We want your patients to be confident they’ve chosen the right team to handle their procedure. Our surgeons are experienced in both cosmetic and reconstructive surgery.

- Board certified by the American Board of Plastic Surgery
- Come to Avera from the U.S. Army Medical Corps. with extensive experience in reconstruction due to traumatic injury and cancer treatment
- More than 20 combined years of surgical experience
- Extensively published clinical research
- Committed to providing patients the highest level of care

Please have your patients call for a consultation at 605-322-4130.
## Contents

**August 2016**  
*Volume 69* *Number 8*

### President’s Comments
- 339 Things are Heating Up – Tom Hermann, MD

### Editorial
- 340 Medical Student Petition Against the USMLE Step 2 Clinical Skills Examination – Josh Rekalla, MS IV; Peter Chang, MS IV; Suzanne Reuter, MD

### The Journal
- 343 Midwest Science Festival: Exploring Students’ and Parents’ Participation in and Attitudes Toward Science – Elizabeth A. Dippel, BA; Keegan Mechels, BA; Emily R. Griese, PhD; Rachel N. Laufmann; and Jill Weimer, PhD

### Primers in Medicine
- 359 Lymphangiectatic Variant of Eccrine Spiradenoma – A Diagnostic Challenge – Usama Yassi, MD; Amy Kerkvliet, MD; RJ Summerer, DO; Ali Jassim, MD, PhD
- 363 New Oral Anticoagulants: What Prescribers Should Know; Differences and Similarities between Warfarin and “New Agents” (Dabigatran, Rivaroxaban, Apixaban, Edoxaban) – Review of Indications, Contraindications and Safety of Use – Marian S. Petrasko, MD, PhD; Amol Raizada, MD; Tereza Petrasekova, BA

### Pharmacology Focus
- 370 Procalcitonin as a Biomarker of Bacterial Infection – Kari Taggart, PharmD; Shelby Nielsen, PharmD

### Special Features
- 373 Board News – Margaret B. Hansen, PA-C, MPAS
- 375 Quality Focus: Depression Screening Tools Improve Care – Stephan D. Schroeder, MD; Dawn Hahn, RN-BC, CMCN
- 377 Patient Education: Comfort Not Poison – Richard P. Holm, MD
- 378 SDSMA PAC Membership 2016

### Member News
- 379 For Your Benefit: Your SDSMA Member Services and Programs  
  Medicaid State Plan Amendments  
  Member Updates Needed for 2017 SDSMA Directory  
  Legal Brief Highlight: Limitations of Actions
- 380 AMA Delegate Report
- 381 Upcoming Events: “Physician Resiliency: Healing the Healer” and “Termination of an Employment Contract”  
  SDSMA 2017 Member Directory – Great Advertising Opportunity!
- 382 The Issue Is…Key Changes Recommended for the New Medicare Payment System

### For the Record
- 383 CME Events

### Advertisers In This Issue
- 384 Physician Directory
extends beyond your medical practice,

If your vision of success
President’s Comments

**Things are Heating Up**

By Tom Hermann, MD
SDSMA President

While the heat of the summer is upon us and Congress is taking a summer break, the issues that face the South Dakota State Medical Association (SDSMA), South Dakota, the American Medical Association (AMA), and our nation continue to deserve our attention. Let me touch on several of these that may pique your interest.

The utilization of marijuana for recreational and medicinal use has and continues to be an issue for the SDSMA. The use of cannabidiol for the treatment of seizure disorders, particularly in children, creates the likely scenario that a bill will be brought forward for consideration in the 2017 legislative session. In our pursuit to do everything possible to help our patients, we must rely on good science - evidence-based if possible. We must listen to the concerns of our law enforcement community and those knowledgeable in early child development. And most importantly, we must ensure that the medical benefit of the utilization of marijuana and cannabidiol outweigh any negative consequences it may have on the individuals using it and the members of our community.

The evolving national perspective of supporting LGBT rights has sought to make our nation more inclusive and sensitive to the rights of all individuals. This has led to heated discussions and controversial legislative actions involving our public bathrooms and school facilities. This issue arose during the 2016 South Dakota legislative session and will again in 2017. The SDSMA believes that a physician’s nonjudgmental recognition of sexual orientation and behavior enhances their ability to render optimal patient care in health as well as in illness. In the case of the transgender or homosexual patient this is especially true, since unrecognized homosexual activity by the physician or the patient’s reluctance to report his or her sexual orientation and behavior can lead to failure to screen, diagnose, or treat important medical problems.

This year the graduates of the University of South Dakota Sanford School of Medicine all successfully matched into post graduate training sites – fine accomplishment and testimony to the quality of their medical education. Accolades to them and to all of you in your ongoing support and teaching of our medical students. As our need for new physicians remains, we need Congress to further support graduate medical education (GME) and to increase funding to support GME. As we seek support for GME, let’s not forget our fellow physicians currently in active practice. Physician burnout is on the rise and we need to do more to support physicians and to reduce the stresses that have led to job dissatisfaction and abandonment of the profession.

The expansion of Medicaid has and continues to be an issue for the state of South Dakota. Gov. Dennis Daugaard’s team has made a sincere effort to address this issue, by creatively recognizing an opportunity to offset the cost of Medicaid expansion for our state through the Centers for Medicare and Medicaid Services (CMS) agreement to pay 100 percent of the medical costs incurred by our tribal patients, who are by treaty so entitled. These efforts to expand Medicaid and to improve health care for Native Americans has in turn shed light on the issues that plague Indian Health Services (IHS). The problems within IHS not only involve funding but also the infrastructure, and as such have remained controversial and insolvable for years. I applaud our congressional delegates – Sens. Mike Rounds and John Thune, and Rep. Kristi Noem for their efforts to bring these issues forward and into the national spotlight.

The cost of care, particularly medications, continues to be a factor that patients, clinics, hospitals, and even government cannot seem to curtail nor budget for. A study published in Health Affairs, and detailed by the Associated Press, reports that health insurers’ spending on expensive prescription drugs nearly quadrupled from 2003 to 2014. Many of us in practice are appalled by the cost of generic medications now compared to just a few years ago. A patient’s rights to care and the affordability of that care is a concern to all in the arena of health care and government and will continue to be in the future. With health care spending accounting for 17.5 percent of the nation’s gross domestic product, it is no small wonder our elected legislative officials are challenged to know what to do.

In the heat of the summer, things are indeed heating up and in my immediate forecast, I predict more extremes as we address the issues that are currently impacting health care delivery in our state and nation.
The United States Medical Licensing Examination (USMLE) Step examinations are comprised of a three-part testing series, Step 1, Step 2 Clinical Knowledge (CK), Step 2 Clinical Skills (CS), and Step 3. A passing grade is required by all allopathic medical students for licensure in the U.S. Step 2 CS is graded solely on a pass/fail format. The goal of the Step 2 CS exam is to ensure that medical students are prepared to provide care as first-year internship residents. The exam is comprised of 12 standardized patient encounters. Students are required to perform a focused history and physical exam on each standardized patient in 15 minutes; then, students spend 10 minutes documenting a patient note on a computer. Not all of the standardized patient encounters require a physical exam. There are three components that factor into an overall passing score: Communication and Interpersonal Skills, Spoken English Proficiency, and Integrated Clinical Encounter. Students need a passing grade on all three components of the exam in order to achieve an overall pass. Graders of the exam are the standardized patients and trained physician graders. According to the National Board of Medical Examiners (NBME) 2015 performance data on the Step 2 CS, 96 percent of MD and DO degree examinees from U.S. or Canadian medical schools passed the exam overall. In contrast, 78 percent of examinees from non-U.S. or non-Canadian schools passed the exam overall.

Recently, there has been a movement against the utility of this examination. A national petition “End Step 2 CS” was started by a group of fourth-year medical students at Harvard Medical School in February 2016 to eliminate the Step 2 CS exam as a requirement for U.S. medical graduates. Since the inception of this petition, over 16,000 medical students, residents, fellows, attending physicians, and others have signed this petition in support of this resolution. On May 5, 2016, the Michigan State Medical Society passed a resolution which opposed the Step 2 CS examination. On May 8, the Massachusetts Medical Society House of Delegates voted in favor of a policy which called upon their state’s Board of Registration in Medicine to end the requirement of Step 2 CS as a licensing requirement in lieu that students pass their schools’ clinical exam. In June, the founders of the petition introduced American Medical Association (AMA) resolutions 311, 316, 317, and 321 at the annual AMA meeting. These resolutions are aimed to transfer jurisdiction of required clinical skills exams over to medical schools accredited by the Liaison Committee on Medical Education (LCME) and the Commission on Osteopathic College Accreditation (COCA).

There are several arguments that the authors of the petition made and the AMA Reference Committee deliberated over. The first is in regards to exam cost. The test registration fee alone is currently $1,275 per student, but the test is only offered in five major U.S. cities. The costs of travel and lodging must be added to the total amount spent on this test for many students. The total fees can easily exceed $2,000. Cumulatively, in 2013 U.S. and Canadian students spent over $20 million on the exam fee alone, and this cost grows if the examinees pay for the test with loans.

The petition authors advocated that each medical school should be responsible for evaluating their students’ clinical skills through their clinical curriculum and argue that many medical schools already have a clinical skills exam in the third or fourth year. These tests are already reviewed by the LCME which can ensure these clinical skills exams are standardized to a degree by conforming to the accreditation process. Step 2 CS lacks this standardization since not all students are evaluated by the same examiner and therefore some degree of subjectivity exists.

The authors of the petition also argue that the exam cannot be used to predict future intern performance nor should it be used as a screening tool of future interns. The LCME already has published standards for medical student
selection into accredited schools. Using Step 2 CS as a screening for the 2 to 4 percent of students that fail occurs at an estimated cost of $1.1 million per examinee. For the remaining 96 to 98 percent of students who passed, their scores can only be viewed as a threshold competency as some subcomponents of the exam are based on dichotomous checklists that are commonly provided by test preparation books. As a result, there is no evidence that supports the usefulness of the data gathering skills subcomponent of the Step 2 CS exam. While proponents of the exam will argue that the other portions do have a positive correlation with intern performance, the same studies already show a positive correlation between an intern’s Step 1 and Step 2 CK score.

After extensive testimony on both sides of this item, the AMA committee voted in favor of the adoption of the resolutions. Therefore, the AMA will work with the Federation of State Medical Boards (FSMB) and state medical licensing boards to advocate for the elimination of Step 2 CS as a requirement for LCME or COCA-accredited medical school graduates who have passed a school-administered clinical skills exam.

The decision to eliminate the Step 2 CS exam still remains with the NBME and FSMB, and it remains to be seen how they will respond to the adoption of these AMA resolutions.

REFERENCES

Jeremy Storm, MD
Now Taking Referrals

Infectious Disease & Travel Medicine
Diagnosis, Treatment & Preventative Services

Dr. Jeremy Storm is board certified in infectious disease and specializes in the treatment of complex or recurrent infections, travel medicine, HIV, infusion therapy, telemedicine, antibiotic stewardship, and infection control. Dr. Storm is offering referral services throughout Western South Dakota and Mountain region with patients seen same day or next day.

2820 Mt. Rushmore Road | Rapid City, SD 57701
(605) 342-3280 | RapidCityMedicalCenter.com
Introduction

While nearly 50 percent of high school seniors express interest in science, technology, engineering, and mathematics (STEM) fields, only about 28 percent of bachelor’s and 20 percent of associate’s degree students choose a STEM major. Additionally, of these students, 48 percent of bachelor’s and 69 percent of associate’s STEM degree students will switch to non-STEM majors or drop out of school before completing their degree. Current initiatives are in place working to address these retention issues by prioritizing, for example, math preparation for STEM degrees with the goal of increasing the number of students who receive bachelor’s degrees in STEM fields to 1 million by 2022. Improving retention rates, and ultimately improving STEM education and workforce rates, are vital to improving our Nation’s health care and health outcomes.

While this issue is being addressed nationally, locally, South Dakota also continues to make great strides. South Dakota is expected to add 17,100 new STEM jobs by 2018 and in 2015 had a lower unemployment rate than the country at 3.5 percent (versus 5.1 percent nationally). However, South Dakota has a generally less educated workforce both regionally and nationally with those over 25 years of age having a bachelor’s degree or higher at 26.2 percent (compared to 28.8 percent nationally, 28.7 percent in Montana, 27.2 percent in North Dakota, 32.6 percent in Minnesota, 25.7 percent in Iowa, 28.5 percent in Nebraska, 24.7 percent in Wyoming). Even so, South Dakota is expected to add 17,100 new STEM jobs by 2018 and in 2015 had a lower unemployment rate than the country at 3.5 percent (versus 5.1 percent nationally). However, South Dakota has a generally less educated workforce both regionally and nationally with those over 25 years of age having a bachelor’s degree or higher at 26.2 percent (compared to 28.8 percent nationally, 28.7 percent in Montana, 27.2 percent in North Dakota, 32.6 percent in Minnesota, 25.7 percent in Iowa, 28.5 percent in Nebraska, 24.7 percent in Wyoming).
Dakota continues to develop its STEM workforce, featuring a variety of programs including the Institute for STEM Education Enhancement, the Sanford Program for the Midwest Initiative in Science Exploration (PROMISE), and Project Lead the Way. These programs along with high science standards in schools support the 54 percent of South Dakota high school students who express an interest in STEM versus 49 percent nationally. The distribution of interest throughout STEM is not balanced however, with most students indicating interest in healthcare illustrating a need to increase interest in other fields. Encouraging interest however, can be difficult.

Children’s interest in science can be traced back to preschool as early exposure to science is often a strong predictor of later interest in the sciences. Early exposure to science doesn’t always take a specific format; in fact, children are often exposed to science mediums without a solid foundation for what science entails or appropriate scaffolding to assist them in better understanding the topic. For example, children may have the opportunity to participate in a trip to a museum or zoo, or they might also have the opportunity to be led through an experiment at school. These two modes of learning, though both beneficial in their own right, may facilitate different types of learning for different learners. These methods are defined as informal and formal, respectively. The idea of informal science exposure is that it is not school or curriculum based and participation is voluntary by the child. Formal education, then, is the education that is often found within a scholastic setting and led by a teacher.

The majority of exposure to science occurs informally. Informal settings provide opportunities for students that may not be possible in more formal settings. In fact, informal learning often helps create more interest and build more positive attitudes in students towards science than more formal settings. Participating in informal science activities have further been linked to a more positive attitude towards science, feeling science is applicable to everyday life, and science-related career aspirations. One way informal settings are able to do this is through hands-on learning activities. Even at young ages, children are able to articulate the fact that science not only interests them more when they’re doing hands-on experiments, but they learn concepts better and retain the information easier. Additionally, both parents and children spend more time engaging in science activities and express more interest in the topic when they are actively involved in the process.

In fact, evidence suggests that leaving children on their own and simply putting science related material in front of them does not lead to a further interest in that topic. Rather, children may be more inclined to learn about a topic if they are guided through it, or if it is tailored to the child’s current interests. This may hold particularly true in cases where parents and children have similar interests, facilitating opportunities for learning given a mutual appreciation for the topic.

**Present Study**

The present study is part of a broader evaluation of the It’s All About Science Festival. This festival is a yearly celebration and opportunity to promote exploration of science, technology, engineering, and mathematics for children and adults and is held at Sanford Research in Sioux Falls, South Dakota. The event is free of charge and
features over 50 hands-on activities, demonstrations, exhibits, performers, a kindergarten science fair project exposition, a poster competition, and presentations from schools across the state. The festival was started by a South Dakota science-based organization to broadly promote STEM education in the region.

In this current study, we were interested in examining the various levels of attitude, exposure, and participation in science that were present among students and parents attending the festival. First, we explored students’ and parents’ interest in science as well as the students’ (of all ages) interest in pursuing STEM fields. We hypothesized students and parents attending the festival would show a high interest in science. We also wanted to explore the types of informal science they engaged in, examining their levels of exposure to science (i.e., going to the zoo) and participation in science (i.e., reading science-related books). We also examined the level of comfort parents had engaging with their children regarding science topics. Finally, we were interested in how informal participation or exposure to science impacted attitude towards science, for both parents and students.

Methods

Participants and Procedures

Data for this study were collected at a local, free science fair that 3,250 people attended. Participants attending the science fair were solicited to complete online surveys throughout the day at a booth with multiple laptops. The booth was next to the only entrance and exit, and throughout the day three to five volunteers randomly sampled participants. Participants 18 and older were consented. Participants younger than 18 were assented and their guardians provided consent. The sample included 65 students (49 percent males) and 79 parents or other adults (66 percent females) who attended Sanford Health’s annual It’s All About Science Festival. See Table 1 for demographic information. Student participants who received free or reduced lunch were 8.8 percent. All students reported receiving mostly A’s (61.5 percent) or mostly B’s (36.8 percent) in school, and all but 6.2 percent reported having at least one teacher or adult in school they could talk to if they were having a problem. Adult attendees’ educational attainment was heavily weighted towards more education, especially when compared nationally. Most adult attendees worked in education, medicine, or science and over 70 percent had a household income over $50,000 (median household income in South Dakota is $49,495).7

Measures

Science Attitude

We used 11 items from publicly available studies to create our science attitude measure. Eight of the items came from the Noyce Enthusiasm for Science Scale (α= 0.91) answered on a 4-point Likert-type scale ranging from strongly disagree (1) to disagree (2) to agree (3) to strongly agree (4) (e.g., “I like to participate in science projects”) and the remaining three came from the National Assessment of Educational Progress (NAEP) answered on a 3-point Likert-type scale ranging from disagree (1) to not sure (2) to agree (3) (e.g., “I like science”) (α=0.83).

Informal Science Exposure

The Active Science Participation scale was created with six items from the National Science Foundation’s Science and Engineering Indicators report (e.g., “Have you visited a zoo or aquarium in the last 12 months?”) (α=0.64).

Informal Science Participation

Informal science participation was measured using four
items from the 2006 Program for International Student Assessment answered on a 4-point Likert-type scale, (1) never or hardly ever, (2) sometimes, (3) regularly, (4) very often (e.g., “How often do you read science books?”) and two items from The National Science Foundation’s Science and Engineering Indicators report answered on a 6-point Likert-type scale ranging from never (1) to once a year (2) to several times a year (3) to once a month (4) to a couple of times a month (5) to at least once a week (6) (e.g., “How often do you attend a science club?”) ($\alpha=0.79$).

Science Confidence
Parents were asked how likely they were to feel confident talking to their child about science on a 3-point Likert-type scale, (1) very likely, (2) likely, (3) not at all likely.

Results
Data were captured for 144 participants who were solicited throughout the day of the science festival. Students were well represented across age and gender with the majority identifying as white (see Table 1). The majority of students indicated positive attitudes towards science and a higher percent agreed or strongly agreed to science attitude questions than their peers at the national level. When asked how interested they were in some day becoming a scientist or working in the medical field, 76.5 percent of students were interested or very interested.

A multiple regression was conducted to test if informal science exposure (M = 7.8; SD = 3.39) such as visiting science locations and informal science participation (M = 7.56; SD = 2.12) such as doing science activities such as reading science novels or watching science TV predicted the level of children’s attitude towards science (M = 102.12; SD = 14.62).

Using the enter method it was found that informal science participation levels explain a significant amount of the variance in the level of attitude towards science (F(2, 46) = 4.80, $p = 0.013$, R$^2 = 0.179$, R$^2_{Adjusted} = 0.142$). The analysis shows that more informal science exposure did not significantly predict science attitude ($\beta = -0.095$, t(47) = -0.427, $p = 0.65$); however, more informal science participation did significantly predict science attitudes ($\beta = 0.43$, t(47) = 2.97, $p = 0.003$).

A multiple regression was also conducted to see if more informal science exposure by visiting and taking their children to science locations and more informal science participation by doing science activities such as reading science novels or watching science TV predicted the level of attitude towards science in parents. However, no significant relationship was found (F(2, 66) = , $p = 0.508$, R$^2 = 0.021$, R$^2_{Adjusted} = -0.010$).

Frequency statistics indicated 63.8 percent of parents indicated they were very likely to be confident in explaining science to their children, 26.6 percent indicate likely, and 2 percent indicated not at all likely. In examining difference in this confidence by those who worked in STEM fields versus those who did not, there were no significant differences found ($t(84)=-0.35$, $p=0.790$).

Discussion
The present study examined the attitudes, exposures, and participation in science of student and parents attending an annual science festival. Our findings suggest that participants in the festival had generally high levels of each of these, indicating consistent exposures to and participation in science for both parents and students. This is not entirely surprising given the make-up of participants attending science festivals. However, the festival does look to attract participants from all around the region, including rural locations, as well as programs that focus specifically on under-represented youth in education. The study did shine light on parents’ comfort in exposing their children to science, indicating that the large majority of parents attending the festival felt very likely or likely to be confident in explaining science to their children.

This paper further explored the relationship between informal science exposures and participation and their potentially unique impact on one’s attitude towards science. As suggested in the introduction, informal science activities (including exposures and participation) have been found to elicit higher levels of interest in science, likely impacting one’s attitude towards science overall. In the current study we found that for students who indicated high levels of informal science participation (i.e., reading science-themed books) was positively related to their attitudes regarding science. Interestingly, however, informal science exposures, such as attending the zoo or independently visiting a science lab, was not significantly associated with positive attitudes towards science. One possible explanation maybe that the informal science participation assessed here required the participant to personally decide and make an effort to engage with science such taking part in a science club or watching a science-related program. On the other hand, informal science exposures such as attending the zoo or even a
Great news: In 2015, 36.5% of our enrollees heard about QuitLine services from healthcare professionals. Even better, we’re introducing a new South Dakota QuitLine module on "PROF" (Program and Resource Online Facilitator) at dohprofsd.org, where health professionals like you will learn even more about the effects of tobacco and the steps required to guide those addicted to seek help. You’ll also learn how to visit with patients about their tobacco use and how best to make a QuitLine referral.

The interactive online system tracks progress, so users can log in and out at their convenience and still maintain their place in the training. We encourage all health professionals and providers who interact with tobacco users to participate in this training.
The Physicians Protector Plan proudly offers a Stand Alone Tail Program for solo to group physician practices. Underwritten by Aspen Specialty Insurance Company, a non-admitted AM Best “A XV” rated carrier, our product delivers a competitively priced alternative to incumbent carrier Extended Reporting Period options. We write across all surgical and non-surgical specialties with preference given to premiere accounts being acquired by health care systems.

Coverage Highlights

- Unlimited reporting period with shorter terms available
- Limits up to $1M per claim / $3M policy aggregate per physician
- Defense outside of limits
- Disciplinary defense coverage up to $25,000
- Additional coverage available for physician owned corporations and employed allied healthcare providers

Territory

All states except for the District of Columbia, Hawaii, Kansas, Louisiana, Mississippi, New Jersey, New York and West Virginia

Submission Requirements

- Stand Alone Tail Application (we can accept a competitor application)
- 10 years currently valued loss runs
- Curriculum Vitae
- Credible tail offer from incumbent carrier
- Incumbent carrier policy declarations

Professional Insurors
800.529.1451
kenasheim@insurorpros.com
www.insurorpros.com
science lab may occur without personal choice or may not include appropriate scaffolding to ensure the impact of the exposure. Regardless, this is a unique finding that highlights the type of informal activities that may be most likely to get students interested in science, and ultimately interested in pursuing the STEM field.

Interestingly, no relationship was found for parents between either exposures or participation in science and their attitudes towards science. There may be several reasons for this, as we age it is evident there are various influences that begin to impact our attitudes towards science including political party, science knowledge level, and religion\(^2\) that were not accounted for in the current study. Overall, however, our findings suggest that the It’s All About Science Festival is successful in engaging students with positive attitudes towards science and high levels of interest in future careers in science.

**Limitations**

Although this study presents novel findings in regard to science programming in the Midwest, its limitations should be discussed. Attendees, while evenly split across ages, were largely white, middle to upper class, with highly educated parents. While 85.7 percent of South Dakota residents are white, our sample was generally under-representative of minority groups in South Dakota including Native Americans who make up 9 percent of South Dakota’s population.\(^3\) Given that the festival was centered in a larger city where a majority of its participants resided, the current study was unable to draw comparisons between urban and rural youth and adults. Finally, we were limited in our ability to match parents and students given the limited time and resources provided for a one-day festival evaluation. Regardless of these limitations, the current study does address a unique sample. There is need for this work to understand who is participating in community, specifically science, activities. The current study lays the foundation for future work targeting youth and community science activities.

**Future Directions**

Given the current findings, a future expansion of the study could include a larger sampling of students from different backgrounds and locations. To address this, the survey could be offered to students and parents across the state. In addition to increasing the sheer number of participants, it would also allow for a comparison between centers of population with higher education (i.e., Sioux Falls) and rural communities that do not have the concentrations of research, health care, and higher education that larger cities offer.

Future work could also focus on incorporating attitudes, exposures, and participation in science of parents and children from the same household in the same survey. By having parents and children take a matched survey simultaneously, the attitudes of parents and children can be taken together to show correlations relating to factors outside of education, race, or income level. The future of STEM careers among youth nationally and in South Dakota relies on researching how to best reach children now, when they are at one of the most influential points in their young lives. By further understanding our youth at this early stage, we can get a better picture of how to make science interesting and enjoyable for all students.

**Acknowledgment**

This material is based upon work supported by the National Science Foundation/EPSCoR Cooperative Agreement #IIA-1355423 and by the State of South Dakota.

**REFERENCES**


**About the Authors:**

Elizabeth A. Dippel, BA, Database and Evaluation Specialist, Perspectives, St. Louis Park, Minnesota.
Keegan B. Mechels, MSII, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.
Emily R. Grieser, PhD, Associate Scientist, Center for Health Outcomes and Population Research, Sanford Research; Assistant Professor, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.
Rachel N. Laufmann, Research Associate, Children's Health Research Center, Sanford Research, Sioux Falls, South Dakota.
Jill M. Weimer, PhD, Director and Scientist, Children's Health Research Center, Sanford Research; Associate Professor, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.
One Number Accesses
Our Pediatric Surgical Specialists,
Any Problem, Anytime.

1.855.850.KIDS (5437)
PHYSICIANS’ PRIORITY LINE

Your 24-hour link to pediatric specialists
for physician-to-physician consults, referrals,
admissions and transport service.

ChildrensOmaha.org
Rural United States Experience of Incorporation of a Technologically Advanced and Procedurally Complex Cardiovascular Program – the Sanford Trans-Catheter Aortic Valve Replacement Experience

By Tomasz Stys, MD; Adam Stys, MD; Amol Raizada, MD; Verlyn Nykamp, MD; David Maziarz, MD; Angelo Santos, MD; Chad Laurich, MD; Orvar Jonsson, MD; Jamal Dodin, MD; Terezia Petraskova, BA; and Maria Molga

Abstract
Trans-catheter aortic valve replacement (TAVR) was approved by the U.S. Food and Drug Administration in 2012 for treatment of severe symptomatic aortic stenosis in non-surgical and high risk patients. Implementation of this complex procedure requires a comprehensive heart team approach. Rural demographics in the Midwest pose many challenges related to low volumes of operations both at institutional and individual levels, leading to serious concerns about the quality of care delivered in such a setting. We compared the TAVR data at the University of South Dakota Sanford Medical Center to the national registry with the aim of looking at differences in outcomes of this procedure in a rural setting.

Introduction
Sanford trans-catheter aortic valve replacement program (TAVR) represents the first existing program and first reported acute and long-term outcomes data in the State of South Dakota, and pertinently is one of the first “rural experiences” of performing TAVR.

As we have learned from other complex health care delivery programs incorporated into our region in the past, the rural demographics in the Midwest pose many more challenges in providing health care that do not apply to the more densely populated and urban areas of U.S. The biggest concerns relate to low volumes of operations both at institutional and individual levels, coupled with the need to provide those services to patients within geographical proximity to where they live. This has historically resulted in serious concerns about the quality of care delivered and outcomes resulting from limited volume experience in such a setting.

In the recent past, we have had a number of successful comprehensive programs addressing the above concerns at an institutional and state level. For instance, the South Dakota: Mission Lifeline System of Care for management of patients with acute myocardial infarction has addressed the issue through the creation of a comprehensive statewide system with a high level of oversight and outcomes scrutiny resulting in outcomes similar or even superior to national data.1

Similarly, we have applied a comprehensive and multidisciplinary approach to create the first TAVR program in the rural state of South Dakota. It was felt that there was a great need to provide these facilities to patients locally, thus eliminating the need to travel great distances for advanced care. The Sanford TAVR program aimed at bridging this gap between rural living and complex medical care. Rural nature of health care provided by Sanford Health System in South Dakota and other neighboring states makes the Sanford TAVI program outcomes analysis pertinent to implementing advanced health care strategies in such a setting.

The process of setting up the program included collaboration of a multi-disciplinary team comprised of designated
interventional cardiologists, cardiothoracic surgeons, imaging cardiologists, vascular surgeons and anesthesiology. Institutional support was necessary for creation of a state of the art hybrid cardiovascular operating room necessary to perform the procedure. This joint effort resulted in the creation of a comprehensive Sanford TAVR program.

TAVR was approved in November 2011 by the U.S. Food and Drug Administration for patients with severe, symptomatic aortic stenosis who were inoperable, with subsequent approval for high risk but operable patients in September 2012.\textsuperscript{2}

After commercial approval of the Edwards Sapien Valve, the TAVR program was initiated in over 250 sites in the U.S. Sanford Health participated as one of the initial sites in the country permitted to introduce the commercially available TAVR device to the U.S. market. The Transcatheter Valve Therapy (TVT) Registry was a platform for device and procedural surveillance, as well as quality assurance and improvement initiatives. The TVT Registry centers collected data on patient demographics, functional status and comorbidities, quality of life, procedural details, postoperative in-hospital, and 30-day outcomes.\textsuperscript{2} Data quality checks were implemented both at the National Cardiovascular Data Registry data warehouse and the Duke Clinical Research Institute Analysis Center. Sites with missing data were contacted to encourage complete reporting.

To meet Medicare insurance coverage requirements, facilities were required to comply with coverage criteria outlined by the Centers for Medicare and Medicaid Services (CMS) National Coverage Determination, including participation in a national procedural registry designed to answer outstanding evidentiary questions.\textsuperscript{2}

To satisfy this requirement, the Society of Thoracic Surgeons (STS) and the American College of Cardiology (ACC) developed the STS/ACC TVT Registry.\textsuperscript{2} The national TAVR Registry created an excellent tool to compare performance and outcomes of the TAVR procedure in “rural” U.S. to the outcomes reflecting the rest of the country.

The TVT Registry was responsive to the CMS National Coverage Determination (May 2012) requirement for national registry participation of all TAVR centers and was intended to serve as a platform for (1) device and procedural surveillance; (2) quality assurance and improvement initiatives; and (3) efficient conduct of device-labeling studies that would speed U.S. access to new devices and support expansion of device labeling with evidence development.\textsuperscript{2} Registry activities had been approved by a central institutional review board, and the Duke University School of Medicine institutional review board granted a waiver of informed consent and authorization for this study.\textsuperscript{2}

**Methods**

We analyzed the TAVR Registry data of the first 52 patients performed at the University of South Dakota Sanford Medical Center during the period of September 2012 through June 2014. The data was compared to outcomes noted for the national TAVR Registry.\textsuperscript{2}

Patients with severe aortic stenosis were defined as having valve area less than 1 cm\(^2\), or a mean gradient greater than 40 mm Hg.\textsuperscript{4} In patients with decreased left ventricular function, dobutamine stress echocardiography was used to confirm true severe aortic stenosis.

Cases were deemed as inoperable or high-risk based on determination by two experienced cardiac surgeons. This decision was in turn dependent on the STS predicted risk of operative mortality (PROM) from isolated aortic valve replacement\textsuperscript{2} and the surgeons’ clinical judgment. Patients with STS score greater than 10 were classified high risk.\textsuperscript{4} Data on New York Heart Association (NYHA) class was also collected. History of prior aortic valve interventions or cardiac surgeries, mitral insufficiency, prior TIA/strokes, peripheral arterial disease, chronic obstructive pulmonary disease, renal insufficiency, hostile chest and porcelain aorta were also included.

Screening of patients was then conducted to further determine further qualification for TAVR. Further clinical evaluation for appropriateness for TAVR included using transesophageal echocardiogram and CT-angiogram of chest, abdomen, and pelvis to determine valve size; calcification, caliber, and tortuosity of the major vessels involved in valve deployment. Procedural approach was dependent on anatomical characteristics of the aorta and femoral arteries.

Patients that were excluded from TAVR included bi-cuspid aortic valves, severe organic mitral regurgitation (not improved after aortic valvuloplasty), intracardiac thrombus, severe tricuspid regurgitation with fluid retention, bed bound patients, and patients with a life expectancy of less than 12 months.
Data Element and End Points Definitions

Our study data was collected using standard definitions according to the STS national database when possible. Each patient was assessed by two cardiac surgeons based on the STS PROM score and their clinical judgment, similar to definitions used in the national registry.

Sanford used a hybrid cathlab which was defined by the registry as a procedure room with standard fluoroscopic catheterization laboratory imaging situated in an operative suite.

Porcelain aorta was defined as extensive circumferential calcification of the ascending aorta precluding safe surgical entry. “Hostile chest” included medical conditions that preclude open chest procedures, including abnormal chest wall anatomy (congenital or acquired), extensive mediastinal radiation, complete absence of sternal reconstructive options based on plastic surgery consultation, or other anatomical reasons to consider repeat sternotomy or right anterior thoracotomy prohibitively hazardous.

As in the national registry, our endpoint definitions were harmonized with the Valve Academic Research Consortium (VARC) and VARC-2 definitions for stroke, transient ischemic attack, aortic valve re-intervention, major bleeding, and major vascular complications.

Device implantation success was defined as successful vascular access, delivery and deployment of a single device in the proper anatomic location, appropriate performance of the prosthetic heart valve (aortic valve area greater than 1.2 cm² and mean aortic valve gradient less than 20 mm Hg or peak velocity less than 3 m/s, without moderate or severe prosthetic valve aortic regurgitation) according to the national registry definition.

Incidence of renal failure was defined as dialysis dependent renal failure or rise in creatinine to a level of more than 3 mg/dl or higher.

Baseline Patient Characteristics

There were 52 TAVR cases entered in the study between September 2012 and June 2014. Of those patients, 43 received the Edward Sapien valve and nine patients received the CoreValve after it was approved. Complete data was available for all patients.

The baseline characteristics of these patients are documented in Table 1. Among the 52 patients undergoing
TAVR, the median age was 81 years and 50 percent were males. The median calculated STS PROM was 6.4 (versus seven in the national registry).

A total of 14 patients (26.9 percent) were considered to have an inoperable status and 38 patients (73.1 percent) were considered at high operative risk (versus 20 percent and 80 percent respectively in the nation). Most of our patients had advanced heart failure with 96 percent in class III/IV NYHA, and a median of six seconds in a 5-m walk test (Table 2).

Table 2. Population Frailty Assessment

<table>
<thead>
<tr>
<th>Test</th>
<th>Sanford Patients</th>
<th>National Registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 meter walk test (n=48)</td>
<td>6 seconds (median)</td>
<td>8 seconds (median)</td>
</tr>
<tr>
<td>Grip Test (n=47)</td>
<td>M: 24 Kg (mean)</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>F: 18 Kg (mean)</td>
<td>NA</td>
</tr>
<tr>
<td>KCCQ-2 (n=43)</td>
<td>50.8</td>
<td>NA</td>
</tr>
<tr>
<td>Katz index (n=50)</td>
<td>6 (mean)</td>
<td>NA</td>
</tr>
</tbody>
</table>

All of our patients had significant comorbidities. 9.6 percent had ejection fraction less than 30 percent, 23 percent had previous stroke, 25 percent had peripheral arterial disease, and more than half had chronic obstructive pulmonary disease. 5.7 percent of patients had renal failure, in which 3.8 percent were dialysis dependent. None of our patients had hostile chest while 3.8 percent had porcelain aorta. 32.7 percent of our patients had moderate or severe mitral insufficiency.

The Sanford TAVR Registry had more class III/IV NYHA patients compared to the national average (96 versus 81 percent, respectively) and a higher incidence of severe COPD (53 versus 28 percent, respectively), suggesting a trend toward sicker patients.

Results

As in the national TAVR data, the majority of Sanford TAVR patient procedures were performed through femoral access, as opposed to trans-aortic or trans-apical access (Table 3).

Acute in-hospital outcomes revealed fewer cases of death from any cause (0 versus 5.5 percent), cardiac arrest (0 versus 5.8 percent), myocardial infarction (0 versus 0.7 percent), renal failure, either dialysis dependent (0 versus 1.9 percent) or acute elevation of creatinine over 3.0 mg/dL (0 versus 3.8 percent) in Sanford patients compared to national data respectively. Device success rates were also better (96 versus 92 percent, respectively) and the median length of stay was four days for Sanford TAVR compared to six days for the national registry. Live hospital discharges occurred in 100 percent of Sanford registry patients and in 94.5 percent of the national registry patients. Although p-values suggested no significant difference in the outcomes (except cardiac arrest), this may have been due to the relatively small number of patients in our data. Outcomes were also comparable with regard to new permanent pacemaker implantation and incidence of major vascular injury and bleeding. A higher percentage of our patients developed atrial fibrillation in-hospital post-TAVR compared to the national average (11.4 versus 6 percent, respectively), although this was not statistically significant (P =0.054) (Table 4).

Two patients in our data developed major bleeding, needing transfusions — one was gastrointestinal and the other a genitourinary source of bleeding post procedure. Major vascular injury also occurred in two patients — one developed perforation of the aorta and associated cardiac tamponade and had to undergo emergent cardiothoracic surgery. The other patient had iliac artery injury that needed vascular bypass surgery.

Outcomes at 30 days within the Sanford TAVR program relative to the national registry resulted in findings of
Table 4. In-hospital Outcomes

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Sanford Health (n=52)</th>
<th>National Average (n=7710)</th>
<th>P value Sanford vs. Rest of Nation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death (any cause)</td>
<td>0 (0%)</td>
<td>427 (5.5%)</td>
<td>0.0512</td>
</tr>
<tr>
<td>Stroke</td>
<td>1 (1.9%)</td>
<td>156 (2.0%)</td>
<td>0.3722</td>
</tr>
<tr>
<td>Cardiac arrest</td>
<td>0 (0%)</td>
<td>447 (5.8%)</td>
<td>0.0443</td>
</tr>
<tr>
<td>TIA</td>
<td>0 (0%)</td>
<td>28 (0.4%)</td>
<td>0.8271</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>0 (0%)</td>
<td>56 (0.7%)</td>
<td>0.6836</td>
</tr>
<tr>
<td>New onset atrial fibrillation</td>
<td>6 (11.5%)</td>
<td>460 (6.0%)</td>
<td>0.0540</td>
</tr>
<tr>
<td>Transapical site access complications</td>
<td>0 (0%)</td>
<td>61 (0.8%)</td>
<td>0.6607</td>
</tr>
<tr>
<td>Renal failure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dialysis dependent</td>
<td>0 (0%)</td>
<td>145 (1.9%)</td>
<td>0.3714</td>
</tr>
<tr>
<td>Creatinine &gt; 3</td>
<td>0 (0%)</td>
<td>276 (3.8%)</td>
<td>0.1493</td>
</tr>
<tr>
<td>VARC major bleeding</td>
<td>2 (3.8%)</td>
<td>267 (3.5%)</td>
<td>0.2740</td>
</tr>
<tr>
<td>New permanent pacemaker</td>
<td>4 (7.69%)</td>
<td>509 (6.6%)</td>
<td>0.1945</td>
</tr>
<tr>
<td>Major vascular injury</td>
<td>2 (3.8%)</td>
<td>493 (6.4%)</td>
<td>0.1992</td>
</tr>
<tr>
<td>Device success</td>
<td>50 (96%)</td>
<td>7,069 (92%)</td>
<td>0.1191</td>
</tr>
<tr>
<td>Median stay of length, d</td>
<td>4 (mean: 5.41)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Live hospital discharges</td>
<td>52 (100%)</td>
<td>7,286 (94.5%)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations – TIA: transient ischemic attack; COPD: chronic obstructive pulmonary disease; VARC: valve academic research consortium; TAVR: transcatheter aortic valve replacement.
superior patient survival (death from any cause 1.9 versus 7.6 percent), higher rate of symptomatic improvement despite initial higher percent of severely symptomatic patients (as almost 85 percent of our patients had a decrease in their NYHA class, compared to 72 percent of the national registry patients), lower rate of renal failure – new dialysis dependence (0 versus 2.5 percent), and lower rate of aortic valve re-intervention (0 versus 0.5 percent). The single death was from pulmonary complications (Table 5).

The Sanford TAVR Registry also documented outcomes at one year, regarding death, stroke and the need for permanent pacemaker (Table 7).

**Discussion**

The Sanford TAVR program is a comprehensive multidisciplinary initiative designed to address the frequently encountered problems of implementing technologically

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Sanford Health (n=52)</th>
<th>National Average (n=3528)</th>
<th>P value Sanford vs. Rest of Nation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death (any cause)</td>
<td>1 (1.9%)</td>
<td>243 (7.6%)</td>
<td>0.3205</td>
</tr>
<tr>
<td>Stroke</td>
<td>1 (1.9%)</td>
<td>90 (2.8%)</td>
<td>0.3569</td>
</tr>
<tr>
<td>Primary cause of death</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac</td>
<td>0</td>
<td>108 (44.8%)</td>
<td></td>
</tr>
<tr>
<td>Valvular</td>
<td>0</td>
<td>7 (2.9%)</td>
<td></td>
</tr>
<tr>
<td>Neurologic</td>
<td>0</td>
<td>13 (5.0%)</td>
<td></td>
</tr>
<tr>
<td>Pulmonary</td>
<td>1 (1.9%)</td>
<td>26 (10.8%)</td>
<td></td>
</tr>
<tr>
<td>Renal</td>
<td>0</td>
<td>7 (2.9%)</td>
<td></td>
</tr>
<tr>
<td>Vascular</td>
<td>0</td>
<td>18 (7.5%)</td>
<td></td>
</tr>
<tr>
<td>Infection</td>
<td>0</td>
<td>12 (5.0%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>28 (11.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New permanent pacemaker</td>
<td>3.8%</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Post-NYHA class III/IV</td>
<td>6 (11%)</td>
<td>298 (12%)</td>
<td>0.1283</td>
</tr>
<tr>
<td>New dialysis dependent renal failure</td>
<td>0 (0%)</td>
<td>78 (2.5%)</td>
<td>0.3100</td>
</tr>
<tr>
<td>Aortic valve reintervention</td>
<td>0 (0%)</td>
<td>16 (0.5%)</td>
<td>0.7881</td>
</tr>
</tbody>
</table>

**Table 6. Change in NYHA Class After TAVR**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Sanford Health Overall (n=52)</th>
<th>National Average (n=7710)</th>
<th>P value Sanford vs. Rest of Nation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- NYHA class III/IV</td>
<td>50 (96.2%)</td>
<td>2,808 (80.8%)</td>
<td>0.0012</td>
</tr>
<tr>
<td>Post-NYHA class III/IV</td>
<td>6 (11.5%)</td>
<td>292 (8.4%)</td>
<td>0.1283</td>
</tr>
<tr>
<td>Change in class</td>
<td>44 (84.6%)</td>
<td>2,516 (72.4%)</td>
<td>0.0176</td>
</tr>
</tbody>
</table>

Abbreviations – NYHA: New York Heart Association; NA: not available.
advanced procedural medicine in the rural U.S. The need to deliver advanced health care with a steep learning curve to sparsely populated areas of the country poses a dilemma to institutions in rural settings that may have challenges meeting adequate individual operator and institutional volumes. This has been historically linked to perception of perhaps inferior performance and clinical outcomes in these situations.

The Sanford data from TAVR Program Registry showed high quality outcomes for rural U.S. Although the p-value for these outcomes did not achieve statistical significance, likely due to the small sample size of our patients, the results were definitely comparable if not better than national data. Cost-efficacy could also be argued as superior given a shorter in-hospital stay at Sanford. This rationalizes the continuous but challenging need to further develop technologically demanding and frequently lifesaving health services in rural areas.

The number of patients that underwent TAVR at University of South Dakota Sanford Medical Center was relatively low and does pose some limitation in data interpretation. Also our data included patients with both Edwards-Sapien and CoreValve while the national registry data included patients with only Edwards-Sapien valve.

The geographical dispersion of patients across rural U.S. creates challenges that may be overcome through a comprehensive program structure, rigorous outcomes scrutiny, and continuous improvement process. Outcomes of programs organized in such a fashion may not only be at par with national standards, but may also exceed them.
Help Shape the Future of Medicine in South Dakota

The South Dakota State Medical Association Foundation, the philanthropic arm of the South Dakota State Medical Association, is a tax-exempt 501(C)(3) non-profit corporation, was established to assist and support medical research, medical teaching and medical education at the Sanford School of Medicine.

On average, medical students graduate with $130,000 in debt. Contributions to the South Dakota State Medical Association Foundation provide financial assistance to students at the Sanford School of Medicine and are all designated for scholarships, grants and low-interest loans for students.

Any amount can be donated at any time throughout the year. If you have questions or want more information, please call Laura Olson at 605.336.1965.

Send Your Contributions Today To:
South Dakota State Medical Association Foundation
PO Box 7406, Sioux Falls, SD 57117-7406
www.sdsma.org

SOUTH DAKOTA
State Medical Association Foundation
Shaping the Future of Medicine in South Dakota
Lymphangieictatic Variant of Eccrine Spiradenoma – A Diagnostic Challenge

By Usama Yassi, MD; Amy Kerkvliet, MD; RJ Summerer, DO; and Ali Jassim, MD, PhD

Abstract

Conventional eccrine spiradenoma is a benign, slow growing and painful tumor of the skin. While the tumor does not usually present a diagnostic dilemma, a rare variant with marked stromal lymphedema can be a challenge to interpret.

We present a case of lymphangieictatic variant of eccrine spiradenoma in an 82-year-old white male who presented with a persistent left flank lesion for several months. The patient was initially asymptomatic and subsequently developed a suspected abscess that was excised to reveal a 6.5 cm subcutaneous mass.

Microscopic examination reveals strands and cords of dark, epithelial, round to oval cells with inconspicuous nucleoli streaming between prominently dilated and congested vascular spaces. Within the cystic component there are small ductular structures. Additionally, prominent stromal lymphedema is present.

To the best of our knowledge, there is only one reported case of this entity in the English literature. This case represents a diagnostic challenge and the purpose of reporting it is to alert surgical pathologists, dermatopathologists and dermatologists of the existence of this unusual variant of eccrine spiradenoma.

Background

Eccrine spiradenoma (ES) is a painful,1,2 intradermal, circumscribed, and firm lesion that often causes bluish discoloration of the overlying skin. Approximately 80 percent are present on the ventral aspect of the upper half of the body.1 Unusual sites include lip, ear and postauricular area, eye lid and hand. Most patients are in their second to fourth decade of life.1 We report a rare case of lymphangieictatic variant of ES with extensive cystic degeneration. This case represents a diagnostic challenge and with careful examination of the lesion and the use of immunohistochemical stains, a diagnosis of eccrine spiradenoma, lymphangieictatic variant was made.

Clinical

An 82-year-old white male presented with a persistent left flank lesion for several months. Clinically it was thought to be an epidermal inclusion cyst. The patient was initially asymptomatic and subsequently developed an abscess which required surgical intervention. Purulent material was expressed and a bilobed 6.5 cm subcutaneous mass was resected.

Gross Findings

Examination revealed an 8 x 3 cm centrally hyperemic skin ellipse overlying a 6.5 x 6 x 2.3 cm subcutaneous mass. There was a well-defined ulcer on the skin surface, 1 cm from the closest peripheral margin and 2.5 cm from one tip. Below the ulcer was a 4 x 3.5 cm subcutaneous cyst filled with red-brown gelatinous material and blood clot surrounded by a thin yellow-gold 0.2 to 0.4 cm capsule.

Microscopic Findings

Examination revealed an ulcerated epidermis. The dermis and the underlying subcutaneous tissue contain a large cystic structure that is extensively degenerated with hemorrhage and a reactive lymphohistiocytic proliferation. At the edge of the cystic structure and adjacent to the subcutaneous tissue there is a small remnant of an epithelial neoplasm composed of strands and cords of dark, epithelial, round to oval cells with inconspicuous nucleoli
streaming between prominently dilated and congested vascular spaces. Within the wall of the cyst there are also small ductular structures (Figure 1).

Immunohistochemical stains were performed and the lesional cells show an epithelial staining pattern with positivity for cytokeratin 7. Ductal differentiation was confirmed by positive epithelial membrane antigen (EMA) and carcinoembryonic antigen (CEA) stains. The surrounding cellular component with strands and ducts shows smooth muscle/myofibroblastic differentiation and are positive for smooth muscle actin (SMA) and S100 immunohistochemical stains (Figure 2).

The lesion is arising in a large well circumscribed cystic structure without significant atypia or mitotic activity.

**Conclusion**

We present a case of an 82-year-old white male with the rare lymphangiectatic variant of eccrine spiradenoma. Though eccrine spiradenoma usually poses few diagnostic challenges, this example showed unusual features of the conventional eccrine spiradenoma and represents a diagnostic challenge. The anatomical location, which suggested that it was an infected cyst, as well as the cystic degeneration, with small islands of tissue left made this a diagnostic challenge. Additionally, most of the tissue submitted was fibrotic and inflamed. In one of the sections there was a small area that hinted of an adnexal neoplasm. In addition to the paucity of the epithelial component, there were many dilated lymphatic channels, so it was confused with lymphangiomia. Other differential diagnoses were infected cyst, cylindroma, metastatic carcinoma and cutaneous lymphadenoma.

A diagnosis of eccrine spiradenoma, lymphangiectatic variant was made after extensive sectioning and with the
aid of immunohistochemical stains especially CEA and EMA which illustrated ductal differentiation within the tumor.

There are no clear recommendations on margins for standard excision and, to our knowledge, no published data on recurrence rates.\(^3\) The purpose of reporting this case is to alert the surgical pathologist and dermatopathologist of the existence of this unusual variant of eccrine spiradenoma.

**REFERENCES**


Please note: Due to limited space, we are unable to list all references. You may contact South Dakota Medicine at 605.336.1965 for a complete listing.

**About the Authors:**

Usama Yassi, MD; Sanford Pathology Clinic, Sioux Falls, South Dakota.

Amy Kerkvliet, MD; Sanford Pathology Clinic, Sioux Falls, South Dakota.

RJ Summerer, DO, Eastern Plains Surgical, Madison, South Dakota.

Ali Jassim, MD, PhD, Sanford Pathology Clinic, Sioux Falls, South Dakota.
Your body is a remarkable network of bone, tissue and joints working in perfect harmony. But when injuries occur, that process can be interrupted. At Orthopedic Institute, orthopedic medicine is all we do. We work to get you up and moving again, recreating that perfect harmony, whatever that may be for you. OrthopedicInstituteSF.com | 605.331.5890

Trusted Wealth Advisory for Physicians for Over 20 Years

Why does Foster Group® rise above other wealth advisory firms? It’s the quality of our client relationships, our personalized strategies, and our solid academic foundation. Plus, we are a leading advisory firm to medical professionals. In fact, more than 375 of our physician clients make up almost 40% of the $1.5 billion in assets we manage.

At Foster Group, we take a tailored approach to helping you meet your personal financial goals. We remove the mystery surrounding investing and wealth management and help you chart a clear path to financial independence.

We work closely with individuals, families, retirement plans, and nonprofits to preserve capital, grow assets, and manage risk.

Talk with us today to see what our holistic approach can do for your financial future. Call us at 1-844-437-1105 or visit www.fostergrp.com/sdsma.

New Oral Anticoagulants: What Prescribers Should Know; Differences and Similarities between Warfarin and “New Agents” (Dabigatran, Rivaroxaban, Apixaban, Edoxaban) – Review of Indications, Contraindications and Safety of Use

By Marian S. Petrasko, MD, PhD; Amol Raizada, MD; and Terezia Petraskova, BA

Introduction

Until recently, warfarin has been the only oral anticoagulant. In recent years, newer oral drugs have emerged with anticoagulant properties and have been used for stroke prevention in patients with atrial fibrillation and prevention and treatment of venous thromboembolism. These newer medications have different pharmacological properties compared to warfarin. In this review, we will discuss the current indications and doses of these novel anticoagulants as well as bridging recommendations.

Coagulation Cascade

The coagulation cascade consists of two separate pathways:

- Extrinsic pathway – Contact activation – Factors XII, XI, IX, which activate Factor X; and
- Intrinsic pathway – Tissue Factor VII which activates Factor X. Subsequently in common pathway activated Factor X activates protrombin (Figure 1).

Warfarin inhibits multiple factors in the coagulation cascade in the extrinsic, intrinsic and the common pathway (Factors II, VII, IX, X), while the newer anticoagulants affect clotting factors in the common pathway (Figure 1).

Warfarin

The hemorrhagic properties of sweet clover were noted in cattle that ingested this plant1 and further described in 1941.2 In 1948, a synthetic analogue warfarin was introduced.1 It was approved as medication in 1954 and, under the trade name of Coumadin, gained its fame when used in President Dwight Eisenhower following a heart attack in 1955.

Warfarin has remained for decades the most widely prescribed oral anticoagulant in North America for both prevention and treatment of venous thromboembolism and ischemic stroke prophylaxis in patients with atrial fibrillation (AF).

Warfarin is a vitamin K antagonist. Warfarin blocks vitamin K epoxide reductase (VKOR) and prevents activation of the coagulation Factors II, VII, IX and X which are synthesized mainly in the liver.

Due to different half-lives of the different coagulation factors affected, the full antithrombotic effect of Coumadin is not achieved for a few days. Absorption of
different commercial products also varies due to their rate of dissolution. The activity of warfarin is measured by the
International Normalization Ratio (INR) which helps guide dosing the medication.

The maintenance dose of warfarin depends highly on diet available vitamin K. While green, leafy vegetables tend to
decrease the INR, other substances may increase it (Table 1).

Novel Oral Anticoagulants

The variability in anticoagulation between individual patients, interaction with food and other medications and
the need for periodic blood testing with warfarin led to a search for new oral anticoagulant agents. These drugs
work on specific factors in the coagulation cascade and were more consistent in their effect. There are currently
four oral novel anticoagulants that are approved by the Food and Drug Administration (FDA) for various
indications: dabigatran, rivaroxaban, apixaban, and edoxaban (Table 2). Unlike warfarin, these drugs do not
require frequent INR monitoring and are thus more convenient to administer.

1. Dabigatran etexilate (Pradaxa, Boehringer Ingelheim) is an oral pro-drug that is rapidly converted by serum
esterase to dabigatran, a potent and direct inhibitor of thrombin. About 80 percent of the drug is excreted by the
kidneys and it has a serum half-life of between 12 to 17 hours.

The RE-LY trial compared its efficacy in primary stroke prevention with warfarin in patients with AF. Although
two different dosages of dabigatran were studied, 110 mg and 150 mg twice a day, the higher dose was associated
with lower rates of stroke and systemic embolism and had similar rates of bleeding as warfarin. The median duration
of a trial was two years and a mean CHADS2 score (Table 3) was 2.1. Increased rates of gastrointestinal bleeding
were noted in the dabigatran group, while increased rates of intracranial bleeding were noted in the warfarin group.
Patients on dabigatran were noted to be more likely to experience dyspepsia as well.
Secondary prevention in patients with prior stroke, TIA or other thromboembolism (2)

The RE-COVER and RE-COVER II trials also showed that dabigatran was non-inferior to warfarin in reducing DVT and PE in patients who were initially treated with five to 10 days of parenteral anticoagulant. Compared to conventional warfarin therapy, dabigatran had a lower risk of overall bleeding but a higher rate of GI bleeding. Patients need to be treated with an initial five to 10 days of parenteral anticoagulant, such as UFH or LMWH.10

2. Rivaroxaban (Xarelto, Janssen Pharmaceutical) is an oral, direct Factor Xa inhibitor. It reaches peak levels within two to three hours and has terminal half-life of seven to 11 hours.15 It is a CYP3A4 substrate.

The ROCKET AF trial was designed as a non-inferiority trial to compare the efficacy of 20 mg of daily rivaroxaban to warfarin in the prevention of stroke or systemic embolization in patients with non-valvular atrial fibrillation with a mean CHADS2 score was 3.47.16 Rivaroxaban was found to be non-inferior in prevention of stroke or systemic embolism as well as in the risk of major bleeding. While intracranial and fatal bleeding occurred less frequently in the rivaroxaban group, gastrointestinal bleeding was more frequent.

The EINSTEIN investigators studied rivaroxaban for the treatment of DVT and found that it was non-inferior in
efficacy compared to traditional treatment with warfarin, with initial administration of LMWH. The drug was initially started at 15 mg po BID for 21 days followed by 20 mg once daily for the duration of therapy.\textsuperscript{17,18}

A lower dose of 10 mg daily of rivaroxaban can also be used for DVT prophylaxis in patients post hip and knee replacement surgeries.\textsuperscript{19-22}

3. **Apixaban** (Eliquis, Bristol Myers Squibb) is an oral direct Factor X antagonist with rapid absorption (reaches peak levels within three to four hours), a 10 to 14 hour half-life and 25 percent renal excretion. Like rivaroxaban, it is also CYP3A4 substrate.

The ARISTOTLE trial was designed as a non-inferiority trial to compare the efficacy of warfarin and apixaban in preventing stroke and systemic embolization in patients with non-valvular AF.\textsuperscript{23} The mean CHADS2 score was 2.1. Apixaban was superior to warfarin in preventing stroke or systemic embolism, caused less bleeding (except gastrointestinal bleeding that was similar in both groups) and resulted in lower mortality. Dosage used was 5 mg PO BID. In patients with two or more of the following: age greater than 80 years, body weight less than 60 kg, or a serum creatinine greater than 1.5 mg/dL, the dose was decreased to 2.5 mg BID.

Apixaban was also found to be non-inferior to conventional therapy with warfarin for the treatment of acute venous thromboembolic disease in the AMPLIFY trial.\textsuperscript{24}

4. **Edoxaban** (Savaysa, Daiichi Sankyo), an oral direct Factor X antagonist, was approved recently in the U.S. for prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation, as well as for treatment of deep venous thrombosis and pulmonary embolism in the patients who have been already treated with parenteral anticoagulant for five to 10 days. The half-life of the drug is 10 to 14 hours.

Edoxaban was shown non-inferior to warfarin in the ENGAGE-AF TIMI trial in prevention of ischemic stroke in patients with nonvalvular atrial fibrillation and creatinine clearance less than or equal to 95 ml/min and had less bleeding overall.\textsuperscript{26}

In the Hokusai-VTE trial edoxaban was shown to be noninferior to warfarin for recurrence of symptomatic venous thromboembolism and was associated with lower rate of clinically relevant bleeding.\textsuperscript{27}

### Table 6. Apixaban: Indications, Dosing and Adjustment in Dosing

<table>
<thead>
<tr>
<th>Indication</th>
<th>Normal Renal Function</th>
<th>Decreased Renal Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonvalvular AF</td>
<td>5 mg BID</td>
<td>Reduce dose to 2.5 mg twice daily if any 2 present:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Serum creatinine &lt; 1.5 mg/dL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Age over 80 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Body weight &lt; 60 kg</td>
</tr>
<tr>
<td>DVT/PE treatment</td>
<td>10 mg BID for 7 days followed by 5 mg BID for 6 to 12 months</td>
<td>Creatinine &gt; 2.5 mg/dL or CrCl &lt; 25 ml/min – not evaluated</td>
</tr>
<tr>
<td>Postoperative prophylaxis</td>
<td>Hip or knee replacement: 2.5 mg BID beginning 12 to 25 hours postoperatively (25)</td>
<td>CrCl &lt; 30 ml/min – not evaluated</td>
</tr>
</tbody>
</table>

### Table 7. Edoxaban: Indications, Dosing and Adjustment in Dosing

<table>
<thead>
<tr>
<th>Indication</th>
<th>Normal Renal Function</th>
<th>Decreased Renal Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonvalvular AF</td>
<td>CrCl≤ 95mL/min</td>
<td>Reduce dose to 30 mg PO daily if 1 or more of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CrCl 15-60mL/min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Body weight &lt; 60kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• P-glycoprotein inhibitors (except amiodarone)</td>
</tr>
<tr>
<td>DVT/PE treatment</td>
<td>60 mg PO daily 5-10 days after initiating therapy with parenteral anticoagulant</td>
<td>Same adjustment as above</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do not use if CrCl &gt; 95 mL/min (increased risk of ischemic stroke)</td>
</tr>
</tbody>
</table>
Discontinuation of Anticoagulants Before Surgery

Warfarin peak plasma concentration is usually two to eight hours after the ingestion. Warfarin in almost completely bound to albumin (99 percent) and its plasma half-life is 25 to 60 hours (with a mean of 40 hours). Unlike warfarin, the effects of the novel anticoagulants cannot be measured accurately using standardized lab tests. Because of differing pharmacokinetics, the newer oral anticoagulants should be discontinued prior to invasive procedures per the product information discussed in their package inserts (Table 8).

Conversion Between Parenteral Anticoagulants (UFH/LMWH) and Novel Anticoagulants

Many patients on warfarin need bridging with parenteral

<table>
<thead>
<tr>
<th>Table 8. Discontinuation of Oral Anticoagulants Before Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dabigatran</strong></td>
</tr>
<tr>
<td>1 to 2 days (CrCl &gt; 50 mL/minute)</td>
</tr>
<tr>
<td>3 to 5 days (CrCl &lt; 50 mL/minute)</td>
</tr>
<tr>
<td>Longer times should be considered for patients undergoing major surgery or those receiving spinal puncture/epidural catheter²⁷</td>
</tr>
<tr>
<td><strong>Apixaban</strong></td>
</tr>
<tr>
<td>Discontinue at least 48 hours prior to surgical or invasive procedures with moderate to high bleeding risk and 24 hours prior to procedures with low bleeding risk³¹</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 9. Conversion Between Parenteral Anticoagulants and Novel Oral Anticoagulants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Novel Anticoagulant to Parenteral Anticoagulant</strong></td>
</tr>
<tr>
<td><strong>Dabigatran</strong>²⁴</td>
</tr>
<tr>
<td>Dabigatran to UFH/LMWH:</td>
</tr>
<tr>
<td>CrCl ≥ 30 mL/min – Wait 12 hours after last dose before initiating UFH/LMWH</td>
</tr>
<tr>
<td>CrCl &lt; 30 mL/min – Wait 24 hours after last dose before starting UFH/LMWH</td>
</tr>
<tr>
<td><strong>Rivaroxaban</strong>²⁵</td>
</tr>
<tr>
<td>Rivaroxaban to UFH:</td>
</tr>
<tr>
<td>Start IV heparin 24 hours after discontinuation of rivaroxaban.</td>
</tr>
<tr>
<td>Rivaroxaban to LMWH:</td>
</tr>
<tr>
<td>Start SC anticoagulant 24 hours after discontinuation of rivaroxaban</td>
</tr>
<tr>
<td><strong>Apixaban</strong>²⁶</td>
</tr>
<tr>
<td>Apixaban to UFH/LMWH:</td>
</tr>
<tr>
<td>Discontinue apixaban begin taken and begin IV UFH/SC LMWH at the next scheduled dose of apixaban</td>
</tr>
<tr>
<td><strong>Edoxaban</strong>²⁷</td>
</tr>
<tr>
<td>Edoxaban to UFH/LMWH:</td>
</tr>
<tr>
<td>Discontinue edoxaban and start IV UFH/SC LMWH at next scheduled Edoxaban dose</td>
</tr>
</tbody>
</table>
anticoagulants (unfractionated heparin-UFH or low molecular weight heparin- LMWH) if their warfarin is transiently discontinued.

In these patients, parenteral anticoagulants are usually started once the INR is less than 2.

Once warfarin is reinitiated, parenteral anticoagulants can be discontinued once the INR is greater than 2.

With the newer oral anticoagulants, the timing of bridging with parenteral anticoagulants depends on the half-life of these medications and their clearance from the system.

### Conversion Between Warfarin and Novel Anticoagulants

While conversion between warfarin and newer anticoagulants is not seen commonly in clinical practice, Table 10 provides guideline on transitioning patients who may want to switch because of ease of administering the drug or other reasons.

<table>
<thead>
<tr>
<th>Warfarin to Novel Anticoagulant</th>
<th>Novel Anticoagulant to Warfarin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dabigatran</strong>&lt;sup&gt;28&lt;/sup&gt;</td>
<td>Discontinue Warfarin and start dabigatran when INR &lt; 2.0</td>
</tr>
<tr>
<td><strong>Rivaroxaban</strong>&lt;sup&gt;29&lt;/sup&gt;</td>
<td>Stop warfarin and start rivaroxaban when INR &lt; 3.0</td>
</tr>
<tr>
<td><strong>Apixaban</strong>&lt;sup&gt;31&lt;/sup&gt;</td>
<td>Discontinue warfarin and start apixaban when INR &lt; 2.0</td>
</tr>
<tr>
<td><strong>Edoxaban</strong>&lt;sup&gt;32&lt;/sup&gt;</td>
<td>Discontinue warfarin and start edoxaban when INR &lt; 2.5</td>
</tr>
</tbody>
</table>

### REFERENCES

Table 11. Adjustment in Dosing of Newer Anticoagulants

<table>
<thead>
<tr>
<th>Condition</th>
<th>Dabigatran</th>
<th>Rivaroxaban</th>
<th>Apixaban</th>
<th>Edoxaban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatic dosing</td>
<td>Not recommended for severe impairment (Child-Pugh class C)</td>
<td>Not recommended in moderate to severe hepatic impairment (Child-Pugh class B or C) and patients with any hepatic disease associated with coagulopathy</td>
<td>Not recommended for severe impairment (Child-Pugh class C)</td>
<td>Not recommended for moderate and severe impairment (Child-Pugh class B or C)</td>
</tr>
<tr>
<td>Age</td>
<td>Efficacy of rivaroxaban in the elderly (age ≥ 65 years) was similar to that of patients &lt;65 years of age. Both thrombotic and bleeding events were higher in the elderly; however, the risk to benefit profile was favorable among all age groups.</td>
<td>Avoid use if meeting 2 of the following criteria: Age ≥ 80 years, body weight ≤ 60 kg, or serum creatinine ≥ 1.5 mg/dL.</td>
<td>Reduce dose by 50% with concurrent use of CYP3A4 or P-glycoprotein inhibitors</td>
<td>Reduce dose by 50% when concurrent use of P-glycoprotein inhibitors</td>
</tr>
<tr>
<td>Major interactions</td>
<td>Avoid use with current use of P-glycoprotein inducer</td>
<td>Avoid use of combined P-glycoprotein and strong CYP3A4 inducers or combined P-glycoprotein and strong CYP3A4 inhibitors (29) HIV protease inhibitor is not recommended</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### REFERENCES


Please note: Due to limited space, we are unable to list all references. You may contact South Dakota Medicine at 605.336.1965 for a complete listing.

### About the Authors:
Marian Petraskova, MD, PhD, Assistant Professor, Cardiovascular Disease Fellowship Program, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.
Amol Raizada, MD, Cardiology Fellow, Cardiovascular Disease Fellowship Program, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.
Tereza Petraskova, BA, School of Arts, Washington University, St. Louis, Missouri.
Drug toxicity, clostridium difficile, and an increase in the number of multi-drug resistant organisms are issues that are plaguing many healthcare providers. All of these can potentially be linked to antibiotic overuse or misuse. In this era of increased emphasis on antimicrobial stewardship, many practitioners are looking for a chemical biomarker to help guide in the diagnosis and/or treatment of infections. One such biomarker being studied is procalcitonin (PCT). Studies regarding the use of PCT as a biomarker for infection have mostly been done in the setting of sepsis and lower respiratory tract infections; however, favorable observational data exists for other infections.

Although the use of PCT is somewhat controversial, the intent of this article is simply to lay out the evidence that is known to allow practitioners to make an informed decision regarding the potential implementation of PCT levels into their own practices.

Background
PCT consists of 116 amino acids and is cleaved from preprocalcitonin by endopeptidase. It is a peptide precursor to the hormone calcitonin (CT); however, PCT itself has no hormonal activity. In healthy, non-infected individuals calcitonin is synthesized in the thyroid and is important in calcium homeostasis. Calcitonin is regulated by the calcitonin-1 gene (CALC-1). It has been proposed that in the setting of a bacterial infection, cytokines and endotoxins released from bacterial cell walls blunt the final step in synthesizing calcitonin, creating an abundance of the precursor hormone, PCT. Neuroendocrine cells located in the lungs and intestines also produce PCT. In the presence of a bacterial infection, non-neuroendocrine and almost all parenchymal tissues are stimulated to produce PCT, leading to a significant increase in the circulating PCT levels. In contrast; the CT level does not change. Noninfectious inflammatory stimuli must be extremely severe in order for PCT to be elevated.

PCT provides several advantages over other inflammatory biomarkers (especially white blood cell count and C-reactive protein). These advantages include a rise earlier in infection, more rapid decrease when the infection is controlled, and a correlation to the extent of infection. PCT also remains elevated longer than most other biomarkers and will be present in neutropenic and other immunosuppressed patients.

As institutions begin to implement the use of PCT, it is recommended that a policy be created to guide practitioners and staff in the proper ordering, interpretation of results, and a protocol that prompts an active intervention upon result of the level.

Reference Levels
Following a triggering event PCT levels will first be detectable at two to four hours, peak in 12 to 24 hours, and have an observed half-life of 24 hours. Based on the kinetic profile, serial PCT levels are recommended and should be measured at least 48 hours apart in order to more accurately interpret the results. Levels normally parallel the infection; meaning that higher levels indicate more severe disease. As the infection is treated, in the absence of a secondary infection, the PCT levels will decrease steadily.

The age of the patient must be considered in the interpretation of PCT levels. For adults and children greater than 72 hours of age, normal PCT levels are considered to be less than or equal to 0.15 ng/mL. For children less than 72 hours of age, PCT levels are less than 2 ng/mL at birth, rise to less than or equal to 20 ng/mL at 18 to 30 hours of age, and fall to less than or equal to 0.15 ng/mL by 72 hours.

It has been observed that in adults and children greater than 72 hours of age, a PCT level of less than 0.15 ng/mL indicates that a significant bacterial infection is not likely. A level between 0.15 and 2 ng/mL does not rule out a bacterial infection; however, these levels may be associated with a localized infection. Levels greater than 2 ng/mL are...
typically indicative of a systemic bacterial infection, sepsis, or a severe localized infection.\textsuperscript{1}

**Lower Respiratory Tract Infections**

Strong evidence exists supporting the use of PCT as an adjunct laboratory measurement in the management of patients with lower respiratory tract infections (LRTIs), including pneumonia, chronic bronchitis exacerbations, and asthma exacerbations. A meta-analysis conducted in 2011 evaluated eight randomized, controlled studies (n=3431) and found the use of PCT in LRTIs resulted in a significant decrease in antibiotic prescriptions by 31 percent and a 1.3 day reduction in antibiotic duration. It was also concluded from these studies that PCT guided therapy did not impact mortality, ICU admission, or length of stay.\textsuperscript{5}

**Sepsis**

The use of PCT has also been studied frequently in the treatment of patients with sepsis. The results of three separate systemic reviews/meta-analyses showed a decrease in antimicrobial exposure by 19 to 38 percent. This decrease in exposure did not result in increased mortality, length of stay, or relapse/persistent infections.\textsuperscript{6-8}

Limited data exists in using PCT to assist in the initiation of antibiotics in the setting of sepsis; however, most evidence supports using the level to guide de-escalation/discontinuation of antibiotics.

**Other infections**

Although many of the randomized controlled trials regarding PCT have been conducted in respiratory infections and sepsis, several observational studies have been done utilizing PCT in other infections. Some of these other infections include abdominal infections, arthritis, bacteremia, endocarditis, meningitis, neutropenia, pancreatitis, postoperative fever, and urinary tract infections. The results of these observational studies varied; however, many showed moderate to strong evidence in favor of using PCT to help guide therapy. The result of these observational studies also showed that evidence in favor of or against using PCT in abdominal infections and pancreatitis was undefined.\textsuperscript{4}

**Limitations**

Although PCT has shown favorable results as a useful biomarker, it should never be used as a stand-alone test to determine the presence or absence of an infection or to predict mortality. Practitioners must always utilize PCT as an adjunct tool, interpreting the results in the setting of the patient’s clinical picture and other available laboratory information. As with any other test, false results (positive or negative) can occur with PCT. Elevations without a bacterial cause have been seen in newborns (less than 72 hours), major stress (severe trauma, surgery, cardiac shock, burns), use of cytokine stimulating agents, malaria, some fungal infections, prolonged decreased organ perfusion, paraneoplastic syndromes (medullary thyroid and small cell lung cancer), and significantly impaired renal function (especially ESRD/hemodialysis).\textsuperscript{2}

**Summary**

Although PCT has shown great promise as a chemical biomarker to assist in the ever growing antimicrobial stewardship efforts, it is not without faults. As institutions and practitioners decide if this test is right for them, they must keep in mind how they envision the test being utilized. Prior to implementation it is very important to establish policies to help guide staff in the ordering of the test, interpreting results, and defining what active treatment recommendations can be made based on the results.

**REFERENCES**


**About the Authors:**

Kari Taggart, PharmD, Assistant Professor, College of Pharmacy, South Dakota State University.

Shelby Nielsen, PharmD, Clinical Pharmacist, Avera McKennan Hospital.
Celebrating Excellence
Outstanding Residents
2016 Graduating Internal Medicine Residents

John Kinross-Wright, MD
Ukamaka Nwadibia, MD
Kevin Marquez, MD
Noah Wiedel, MD
Kalyan Potu, MD
Sean McGrann, MD
Anish Patel, MD
South Dakota Board of Medical and Osteopathic Examiners

President
Walter O. Carlson, MD, MBA

Vice President
Kevin L. Bjordahl, MD

Secretary
Brent J. Lindbloom, DO

Deborah K. Bowman

Mary S. Carpenter, MD

Elmo J. Rosario, MD

Laurie B. Landeen, MD

David E. Lust, JD

Jeffrey A. Murray, MD

- Protects the health and welfare of the state’s citizens by ensuring that qualified medical health care professionals are licensed to practice in South Dakota
- Licenses and regulates over 9,000 licenses within fourteen different medical categories
- Co-regulates medical professions with the Board of Nursing
- Establishes regulations by proposing legislation and adopting administrative rules
- Supports and promotes the Health Professionals Assistance Program that monitors the recovery and/or rehabilitation of impaired healthcare providers
Positioned for the Future, Focused on Partnership

Empowering Consumers with Choice

DAKOTACARE’s exceptional distinction is its broad provider network. Patients can stay with their doctor, choose their hospital and go to the pharmacy of their choice.

~ E. Paul Amundson, MD, Chief Medical Officer for DAKOTACARE

Committed to Participating Providers

DAKOTACARE and the South Dakota State Medical Association have enjoyed a long history of cooperation and mutual trust over the years, with direct involvement of South Dakota Physicians. This is what sets DAKOTACARE apart.

~ Michael W. Pekas, MD, Associate Medical Director for DAKOTACARE

Focused on Quality Care and Outcomes

DAKOTACARE works in a collaborative, non-adversarial way with network physicians, placing a top priority upon helping providers make quality-based decisions in the best interest of their patients.

~ James A. Engelbrecht, MD, Associate Medical Director for DAKOTACARE
Quality Focus:

Depression Screening Tools Improve Care

By Stephan D. Schroeder, MD, CMQ, CMD, Medical Director; and Dawn Hahn, RN-BC, CMCN, Project Manager

Although mental health professionals are skilled at identifying and treating depression, people often seek treatment for depression from their primary care physicians. Approximately 35 percent of patients seen in primary care meet criteria for some form of depression and 10 percent suffer from major depression. However, accurate identification of these patients is challenging.

Research suggests that guideline-based depression screening and tracking tools may improve early diagnosis and treatment. The U.S. Preventive Services Task Force currently recommends routine screening for depression when staff-assisted depression care supports are in place including coordination, case management, and mental health treatment.

The most commonly used screening tools for depression is the Patient Health Questionnaire (PHQ-9). The PHQ-9 demonstrates great validity and also measures severity and can be used at follow-up visits to evaluate the effectiveness of treatment. With the first two questions, you can eliminate depression in about half of the patients screened. If either of those questions gets a positive response, you go to the next seven. Patients with elevated scores should be referred for a full diagnostic interview.

Although tools for identifying and tracking patients with depression are available, there also needs to be strong support staff to get good outcomes in primary care. The American College of Preventive Medicine recommends that all primary care practices have systems in place to assure accurate diagnosis, treatment, and follow-up of mental health disorders. These systems may be either:

- Within your own practice, using clinical guidelines for the diagnosis and treatment of depression; or
- Within an established system of referral to mental health professionals.

Depending on the size of practice, a mental health professional could be included as an integral part of the clinic staff, or hire a part-time consultant. Another method is to establish an ongoing, collaborative relationship with a mental health provider in private practice.

Depression interventions initiated in the primary care setting have been shown to be effective for the treatment of depression. Findings of the STAR*D study confirm that primary care providers, when given the time, staffing, and reimbursement, can provide high-quality and appropriate care for patients with depression. A patient’s mental state deserves routine measurement and monitoring along with the weight, pulse, and blood pressure.

If you would like additional information, please feel free to contact Dawn Hahn at dawn.hahn@area-a.hcqis.org or me at stephan.schroeder@area-a.hcqis.org.

REFERENCES

Should a physician ever assist a dying person with suicide?

About 20 years ago my father was dying of metastatic colon cancer spread to bone. Dad was one of those unusual cases in which meds were simply inadequate for his unrelenting pain. Either he was totally unconscious, or awake and very uncomfortable. There seemed no helpful in-between, and too often pain meds brought wild and scary dreams, caused him to be combative, and frightened him and all involved.

My mom had called me one evening and warned that Dad was talking about driving into a bridge abutment. She handed him the phone and I pleaded with him not to do such a thing. “I will talk with your doctor and find a better pain reliever,” I promised. “How can I get relief, and how will this end?” he asked. I explained in cases like his, people often develop pneumonia, and since he directed us not to use antibiotics, this might bring it to a close pretty quickly.

Indeed, in less than two days he developed pneumonia, and his need for pain medicines dropped away, due to natural pain relief mechanisms that kick in when lungs start to fail. In two more days he escaped his cancer dying from pneumonia. The death certificate called it death by natural causes, but I suspect he voluntarily stopped coughing after our talk that night, which allowed for the blessing of a rapid case of pneumonia.

There are those who request that physicians should by law be allowed to prescribe death-inducing poisons for patients who are similarly suffering. These people could then fill the prescription, take the poison on their own time, and thereby choose to die on their own terms instead of having to wait for pneumonia.

In my opinion the issue turns around the word “intent.” It runs against my moral structure to give a poison intended to kill. On the other hand, I consider it acceptable to prescribe plenty of medicine intended to relieve suffering, even if it might hurry death.

It is truly my moral duty to provide comfort, not poison, as people are dying, even if it is the same medicine.
Student Member

Tony L. Berg, MD
Kevin L. Bjordahl, MD
Mary Bjordahl
Brook M. Eide, MD
Erin L. Eide
Gail Fuller
William C. Fuller, MD
Mark L. Harlow, MD
Micki Harlow
Joanie Holm
Richard P. Holm, MD
Kathy Jacobs
Ted B. Jacobs, DO
James Keil, MD
Claudette Margallo
Lucio N. Margallo, II, MD
Jean F. McHale
Michael S. McHale, MD
Karen McPherson
Scott A. McPherson, MD
Janice Minder
Jim L. Minder, MD
John R. Oliphant, MD
Rodney R. Parry, MD
Ruth Parry
Beth M. Pietila
Michael P. Pietila, MD
Marlys Porter
Richard I. Porter, MD
Julie T. Raymond, MD
Herbert A. Saloum, MD
Linda Saloum
Sarah Sarbacker, MD
Steve Sarbacker
Connie Schroeder
Stephan D. Schroeder, MD
J. Geoffrey Slingsby, MD
Jacalyn Slingsby
Jana Thompson
Vance Thompson, MD
Marilyn Van Demark
Robert E. Van Demark, Jr., MD

Member $175+

Benjamin C. Aaker, MD
Angela Kay Anderson, MD
Susan M. Anderson, MD
Priscilla F. Bade, MD
James M. Barker, MD
Margaret Anne Becker, MD
Jerome W. Bentz, MD
Lisa B. Brown, MD
Howard W. Burns, MD
Martin J. Christensen, MD
Rochelle Christensen, MD
Kara L. Dahl, MD
Jeffrey S. Dean, MD, FACS
Jeffrey S. Dean, MD, FACS
Thomas M. Dean, MD
Rachel C. Edelen, MD
Michael Eide, MD
Shelby L. Eischens, MD
Andrew R. Ellsworth, MD
David L. Elson, MD
Joel D. Farmer, MD
Stephen T. Foley, MD
John R. Fritz, MD
Stephen H. Gehring, MD
Patricia Kay Giebink, MD
Kurt J. Griffin, MD
Nicole J. Grossenburg, MD
Michael Shawn Haley, MD
Daniel J. Heinemann, MD
Laurie A. Hogden, MD
Robert C. Hohm, MD
Richard L. Kafka, MD
David L. Kapaska, DO
Donald H. Knudson, MD
Kenneth J. Knudtson, MD
Alan A. Lawrence, MD
Scott A. Lockwood, MD
Thomas L. Luzier, MD
James B. MacDougall, MD
George Maher, DO
Marisa C. Medina, MD
Mary J. Milroy, MD

Member $175+

Mark J. Oppenheimer, MD
Marian Petrasko, MD
Tim M. Ridgway, MD
William O. Rossing, MD
Robert J. Summerer, DO
Ronold R. Tesch, MD
Thavam C. Thambi-Pillai, MD
Eric R. Thomas, MD
Gary L. Timmerman, MD
Karen S. Tjaden, MD
Kynan Trail, MD
Victoria L. Walker, MD
Grace E. Wellman
Thomas C. White, MD
Jason W. Wickersham, MD

$100+

Susan Blake
Karl J. Heilman, III, MD
Robert C. Hohm, MD
Laurie B. Landeen, MD
Fred C. Lovrien, MD
Matthew E. Simmons, MD
Joseph Wyatt, MD

Chairman’s Club

$1,000+
(Physician and Spouse)

Karla K. Murphy, MD
Thomas Murphy

Senate Club $500+
(Physician and Spouse)

Mike Alley
Anne Barlow
John F. Barlow, MD
Douglas G. Bell, MD
Gaye Bell
Jean Bubak
Mark E. Bubak, MD
Mary S. Carpenter, MD
Mark East
Lynn Eckrich
Stephen G. Eckrich, MD
Virginia L. Frei, MD
H. Thomas Hermann, Jr., MD
Terry Hermann
Daniel C. Johnson, MD
Janice Knutsen
Roger S. Knutsen, MD
Stephen M. Kovarik, MD
Deborah Ann Kullerd, MD
Scott Maxwell
Jennifer K. May, MD
Stephan J. Miller, MD
Mary J. Milroy, MD
Mary D. Nettleman, MD
Jeremy Storm, DO

House Club $300+
(Physician and Spouse)

Christopher J. Adducci, MD
Helen Adducci
Marty L. Allison, MD
Robert L. Allison, MD
Michelle L. Baack, MD
Todd Baack
David W. Bean, Sr., MD
June Bean
Kay Berg

House Club $300+
(Physician and Spouse)

Your SDSMA PAC membership is very important in order to elect political candidates who understand the practice of organized medicine in South Dakota. To donate to SDSMA PAC, please visit www.sdsm.org.
For Your Benefit:

Your SDSMA Member Services and Programs

Your membership is voluntary, and we appreciate it. As a member of the SDSMA, you have access to valuable member services and programs. Those include member advocacy and physician representation; Legislative; Legal; Regulatory; Networking events; Leadership development; and Personal and professional education.

Want to know more? Call us at 605.336.1965, visit www.sdsmia.org or email membership@sdsmia.org.

“For Your Benefit” is the SDSMA’s monthly update on programs and services available to physicians through their affiliation with the SDSMA.

Medicaid State Plan Amendments

On July 1, the South Dakota Department of Social Services made changes to the South Dakota Medicaid State Plan concerning reimbursement for outpatient hospital services in the state’s fiscal year 2017.

Obsolete language pertaining to outpatient hospital reimbursement has been replaced with language to implement FY 2017 legislative appropriations.

The state estimates the federal fiscal impact associated with this amendment to be $211,749 in federal FY 2016 and $635,246 in federal FY 2017.

Learn more at https://dss.sd.gov/.

Source: South Dakota DSS

Member Updates Needed for 2017 SDSMA Directory

In order for the SDSMA office to provide members with timely information, it is important that members regularly review their contact information on file with the SDSMA. Is your email correct? Have you changed practice locations? Is your mail going to the right place? Please take a few minutes to review your profile information at www.sdsmia.org and make any necessary updates. Updated photos can be uploaded to your user account or emailed to membership@sdsmia.org.

The information listed in your profile is what the SDSMA uses for contacting you by mail, email, or phone, and this information is listed in the annual Member Directory.

Questions about updating your information can be directed to membership@sdsmia.org or 605.336.1965.

Source: SDSMA staff

Legal Brief Highlight: Limitations of Actions

A medical malpractice action may be brought against either individual physicians or professional corporations within two years after the alleged malpractice occurred, with a few exceptions.

A person making a claim based on an alleged error or omission that occurred while he or she was a minor must commence an action within two years of the alleged malpractice or before his or her 19th birthday, whichever period is longer. Because a minor need not bring a malpractice action until after they become an adult, all records pertaining to the treatment of minors should be kept beyond their 19th birthday. This rule should apply even if the physician-patient relationship has been terminated prior to that time.

Exceptions exist for continuing injury to the patient, continuing treatment of the condition, and if the physician intentionally conceals the condition or the cause of the condition.

For more information, download the SDSMA legal brief Limitations of Actions or access the risk mitigation resources at www.sdsmia.org. Through the SDSMA Center for Physician Resources, the SDSMA has developed more than 50 legal briefs that are available to members. In addition, the Center develops and delivers and programs for members in the area of practice management, leadership and health and wellness.

Source: SDSMA staff
Members of the South Dakota State Medical Association (SDSMA) and the SDSMA Medical Student Section attended the American Medical Association (AMA) Annual Meeting in Chicago in June with hundreds of others from across the country. The gathering was filled with activities and policy debate that will help shape the future of health care in the nation. Some policies adopted by the AMA House of Delegates include the following:

**Opioid Overdose Epidemic**
The physician role in reducing opioid medication misuse, overdose and death is an important one. Several new policies were put into place addressing factors that are critical to reversing the epidemic – including policies addressing prescription drug monitoring programs, access to naloxone and addiction medicine as a sub-specialty.

**Protecting Health Care Workers from Violence**
Approximately 70 percent of all reported workplace assaults between 2011 and 2013 occurred in health care and social service settings. To help address this, the AMA adopted policy that calls on the Occupational Safety and Health Administration (OSHA) to require health care employers to implement workplace violence prevention programs. While OSHA has issued guidelines for preventing workplace violence in health care settings, there is currently no enforceable, federal requirement for employers to implement them. The policy urges the federal government to develop and enforce a federal standard for health care employers to help shield health care workers from workplace violence. The policy also encourages physicians to participate in training to prevent and respond to threats of workplace violence.

**Supporting Hemorrhage Control Training to Save More Trauma Victims**
According to the World Health Organization, uncontrolled bleeding is the leading cause of potentially preventable death in trauma patients worldwide. Similarly, the U.S. military found that uncontrolled hemorrhage due to trauma was the most common cause of preventable death among more than 6,800 military casualties in Iraq and Afghanistan. The AMA adopted policy to encourage training for both professional first responders and the public in hemorrhage control techniques to help save the lives of more trauma victims.

**Reforming the Juvenile Justice System to Protect Adolescent Health**
The U.S. has the highest youth confinement rates in the world, yet 40 percent of today’s juvenile detentions and confinements are the result of non-violent offenses. With growing concerns about the lasting adverse mental and physical health effects on incarcerated youth, the AMA adopted new policies calling for reforms of the nation’s juvenile justice system to help protect the long-term health and safety of adolescents during and after confinement. Another new policy aims to help prevent youth incarceration when rehabilitation or community-based alternatives are most appropriate and no threat to public safety exists.

**Elimination of USMLE Step 2 CS**
The House of Delegates passed a resolution advocating for the elimination of USMLE Step 2 CS and COMLEX level 2-PE exams. Eliminating the national clinical skills exam for medical school graduates will reduce unnecessary costs in the education process without negatively affecting patient care. The exam fee alone costs $1,275 and most students pay hundreds of dollars more to travel to one of the five national testing centers. The exam provides students only a pass/fail grade. It is believed that testing basic clinical competencies and effective communication with patients can more efficiently be evaluated by individual medical schools, which would provide a more comprehensive assessment as well as targeted feedback to help students improve their skills in communication, history taking, physical examination, and clinical reasoning.

**Code of Medical Ethics**
Physicians affirmed a comprehensive update of the nearly 170-year-old *AMA Code of Medical Ethics*, the conclusion of a project started eight years ago to ensure that the AMA’s ethical guidance keeps pace with the demands of the changing world of medical practice. The modernized Code is the first comprehensive review of this foundational document in more than half a century. For this undertaking, the AMA Council on Ethical and Judicial Affairs reviewed each individual ethical opinion for clarity, timeliness, ongoing relevance in today’s health care environment and consistency.

**Gun Research, Background Checks**
The AMA adopted policy calling for background checks and a waiting period for all firearms purchasers, expanding on its previous policy...
of requiring the same for only handguns. Eighteen states have background check requirements, but the provisions vary widely. The newest policy builds on numerous AMA policies that support increased firearm safety to reduce and prevent firearm violence. The new AMA policy parallels policies endorsed by other health organizations. Additionally, the AMA resolved to lobby Congress to overturn legislation that for 20 years has prevented the Centers for Disease Control and Prevention from researching gun violence.

**New Telemedicine Ground Rules**

With the increasing use of telemedicine and telehealth technologies, delegates adopted new policy that outlines ethical ground rules for physicians using these technologies to treat patients. According to the new policy, any physician engaging in telemedicine must:

1) disclose any financial or other interests in particular telemedicine applications or services; and 2) protect patient privacy and confidentiality. The policy outlines guidelines for physicians who either respond to individual health queries electronically or provide clinical services through telemedicine.

Respectfully Submitted,

Mary S. Carpenter, MD, SDSMA Delegate to the AMA
Robert L. Allison, MD, SDSMA Alternate Delegate to the AMA

---

**Upcoming Events: “Physician Resiliency: Healing the Healer” and “Termination of an Employment Contract”**

The SDSMA Center for Physician Resources brings you two valuable events in its Practice Support Series.

**Sept. 13 – “Physician Resiliency: Healing the Healer”**

This program will also provide key advice on the litigation process and how to get through a malpractice claim both personally and financially.

**Oct. 4 – “Termination of an Employment Contract”**

This program will help you identify and address the unique challenges employment can present to professionalism and the practice of medicine, providing guidance on how to negotiate with potential employers.

Register today for the free webinars at www.sdsmoa.org.

*The USDOSSOM designates these activities for a maximum of 1 AMA PRA Category 1 Credit(s). Physicians should claim only the credit commensurate with the extent of their participation in the activity.*

Source: SDSMA staff

---

**SDSMA 2017 Member Directory – Great Advertising Opportunity!**

The SDSMA is in final development of the 2017 Member Directory. This is a great opportunity for organizations of all sizes to reach physicians and health care facilities through the nearly 3,000 directories distributed across the region. These directories are widely used and often-referenced throughout the year giving your organization continuous exposure.

Advertisers receive a copy of the directory which includes photographs of more than 2,500 members as well as office addresses, telephone and fax numbers, and medical specialties. Directories will be distributed in early January.

Maximize your advertising dollars for 2017. Contact Laura Olson at lolson@sdsmoa.org or 605.336.1965 today to secure a place for your organization’s advertisement. Ad copy is due Sept. 2. Call or email today for advertising rates, deadlines and to obtain a contract – take advantage of this opportunity!

Source: SDSMA staff
Physicians have submitted comments to the Centers for Medicare & Medicaid Services (CMS) detailing the changes that should be made to the draft rule for the new Medicare physician payment system in order to make it work better for physicians and patients.

The American Medical Association (AMA) and state medical societies are urging changes across the reformed program as well as revisions that are specific to the Merit-based Incentive Payment System (MIPS) and the alternative payment model (APM) option.

Three of the overarching program recommendations call on CMS to:

• Create a transitional reporting period in the first year, beginning July 1, to allow sufficient time to prepare physicians and have a successful launch of the new payment system.

• Provide more flexibility for solo physicians and small group practices, such as modifying the low volume threshold, lowering reporting burdens, comparing practices to their peers, and providing education, training and technical assistance to these practices.

• Provide physicians with more timely and actionable feedback in a more usable and clear format.

The comments outline several key recommendations regarding MIPS, which currently is comprised of four components. The comments ask CMS to:

• Align the different components so MIPS operates as a single program, rather than four separate parts.

• Further simplify reporting burdens by creating more opportunities for partial credit and reducing the number of required measures.

• Maintain the thresholds for reporting on quality measures at 50 percent.

• Replace current cost-of-care measures that were developed for hospital-level measurement and refine new episode-of-care measures prior to widespread adoption.

• Remove the pass-fail component of the Advancing Care Information score and restructure the electronic health record performance measures rather than folding the current Meaningful Use Stage 3 requirements into MIPS.

• Improve risk adjustment and attribution methods before moving forward with the resource use category, and reduce the number of required Clinical Practice Improvement Activities.

MIPS is a revised fee-for-service model that most physicians will participate in initially, but the program allows for an alternative course through APMs that may work better for some practice types. Physicians detailed several ways the APM option could be improved, including:

• Simplify and lower financial risk standards for advanced APMs, and base the risk requirements on physicians’ Medicare revenues instead of total Medicare expenditures.

• Provide more opportunities for APM participation.

More than 110 state medical societies and national medical specialty societies signed a letter to CMS that called for simplification, an easier APM pathway, and accommodations for physicians in small and rural practices. Physicians identified in the letter several of the positive MIPS proposals that should be finalized, including reporting quality information through a variety of methods, such as electronic health records (EHR), clinical registry, qualified clinical data registry (QCDR) and group practice reporting.

Source: AMA
# CME Events

Continuing Medical Education events which are being held throughout the United States (Category 1 CME credit available as listed)

<table>
<thead>
<tr>
<th>August 2016</th>
<th>August 2016</th>
<th>August 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>August 17</strong> &lt;br&gt;VA Tumor Conference &lt;br&gt;AMA PRA Category 1 Credit(s)” available &lt;br&gt;Register online: usdssom.learningexpressce.com</td>
<td><strong>August 16</strong> &lt;br&gt;VA Medical CME Activity: Teratogenic Medications in Pregnancy &lt;br&gt;AMA PRA Category 1 Credit(s)” available &lt;br&gt;Register online: usdssom.learningexpressce.com</td>
<td><strong>August 25</strong> &lt;br&gt;Pediatric Grand Rounds &lt;br&gt;AMA PRA Category 1 Credit(s)” available &lt;br&gt;Register online: usdssom.learningexpressce.com</td>
</tr>
<tr>
<td><strong>August 18</strong> &lt;br&gt;Pediatric Grand Rounds: Emerging Infectious Diseases and Zika Virus &lt;br&gt;AMA PRA Category 1 Credit(s)” available &lt;br&gt;Register online: usdssom.learningexpressce.com</td>
<td><strong>August 22</strong> &lt;br&gt;Dermatopathology Conference/Pathology Grand Rounds: Psoriasiform Dermatitis &lt;br&gt;AMA PRA Category 1 Credit(s)” available &lt;br&gt;Register online: usdssom.learningexpressce.com</td>
<td><strong>DO YOU HAVE A CME EVENT COMING UP? WOULD YOU LIKE TO HAVE IT LISTED HERE?</strong> &lt;br&gt;Contact: Elizabeth Reiss, South Dakota Medicine, 2600 W. 49th Street, Suite 200, Sioux Falls, SD 57105 &lt;br&gt;Phone: 605.336.1965 • Fax: 605.274.3274 &lt;br&gt;Email: <a href="mailto:ereiss@sdsmma.org">ereiss@sdsmma.org</a></td>
</tr>
</tbody>
</table>

---

### Sioux Falls VA Health Care System

A Hospital for Heroes!

- First-Class Care.
- In Sioux Falls Since 1949.
- High Patient Satisfaction Scores!
- General Medical, Surgical & Psychiatric.
- VA Provides a Variety of Services & Benefits for Veterans.
- Serving Veterans in Eastern South Dakota, Southwestern Minnesota & Northwestern Iowa!

---

We strive to hire only the BEST! For employment opportunities, call 605-333-6852 or log on to www.siouxfalls.va.gov or www.usajobs.gov
Physician Directory

PATHOLOGY

Anatomic Pathology & Clinical Pathology

PHYSICIANS LAB SERVICES
- Cytopathology
- Surgical Pathology
- Hematopathology
- Clinical Pathology Consultation
- Fine Needle Aspiration Cytology

focused on excellence

1301 S. Cliff Ave., Suite 700 • Sioux Falls, SD • (605) 322-7200 • 1-800-658-5474
www.pplpath.com

SIoux Falls:
Steve P. Olson, MD
Karla K. Murphy, MD
Raed A. Sulaiman, MD
Bruce R. Prouse, MD
Michelle J. Bleile, MD
Jacquelyn D. Choate, MD
Shannon M. Gabriel-Griggs, MD
Catherine T. Stoots, MD
Erin E. Quist, MD
Bailey A. Reindl, MD

MITCHELL
Kim M. Lorenzen, MD

YANKTON
Richard D. Strom, MD

SPENCER, IA
Stephanie J. Johnson, MD
Lori L. Sinclair, MD

Advanced technology powered by human touch
We understand the art of healing and the science of avoiding risk.

Medical liability and more.

At MMIC, medical liability is just the beginning. For more than 35 years, we’ve worked directly with physicians and developed a deep understanding of the risks involved with practicing medicine. We’re there for those who are always there, drawing on a wide range of clinical data, insights and best practices from medical experts to help care teams deliver better care. To learn more visit MMICgroup.com.
What's stronger than cancer? Our clinical trials.

**CLINICAL TRIALS AT SANFORD HEALTH**

Carefully conducted research studies are the fastest and safest way to find new treatments and improve the health of all patients. Sanford Health provides the most advanced care and treatment that today's medical research offers and has over 250 open cancer clinical trials and over 320 open clinical trials [all disease types](#). Participating in a clinical trial may provide you with access to innovative treatments, while helping to improve care and find cures for future generations.

The types of studies conducted at Sanford Health include:

- **Treatment studies** to improve the standard of care.
- **Prevention studies** to look for better ways to prevent disease.
- **Diagnostic and screening studies** designed to find better ways to detect diseases.
- **Quality of life studies**, which explore ways to improve comfort and quality of life for patients.

SANFORD CANCER CENTER

1-87-SURVIVAL