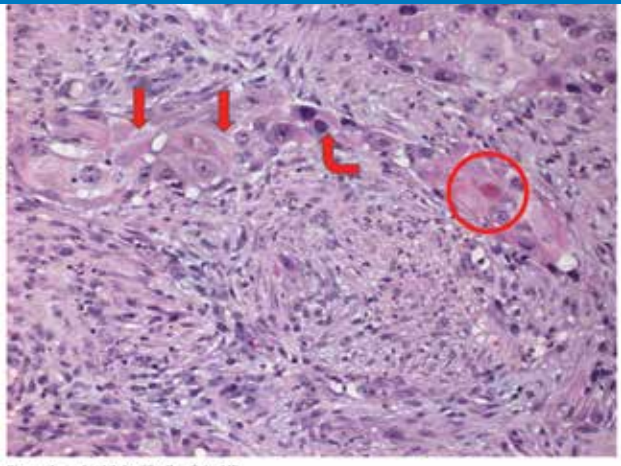


Figure 5. Colonic mucosa involved by malignant squamous cells which infiltrate into the submucosa. There is no evidence of overlying adenomatous dysplasia. (10X).



Picture obtained with help of Dr. Erin Quist, MD

Figure 6. Malignant squamous cells, characterized by enlarged cells with eosinophilic cytoplasm, large irregular nuclei with prominent nucleoli, and intercellular bridges, are seen infiltrating into colonic muscularis propria. The curved arrow represents atypical squamous cells, the down arrow represents intercellular bridges, and the circle shows the keratin pearl formation. (20X).



Picture obtained with help of Dr. Erin Quist, MD

Discussion

SCC of the colon is a rare malignancy that accounts for less than one percent of colon malignancies.[5] Some proposed theories of pathogenesis include infections by pathogens such as human papillomavirus and schistosomiasis, exposure to radiation, and chronic inflammation as a result of inflammatory bowel disease.[5] Some researchers have postulated whether the mutation of somatic genes and stem cells could also play a role.[5] A recent study analyzing ten SCC samples showed a possible role of the PI3K pathway in SCC pathogenesis.[2] Although epidemiological evidence is limited,

there has been a mean age of diagnosis of 56.98 years and a slight female predominance (54.5% vs 45.5% in men) seen.[2]

Patients often present with symptoms of abdominal pain, gastrointestinal bleeding, constipation, diarrhea, and weight loss.[3] Diagnosis of this malignancy is similar to that of colonic adenocarcinoma through a combination of biopsy findings and imaging studies.[5] However, a histological finding by itself cannot be used to make a diagnosis of primary SCC of the colon. Three criteria have been historically used to diagnose primary SCC of the colon. The first is the absence of SCC in another organ that could metastasize to the colon.[3] The second is the absence of a fistula tract of the tumor that is lined with squamous cells.[3] Lastly, there is an absence of SCC of the rectum that extends into the colon.[3]

As mentioned previously, due to its rarity, there is a lack of standardized treatment protocols for SCC of the colon.[5] Thus, treatment regimens used have been derived off of current treatment regimens for adenocarcinomas of the rectum.[5] Surgical management through low abdominal resection or abdominoperineal resection have been used for limited local disease.[5] Following surgical resection, use of chemotherapy and/or radiation has also been examined.[4] Proposed chemotherapy regimens include the use of 5-fluorouracil, cisplatin, and mitomycin-C.[4] Radiation therapy with a dose of 5,400 to 6,000 cGy and targeting the tumor and locoregional lymph nodes has also had reported success.[5] The combination of chemotherapy and radiation has shown the ability to cause complete resolution of the tumor in patients in case reports.[4] Thus, providers could start patients on a chemotherapy and radiation regimen and reserve surgical resection for patients with malignancies that recur or are unresponsive to treatment.[4] The presented patient was started on chemotherapy instead of surgery due to the aggressive nature of the metastatic malignancy that was causing liver failure. Radiation was recommended for the patient; however, due to his eventual decompensation and shift to comfort care, he was unable to undergo radiation therapy. The role of immunotherapy in patients with SCC of the colon is limited at this time. A recent case report showed significant response to a regimen of sintilimab and modified FOLFOX therapy (oxaliplatin, leucovorin, and fluorouracil) in a patient with PD-L1 expression and proficient mismatch repair/microsatellite-stable SCC of the colon.[6] In this case, the presented patient had an ERBB2 mutation and PD-L1 expression; however, immunotherapy was not explored.

Conclusion

Through this case, a presentation of SCC of the colon was examined in a 77-year-old male. Due to its rarity, there is a lack of understanding of SCC of the colon as it relates to pathogenesis and an optimized therapeutic regimen. Currently, surgery is preferred for localized disease. Although use of chemotherapy and radiation is promising, current evidence is limited to case reports. Thus, there is a need for further discussion of cases of SCC of the colon to better characterize this rare malignancy.

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2026 SDSMA Annual Leadership Conference

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Member News

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

Ben Meyerink, MD to Lead SDSMA as New President

Ben Meyerink, MD, of Sioux Falls became the 145th president of the SDSMA on May 29. He first joined the SDSMA in 2014. Prior to joining the association as an actively practicing physician, Dr. Meyerink was a member as a medical student while attending the University of South Dakota Sanford School of Medicine.

Dr. Meyerink is a family medicine physician in Sioux Falls at Avera Medical Group Family Medicine 69th & Cliff. He has been involved in leadership in medicine for several years. Prior to becoming SDSMA president, he held positions on the SDSMA Board of Directors, Policy Council, committees, his local District 7 Medical Society and is a member of the American Medical Association. Dr. Meyerink also volunteers for the SDSMA Doctor of the Day Program at the State Legislature.

In addition to his work with the SDSMA, Dr. Meyerink has been involved in the Academy of Family Physicians at the state and national levels and as a resident was elected by the AAFP body to serve as their national delegate for their own House of Delegates. He also has been active in research and education. During his residency at Mayo Clinic, he presented at national and international research conferences and was part of numerous publications. He also received his department's Resident of the Year and other awards during his time there. Currently, he serves as the University of South Dakota Sanford School of Medicine's director of Advising and Student Success and plays an integral role in the residency match process for all medical students.

Originally from Platte, Dr. Meyerink received his medical degree from USD SSOM and completed his residency training at Mayo Clinic in Rochester. After residency he returned home to South Dakota to practice medicine. He holds a faculty appointment in the Department of Family Medicine at USD SSOM.

Keith Hansen, MD swore in Ben Meyerink, MD.

SDSMA Annual Leadership Conference Highlights

The 2026 SDSMA Annual Leadership Conference and Awards Dinner on Friday, May 29 at The Catlin Downtown Sioux Falls was a success! The day was incredible with excellent presenters on the transformative role lifestyle medicine. Thank you to those who attended and presented! Did you miss the conference? A video is available at sdsma.org.

Michelle Thompson, DO

Allen Weiss, MD

Rob Allison, MD; Allen Weiss, MD; Marty Allison, MD; Michelle Thompson, DO; Amy Prunuske, PhD; South Dakota Secretary of Health Melissa Magstadt; Kathryn Wermers, DNP

2026 Awards - Congratulations to the Recipients!

Awards were presented to recipients at the SDSMA Annual Awards & Scholarship Dinner on May 29.

SDSMA Awards

- 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 **Matthew Simmons, MD** of Rapid City.
- The **Outstanding Young Physician Award** was presented to **Sara Marroquin, MD** of Sioux Falls. 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, or 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 **Amy Lueking, MD** of Pierre.
- 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 **William Dendinger, MD** of Vermillion.
- **Jen Tinguely, MD, MPH** of Sioux Falls is the recipient of 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 the SDSMA.
- **Robert Allison, MD** of Fort Pierre is the recipient of the **Special Presidential Award**. This award is chosen by the SDSMA president to recognize the recipient's contributions to the medical profession.
- **Justin Bell** of Fort Pierre is the recipient of the **Friend of Medicine Award**. As a dedicated lobbyist representing SDSMA, he received this award in recognition of his contributions serving as an effective advocate for health care and the medical profession.

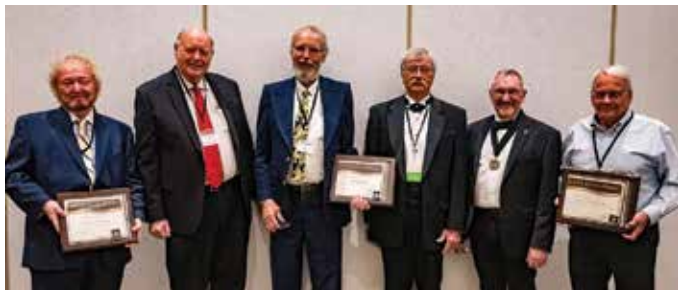
Matt Simmons, MD — Distinguished Service Award, Justin Bell — Friend of Medicine Award; Robert L. Allison, MD — Special Presidential Award; Amy Lueking, MD — Community Service Award; William Dendinger, MD — Young at Heart Award; Sara Marroquin, MD — Outstanding Young Physician Award; Titus Weller, MD — Copic Humanitarian Award. Not pictured: Jen Tinguely, MD, MPH – Past Presidents Award

Copic Humanitarian Award

The **Copic Humanitarian Award** honors a physician for volunteer medical services and contributions to their community. **Titus Weller, MD** of Pierre is the recipient of this year's award. The award recognizes 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. Weller has chosen Avera Foundation – St. Mary's as the donation recipient.

50-Year Awards

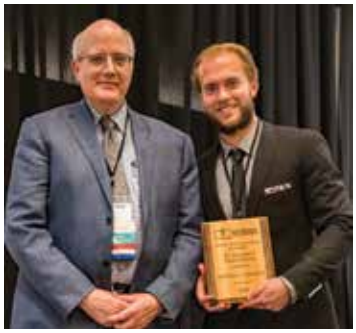
Eleven physicians were recognized with the SDSMA's 50-Year Award. Physicians who received this award are: **Gary Carlson, MD** of Rapid City; **William Dendinger, MD** of Vermillion; **George Nicholas, MD** of Huron; **Eugene Hoxtell, MD** of West Richland, Washington; **Thomas Krafka, MD** of Rapid City; **Gregory Magnuson, MD** of Sioux Falls; **John Malm, MD** of Gregory; **Sam Mortimer, Sr., MD** of Beulah, Wyoming; **Rodney Parry, MD** of Sioux Falls; **Mary Slattery, MD** of Sioux Falls; and **C. Roger Stoltz. MD** of Sioux Falls. These physicians became licensed to practice medicine a half-century ago and have contributed greatly to the medical profession.



50-Year Award recipients: George Nicholas, MD; William Dendinger, MD; John Malm, MD; Tom Krafka, MD; Rodney Parry, MD; Gregory Magnuson, MD. Not pictured: Gary Carlson, MD; Eugene Hoxtell, MD; Sam Mortimer, Sr., MD; Mary Slattery, MD and C. Roger Stoltz, MD.

Poster Session

During the Annual Leadership Conference, medical students and residents participated in a poster session highlighting their work. Congratulations to Matthew Schmitz, who presented his winning project, "Conducting a Cadaveric Suturing Laboratory to Increase Clinical Readiness in Medical Students – An Education Research Project," to the SDSMA Policy Council.



2026-27 SDSMA Board of Directors

Below are the members of the 2026-27 SDSMA Board of Directors and CEO as of May 29 following the annual conference

- President – Ben Meyerink, MD – Sioux Falls
- President-Elect – Megan Smith, MD – Burke
- Vice President – Deepak Goyal, MD, MBA – Rapid City
- Secretary-Treasurer – Mandi Greenway Bietz, MD – Mitchell
- At-large Director – Sarah Flynn, MD – Sioux Falls
- At-large Director – Ty Hanson, DO – Aberdeen
- At-large Director – Brian Wilson, DO – Rapid City
- Policy Council Chair – Laura Hofert, MD – Madison
- Immediate Past President – Keith Hansen, MD – Sioux Falls
- AMA Delegate – Robert Allison, MD – Fort Pierre
- AMA Alternate Delegate – Robert Summerer, DO – Madison

The Board is pictured with CEO Tammy Hatting.

Thank you to outgoing board member Jen Tinguely, MD, MPH!

These dedicated leaders are guiding the SDSMA forward, advocating for physicians, patients, and the health of all South Dakotans.

Front row L to R: Laura Hoefert, MD; Megan Smith, MD; Jen Tinguely, MD, MPH; Sarah Flynn, MD; Rob Allison, MD; Brian Wilson, MD.
Back row L to R: Mandi Greenway Bietz, MD; Keith Hansen, MD; Ben Meyerink, MD; Ty Hanson, DO; Robert Summerer, DO; Tammy Hatting, SDSMA CEO.

Member News

SDSMA Foundation Announces Medical Student Scholarships

At the South Dakota State Medical Association Annual Awards & Scholarship Recognition Dinner during the annual conference on May 29, the SDSMA Foundation recognized scholarship recipients for medical students attending the University of South Dakota Sanford School of Medicine during the 2026-27 school year. The Foundation awarded more than $400,000 in scholarships to medical students for the 2026-27 year. Thank you to those who have donated to the SDSMA Foundation. To donate, visit sdsma.org.

- Joseph Anders – SDSMA Freshman Tuition Scholarship
- Mariah Block – Herbert A. Saloum Memorial Scholarship
- Bodhi Brady – SDSMA Freshman Tuition Scholarship
- Riggins Bundy – SDSMA Junior Scholarship
- Emily Eisenbraun – SDSMA Senior Scholarship
- Michael Frick – Yankton District Medical Society Scholarship
- Lucas Goetz – Howard and Mary Ann Saylor Scholarship
- Ryder Grantham – Yankton District Medical Society Scholarship
- Jordan Grothe – Avera Health Plans Scholarship
- Ruby Hawks – Richard Holm Prairie Doc Memorial Scholarship
- Jacob Hegland – J. Michael McMillin Scholarship
- Rebecca Hofer – Richard Holm Prairie Doc Memorial Scholarship
- Rylee Honomichl – SDSMA Junior Scholarship
- Grace Jacobs – SDSMA Senior Scholarship
- Kyla Jarvis – Black Hills District Medical Society Scholarship
- Velvet Jessen – Pierre District Medical Society Scholarship
- Noah Johnson – SDSMA Freshman Tuition Scholarship
- Olivia Kern – SDSMA Freshman Tuition Scholarship
- Isabelle Lehman – Howard and Mary Ann Saylor Scholarship
- Kiley Medler – SDSMA Past Presidents' Scholarship
- Griffin Metz – Avera Health Plans Scholarship
- Casey Miller – T.H. Sattler Memorial Scholarship
- Jaelyn Morehead – SDSMA Past Presidents' Scholarship; Wulbers Scholarship
- Parker Owen – SDSMA Senior Scholarship
- Cole Purdy – Avera Health Plans Scholarship
- Ethyn Rollinger – SDSMA Freshman Tuition Scholarship
- Phebie Rossi – Black Hills District Medical Society Scholarship
- Joslyn Russell – J. Michael McMillin Scholarship
- Matthew Schmitz – Wulbers Scholarship
- Hattie Shaffer – Pierre District Medical Society Scholarship
- Aiden Vande Zande – J. Michael McMillin Scholarship
- Gracelyn Wager – Wulbers Scholarship
- Alexander Withrow – SDSMA Senior Scholarship

New Foundation Scholarships Announced

Two new scholarship have been established this year by the SDSMA Foundation Board of Directors – the SDSMA Sophomore Scholarship, and the Dean's Advocacy & Leadership Scholarship.

The Sophomore Scholarship will be awarded in the future to second-year medical students at USD SSOM and provides up to the full amount of annual tuition. This completes the Foundation's goal of endowing a scholarship fund for each of the four years of medical school.

The Dean's Advocacy & Leadership Scholarship, established by USD SSOM Dean Tim Ridgway, MD, will be awarded to third-year students at USD SSOM for two years of medical school. It will go to students who have demonstrated an interest in advocacy and leadership in medicine.

Susan M. Anderson, MD Endowed Chair

At the SDSMA Annual Awards & Scholarship Recognition Dinner, SDSMA Foundation Chair Brian Wilson, MD announced a gift made by the Foundation in the amount of $500,000 toward the establishment of USD SSOM's Susan M. Anderson, MD, Endowed Chair fund. Dr. Anderson was a member of the SDSMA Board of Directors when she passed away in March 2024. This gift will help contribute to the continuing legacy of Dr. Anderson.

Gala Event Planned for September 24

Save the date! The SDSMA Foundation will be hosting a gala this fall. Held on September 24 at Monick Yards in Sioux Falls, it will be an evening of celebrating donors and partners and recognizing the important relationship that are shaping the future of medicine. Stay tuned for details!

Congratulations to the 2026 Graduates of the SDSMA Health Leadership Institute!

SDSMA CENTER FOR PHYSICIAN RESOURCES
Health Leadership Institute

Congratulations to the physicians who graduated this spring from the SDSMA Health Leadership Institute:

- Evangelia Assimacopoulos, MD
- Michelle Baack, MD
- Karina Gonzalez Otarula, MD
- Dawn Hill, MD
- Jalen Lamb, DO
- Jacob Prunuske, MD, MSPH

The HLI's six-month program offers current and future leaders the opportunity to gain in-depth knowledge of the role leadership plays in medicine. The program brings together physicians from across the state and prepares them for participating in roles within their practice or health system and cultivates their professional development, civic development, community engagement and leadership skills.

2026-27 Cohort Begins in October – Now Open For Registration!

The HLI is now accepting participants for the 2026-27 cohort! Those interested may contact Justin Ohleen at johleen@sdsma.org or 605.336.1965. Sessions 1 and 6 will be held in Sioux Falls. Sessions 2 through 5 will be virtual.

Schedule:

Session 1 – Self Awareness - October 16-17, 2026
Session 2 – Interpersonal Communications - November 13-14, 2026
Session 3 – Teamwork and Collaboration - December 11-12, 2026
Session 4 – Systems Awareness - January 22-23, 2027
Session 5 – Wellness Centered Leadership - February 26-27, 2027
Session 6 – Influencing Organization Change & Culture – April 2-3, 2027
Learn more about the HLI at sdsma.org.

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- **Establishes regulations by proposing legislation and adopting administrative rules**
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