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Looking out my window, I see the colorful leaves falling and blowing across the yard; sure signs of fall are definitely here. With the onset of fall, activity at the SDSMA picks up.

The Council of Physicians met Sept. 19 in Mitchell, and it was a great way to kick off the 2014-15 calendar. I am always impressed with the dedication and thoughtful discussion of Councilors as they debate and create policies which will have a profound effect on the health of South Dakotans and the practice of medicine in our state. I want to express my deep sense of gratitude to the Councilors and committee members who take time out of their busy practices to contribute to the SDSMA.

The district meetings have started and Barb Smith and I have visited the Mitchell, Watertown, Black Hills and Aberdeen districts. We’ve enjoyed getting out on the road to visit with members and spouses, and have been hosted at fun socials and dinners. I’ve enjoyed sharing our 2015 SDSMA advocacy agenda and have appreciated the questions and input from members. Previous SDSMA presidents have enthusiastically said the district visits were the favorite part of their presidential year. I would say that is definitely true and I look forward to the upcoming visits.

The repeal of the sustainable growth rate (SGR) formula continues to top the national agenda for both the AMA and SDSMA. The Balanced Budget Act of 1997 tied Medicare payments to the growth of the U.S. economy. Unfortunately, the cost of care far exceeded general economic growth and created a shortfall in Medicare funding. If the SGR would go into effect, it would result in a precipitous fall in Medicare reimbursement which has already failed to keep up with inflation. From 2001 to 2013, the average Medicare physician payment update was just 0.29 percent, while the government measure of inflation in medical practice estimated that costs had risen 25 percent during that same time period. In 2002, the conversion factor required a 5 percent cut. By 2013, the size of the cut had grown to 26.5 percent. Including the additional 2 percent cut required by the Budget Control Act of 2011, the cut today approaches 30 percent. Everyone, including Congress, realizes that deep cuts create a crisis in providing health care to the nation’s seniors. Unfortunately, rather than address and fix the problem, Congress has passed 17 short-term patches which have only delayed the inevitable day of reckoning. The SDSMA supports innovative physician-led initiatives to replace the SGR with new payment models which will improve the quality of care while lowering costs. We all need to let our voices be heard that the time for SGR repeal is now.

On a state level, expanding access to health care continues to be an important advocacy issue. The U.S. Supreme Court’s decision that the Affordable Care Act’s (ACA) requirement that states expand Medicaid was unconstitutional has left individuals making less than 100 percent of the federal poverty level (FPL) in a loophole whereby they are left with no coverage, while individuals making 100 to 400 percent qualified for the federal subsidies on the exchange. This left it up to individual states to decide whether to expand Medicaid coverage. South Dakota has not expanded Medicaid. The SDSMA supports expanding Medicaid to individuals making less than 100 percent of the FPL and supports continued Medicaid pilot projects to provide health care more efficiently and cost effectively.

A provision in the ACA required Medicaid payments for primary care providers to be raised to Medicare levels in 2013 and 2014 and is due to expire Dec. 31. Unless the state of South Dakota acts, Medicaid payments will plummet. The SDSMA has sent letters urging that reimbursement keep pace with inflation. This represents an important advocacy issue for us all as we strive toward access to care for all South Dakotans.

The Tier 1 program of the State Employee Health Plan is an issue of member and patient concern. This program uses financial disincentives to encourage employees to have procedures done at Tier 1 facilities. The SDSMA believes that this fragments care, places unreasonable travel requirements on patients and drives care out of community health care facilities. The SDSMA wrote to Gov. Daugaard expressing our concerns and recently met with high-level officials in the governor’s Administration to offer alternatives for coordinated, local health care. We were pleased with the open communication, receptivity to our concerns and look forward to a good working relationship.

Initiated Measure (IM) 17 will be on the statewide ballot on Election Day. The SDSMA believes that the physician-patient relationship is a key foundation in providing quality health care. For that reason, the SDSMA strongly supports IM 17.

As you can see, the SDSMA continues to work hard on behalf of its members to improve the health care of South Dakotans and the practice of medicine in our state.
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When Bob Dylan wrote his song, *The Times They Are a-Changin’*, he could have been writing about the South Dakota State Medical Association Alliance:

*Come gather 'round people wherever you roam*
*And admit that the waters around you have grown*
*And accept it that soon you'll be drenched to the bone*
*If your time to you is worth savin’*
*Then you better start swimmin’ or you'll sink like a stone*
*For the times they are a-changin’*

A group of volunteer Alliance members met in Pierre on Oct. 13 to "get with the times" and start "a-changin’" our organization. We recognized that the Alliance has been a support system for members for over 100 years. Fifty years ago, and certainly over 100 years ago at our founding, physician spouses were practically all female, and usually remained in the home to raise a family and manage the household. They volunteered time for worthy causes and enjoyed the company of others who lived the same life challenges: daddy on call, Christmas dinner interrupted, pagers going off in the middle of a basketball game. Today, however, physician spouse/partners are approximately 50 percent male, and often have their own professions, perhaps as a physician themselves. Hospitalists and specialists have changed/reduced the call obligation, and the need for a support group for physician spouses has diminished considerably.

With that in mind, we had to ask ourselves, "Are we still relevant in today's society? Why would busy people choose to spend their time becoming active in the Alliance? What makes us different from any other volunteer organization? What is our purpose?" One member quickly pointed out that we are effective lobbyists on health and medical issues that come before the state legislature. We support our physicians with that work. If we do not make medicine's views known, someone else is eager to present their opinion, and it may be an alternative view that we do not support. I could list many examples of our successes, but child safety seats, mandatory seat belts in front seats, and increasing the tobacco tax come to mind. We have also lobbied at various times for money for the medical school and increases in class size. Another member felt that the activities we organize to support medical scholarships are important to continue. Physicians coming out of medical school have huge school debts, and those scholarships affect our most recent graduates and spouses. Since we all want our volunteer time to support causes that make a difference in our communities, everyone saw value in continuing to offer a quick and easy state health project.

When the discussion ended, we did see relevancy in our organization, but knew it had to be streamlined and simplified to meet the time demands of members' lifestyles. First, we agreed to try a committee structure for one year, and reduced the organization at the state level to four focus groups:

- **Health Project** – Stephanie Lehmann, Cathie Calhoon and interested volunteers;
- **Legislation** – Suzanne Wiedel, Peggy Huber and interested volunteers;
- **Medical Student Scholarship/Fundraising** – Grace Wellman, Mary Lou Pierce and interested volunteers;
- **Membership** – Linda Saloum and interested volunteers

For practical purposes we retained a secretary (Peggy Huber) and treasurer (Sally Kelts). Gone are the formal offices and titles, and the quarterly meetings! No year-long obligations! One-time events! Instead, focus groups will operate individually, and set their own goals for the year, or their one event. Other volunteers expressed interest in retaining the newsletter (Connie Schroeder), continuing to maintain our history in the archives (Marlys Porter) and re-writing the bylaws, which have been suspended as we rework our leadership style (Patti Herlihy).

Districts can organize in any manner that works for them. Meet once a year or once a month! Participate in the state health project or identify your own local project. Have one committee team or have 10! What does your group want? A contact name with an email address will be needed to receive information from the four focus groups at the state level. Districts are free to collect their own dues, or if necessary, have the state membership coordinator do it.

The volunteer group that met at the Oct. 13 meeting felt that our overall mission was to identify our relevance, simplify our function, and continue our group's service in a manner that fits with today's society. I think our founders would be proud of how we have adapted their plan to our lifestyle!
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Polycystic ovary syndrome (PCOS) is the most common metabolic abnormality in reproductive age women. This syndrome has multiple effects on both metabolic and reproductive health.

PCOS, previously also known as Stein-Leventhal syndrome, was described by Drs. Stein and Leventhal at Rush University in the 1930s when they described patients with sterility, hirsutism, and amenorrhea. The authors studied these patients to try to ascertain their cause of amenorrhea initially with pneumoroentgenography which demonstrated bilaterally enlarged ovaries. They then proceeded to laparotomy with wedge resection of the enlarged ovaries and described the pathologic criteria for PCOS; symmetrically enlarged pearly ovaries, a thickened capsule, multiple 2 to 8 or 10 mm clear cysts in the cortex, absence of corpora albicanta or lutea, as well as edema and fibrosis of the underlying stroma.2 Following surgery the authors noted that some of these patients resumed regular menses consistent with ovulation. These initial observations launched research into this condition which continues to this very day.

PCOS is characterized by oligo or anovulation and hyperandrogenism, which results in irregular menses or amenorrhea as well as hirsutism and in severe cases virilization. The exact etiology of PCOS remains enigmatic. Most patients with PCOS have some degree of insulin resistance which may play a role in its development. PCOS has been associated with a number of comorbidities including infertility, endometrial hyperplasia and carcinoma, hirsutism, type 2 diabetes mellitus, hyperlipidemia, hypertension, sleep abnormalities, depression and heart disease. Because women with metabolic syndrome are at increased risk of PCOS, one of its aliases is Syndrome XX.

PCOS remains an area of active investigation. One of the issues faced by investigators have been the number of different definitions used in the past for PCOS. There have now been a number of consensus conferences to arrive at uniform diagnostic criteria to allow for better communication and research. The Rotterdam consensus requires that the patient have two of the three following signs and symptoms; irregular or no menses, clinical or laboratory evidence of hyperandrogenism, and polycystic ovaries on ultrasound. It is also vital to exclude other endocrine conditions which can mimic PCOS including androgen producing ovarian tumors, late onset congenital adrenal hyperplasia, hyperprolactinemia, thyroid dysfunction, Cushing's syndrome, and acromegaly.

In 2013 the Endocrine Society published guidelines for the evaluation and treatment of women with PCOS.3 These guidelines review the evidence and make recommendations on the best method to evaluate and treat women who present with PCOS. The authors suggest that the Rotterdam criteria still be used in making the diagnosis in reproductive age women and also review the unique challenges in making the diagnosis in the adolescent or menopausal patient. Also when evaluating a patient with PCOS it is important to assess for the commonly associated co-morbidities such as type 2 diabetes, hyperlipidemia, obesity, hypertension, endometrial hyperplasia and carcinoma, as well as others. Evidence-based treatments for patients with PCOS are also discussed. Treatments include combined oral contraceptives for those not interested in currently conceiving which will help prevent the development of endometrial hyperplasia while also reducing ovarian androgen production. Combined oral contraceptives also increase sex hormone binding globulin which will further decrease circulating free testosterone. On the other hand, clomiphene citrate, to induce ovulation is the drug of choice for women who wish to conceive. Metformin is indicated in patients with PCOS who have evidence of glucose intolerance. These guidelines are comprehensive and give evidence based recommendations for patients with PCOS. Health care providers who care for women with PCOS will find these guidelines indispensable.
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Your ownership and insight puts the “care” into DAKOTACARE.
An Algorithm for the Evaluation and Treatment of Sacroiliac Joint Dysfunction

By Samuel W. Carlson, MSII; Sean Magee, PT, MDT; Walter O. Carlson, MD, MBA

Abstract
Approximately 90 percent of adults experience an episode of low back pain in their lifetime. Sacroiliac joint (SIJ) dysfunction has been shown to cause approximately 13-30 percent of LBP in the adult population. SIJ fusion is becoming an increasingly popular treatment alternative for SIJ dysfunction. This paper presents a literature-based algorithm to assist the clinician in the evaluation and treatment of patients with suspected SIJ dysfunction.

Introduction
Low back pain (LBP) is the second most common reason patients visit their primary care physicians.\textsuperscript{1,2} Approximately 90 percent of adults experience an episode of LBP in their lifetime.\textsuperscript{1,2} The total economic burden of LBP on individuals and the community is high and increasing with various estimates ranging from $60 to $100 billion annually.\textsuperscript{3,4} Traditionally, it has proven difficult to accurately and reliably diagnose the specific pain generator(s) that contribute to a patient’s LBP. The sacroiliac joint (SIJ) is becoming increasingly recognized as a pain generator that contributes to chronic LBP.\textsuperscript{5} While reports in the literature vary, SIJ pain accounts for approximately 13 percent of LBP with some estimates as high as 30 percent.\textsuperscript{6,7} The potential to overlook SIJ pain as a major contributor to LBP remains a concern, resulting from the difficulty of diagnosing pain generator(s) of LBP. Thus, it is essential that health care providers managing patients with LBP have effective methods and reliable research to evaluate and to treat SIJ dysfunction. The following algorithm provides health care providers with the first comprehensive, peer-reviewed assessment tool to evaluate and treat LBP caused by SIJ dysfunction.

Purpose
SIJ dysfunction is a significant cause of LBP. An algorithm for assessing SIJ dysfunction as the cause of LBP when evaluating, diagnosing, and treating patients with LBP will provide clinicians with a useful tool in decision making. The purpose of this paper is to employ the most current literature and our experience in determining SIJ dysfunction as a cause of LBP and to create an algorithm (Figure 1) for clinicians to use when evaluating SIJ dysfunction as a cause of LBP.

Materials and Methods
This algorithm was based on our experience evaluating and treating patients with LBP and SIJ dysfunction. In addition, we researched the literature pertaining to LBP, SIJ dysfunction, and the evaluation and treatment of LBP and SIJ dysfunction.

Algorithm
This paper provides an algorithm (Figure 1) to help clinicians arrive at an accurate and reliable diagnosis of SIJ dysfunction as a cause of LBP. The algorithm begins by assuming that the patient’s LBP originates in the lumbar spine until proven otherwise. This assumption is valid based on data from the literature that suggests that lumbar spine pathologies are more likely to be the principal pain generator(s) that contribute to LBP.\textsuperscript{7,8} However, recently DePalma et al. has shown that SIJ pain is predicted to be the primary source of LBP for low BMI females age 60-80.\textsuperscript{9} When taking the patient’s history, there are certain historical facts consistent with SIJ dysfunction such as vaginal delivery, a lumbar sacral fusion, or post disruptive pelvic trauma.\textsuperscript{10,11} Because there are many potential pain generator(s) that can contribute to LBP, it is important that the clinician also possesses a sufficient understanding of these pathologies in order to recognize or dismiss them as the primary source of LBP.

After completing the patient’s history, the clinician then performs a mechanical hip and/or a mechanical low back evaluation in order to further investigate the hip and/or spine as the primary cause of the patient’s LBP. Mechanical symptoms and signs originating from the low back are predictable and will increase or decrease, peripheralize or centralize, and remain worse or become better...
SI Joint Algorithm

Always assume that the perceived SI joint pain is coming from the lumbar spine until proven otherwise.

START

History (Correlates with a pain possibly originating from SI joint)
- Pain post vaginal delivery
- Fall onto buttocks
- Prior lumbar sacral fusion
- Ipsilateral iliac bone graft harvest
- Post "breaking" in head on collision
- Post disruptive pelvic trauma
- Pain located at SI joint or below
- Possible posterior thigh or leg pain
- Possible groin pain
- Pain with weight bearing activity
  - Walking, running, ascending/descending stairs and curbs, lifting, lying on involved side

(+) Mechanical Low Back Evaluation

(No effect on SI or referred pain) (Pain Centralized or Abolished)

(+) Treat as Mechanical Low Back Pain

(-) Mechanical Hip Evaluation

(No Effect)

(+) Treat as Mechanical Hip Pain

(-) Mechanical SI Joint Evaluation

3 or more positive SI Joint tests
- Pain below LS vertebral body
- Normal Patellar Tendon/Heel cord reflexes
- No nerve tension signs
- (-) SLR and sitting slump test
- Positive Ferri Finger Test
- Scoliosis, Pelvic Obliquity, True Leg Length Discrepancy

(+) Pain of SI Joint Origin

Conservative Care for SI Joint Dysfunction
- Anti-inflammatory Medication
- SI joint Belt
- Alter Activities
- Physical Therapy, chiropractor, osteopath for SI joint mobilizations or manipulation

Imaging studies (if lumbar is negative.)
- AP Pelvis/Hips
- SI Joint
- CT & MRI Optional

(Short Term or No Relief) (Pathology Noted)

Treatment of Other Pathology Causing SI Joint Pain
- Hip
- Pelvis
- SI Joint
  - Fractures
  - Tumors
  - Infection

Figure 1: A Visual Representation of the Algorithm Described by this Paper
with different movements and/or positions of the low back. If pain centralizes or abolishes with repetitive test movements or sustained positioning of the lumbar spine, the pain is being referred from the lumbar spine. These signs typically indicate discogenic pain and thus must be treated as such. If pain primarily comes on with weight bearing activities, the hip joint must be ruled out as the source of pain. Pain originating from the hip joint will usually increase with the hip Scour’s test (Figure 1), FABER test (Figure 2) and/or FADIR test (Figure 3). Mechanical hip pain will often respond to repetitive test movements or sustained positioning of the hip with a directional preference: increasing or decreasing, and remaining worse or better after the movements or the sustained position. If the hip is determined to be the source of the pain, then the clinician should treat the specific hip condition causing the pain.

When the history suggests SIJ dysfunction as a possible diagnosis and the mechanical low back and/or mechanical hip evaluations produce negative results, the clinician should begin to conduct a mechanical SIJ evaluation. The mechanical SIJ evaluation begins with a Fortin finger test in which the patient is asked to point to where he or she is experiencing pain. A positive result occurs when the patient points to an area below the L5 vertebra or when he or she points to the SIJ. If a patient points to a position superior to L5 then it becomes less probable that the patient’s LBP results from SIJ dysfunction. With a positive Fortin finger test, the clinician should begin to perform SIJ pain provocation tests to further examine the SIJ. There are five common SIJ provocation tests that should be performed: distraction (Figure 4), compression (Figure 7), thigh thrust (Figure 5), Gaenslen’s (left and right) (Figure 6), and the sacral thrust provocation test (Figure 8). When any of these tests elicit the patient’s clinical pain, they are considered positive. The literature suggests that in the absence of centralization during the mechanical back evaluation, if three or more of the provocation tests are positive it is indicative of SIJ dysfunction. Thus, if mechanical low back and hip pain have been dismissed, and the history and physical examination suggests SIJ dysfunction, the clinician should proceed with the SIJ algorithm for treatment and diagnosis.

From the algorithm, phase 1 treatment for SIJ dysfunction includes anti-inflammatory medication, the use of a sacral belt, and altering the patient’s physical activities. If anti-inflammatory medications do not provide the patient with sufficient pain relief, a sacral belt can be applied. For additional pain relief, it is recommended that the patient alter his or her daily activities such as lying on the painful side or sitting for extended periods of time. If the patient’s pain subsides, the patient can return to normal activity. If phase 1 treatment provides temporary relief, the clinician is advised to begin phase 2 treatment.

Phase 2 treatment consists of SIJ manipulations conducted by chiropractors, osteopaths, and/or physical therapists. Manipulation is frequently used to treat patients with LBP and has proven to be an effective treatment method. If the clinical prediction rule developed by Flynn et al. is followed for lumbar pelvic manipulation, and four of the five factors are present, there is over a 90 percent likelihood of improvement. If the pain decreases, the patient can return to normal activity. If there is no reduction in pain or there is only temporary relief from manipulation, mobilization and/or directional preference exercises it is recommended that phase 3 treatments begin.

Phase 3 treatment consists of stretching, strengthening, core strengthening, stabilization exercises, and balance training conducted by a physical therapist. If the patient's pain decreases, he or she can return to activities as tolerated. When the patient does not respond to phase 3 treatments, the clinician then obtains CT and/or MRI images of the pelvis, SIJs and hips. If the imaging studies reveal hip joint pathology, pelvic/hip fracture, tumors, infections, or other pathologies, the clinician should provide appropriate treatment for these conditions. If there is no response to the treatment of the presumed pelvic or hip pathology, it is recommended that the clinician reassess the low back. If the imaging studies are negative, then the clinician should begin phase 4 treatment.

Phase 4 of the algorithm starts with an SIJ injection, which can provide both diagnostic information and therapeutic effects. Injections should be performed with either fluoroscopic or CT image guidance, enhancing the clinician’s ability to deliver an accurately placed injection. Research has shown with the use of image guidance, successful SIJ needle placement was achieved in 90 percent of patients. The injections are diagnostic if the patient experiences pain relief for the duration of time that the anesthetic agent is active. The literature states that a reduction in pain by 70-80 percent based on the patient's perceived changes in pre- and post-injection pain rating scales (1-10) is a positive test. If the patient experiences pain relief for only a short period of time, the injection is considered diagnostic but not therapeutic and the patient can begin phase 5 treatment.

Phase 5 treatment involves another SIJ injection. If this injection provides long-term pain relief then the patient can progress to activities as tolerated. If the second
Injection only provides temporary relief then the injection was diagnostic, but not therapeutic and the patient should consider alternative treatment options as defined by the algorithm.

In phase 6, the alternative treatment options include acupuncture, neuro-augmentation, radiofrequency ablation, and prolotherapy.8,37-42 If the patient’s pain subsides, the patient can return to activities as tolerated. If there is no significant response to phase 6 treatment and the patient’s pain has been present for over six months, the clinician should progress to phase 7 treatment.

According to phase 7, after all conservative treatment options have been exhausted and the pain is limiting the patient’s activities of daily living, SIJ fusion becomes a viable option (Figure 2). According to the literature, SIJ fusion procedures have a high confirmed fusion success rate with some studies reporting a fusion success rate of 92 percent.43 Once a successful SIJ fusion is completed, and the patient’s pain is abolished, the patient may return to activities of daily living. If the patient’s pain does not respond to the fusion treatment, it is advised that the patient be referred to a chronic pain clinic for long-term pain management.

Conclusion

This algorithm was developed to assist clinicians in diagnosing and treating LBP caused by SIJ dysfunction. LBP can be the result of multiple pain generator(s) and it is essential that the clinician has an effective and reliable method for evaluating and treating the pain generator(s) responsible for LBP. While not all LBP is generated by SIJ dysfunction, SIJ dysfunction remains a significant cause of LBP and remains difficult to precisely diagnose. Thus, physicians are encouraged to use this algorithm in evaluating patients with LBP.
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Sacraliliac Joint Pain Provocation Tests

Figure 4. Distraction Test
The subject lies supine. The examiner applies a posterior directed force to both anterior superior iliac spines. The test is positive when the patient’s exact pain is reproduced or increased.

Figure 5. Thigh Thrust Test
The patient lies supine with the hip and knee flexed where the thigh is at a right angle to the table and slightly adducted. One of the examiner’s hands cups the sacrum and the other arm and hand wraps around the flexed knee. The pressure applied is directed dorsally along the line of the vertically oriented femur. The procedure is carried out on both sides. The test is positive when the patient’s exact pain is reproduced or increased.

Figure 6. Gaenslen’s Test
The subject lies supine near the edge of the table. One leg lies over the edge of the table, and the other hip and knee are flexed toward the patient’s chest. The examiner applies firm pressure to the flexed knee toward the chest and a counter pressure to the knee of the hanging leg toward the floor. The procedure is carried out on both sides. The test is positive when the patient’s exact pain is reproduced or increased.

Figure 7. Compression Test
The subject lies on his/her side, with the hips and knees flexed to about a right angle. The examiner kneels behind the subject on the table. The examiner applies a pressure vertically downward on the upper iliac crest. The procedure is carried out on both sides. The test is positive when the patient’s exact pain is reproduced or increased.

Figure 8. Sacral Thrust Test
The subject lies prone. The examiner applies a pressure vertically downward on the center of the sacrum. The test is positive when the patient’s exact pain is reproduced or increased.

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:
Samuel W. Carlson, MSII, University of Iowa Carver College of Medicine, Iowa City.
Sean Magee, PT, MDT, Orthopedic Institute, Sioux Falls.
Walter O. Carlson, MD, MBA, Orthopedic Institute, Sioux Falls.
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Stroke: Current Concepts

By Megan Albertson, MD; and Jitendra Sharma, MD

Abstract
Cerebrovascular accidents (CVAs) are the leading cause of disability and the fourth leading cause of death in the U.S. The WHO defines stroke as “rapidly developing clinical signs of focal disturbance of cerebral function lasting more than 24 hours with no apparent cause other than of vascular origin.” Strokes are subdivided into two major classifications: ischemic (80–87 percent) and hemorrhagic (13–20 percent). Ischemic strokes occur from thrombi, emboli, or global hypoperfusion. Hemorrhagic strokes are either parenchymal (10 percent of all strokes) or subarachnoid (3 percent of all strokes). There are a variety of recognized risk factors for stroke which include: age, race, family history, hypertension, diabetes mellitus, atherosclerosis, cardiac arrhythmias, prosthetic valves, hyperlipidemia, cigarette smoking, and others (drugs or hormones). The initial assessment of a patient suspected of stroke should be done quickly enough to ensure maximal reperfusion of brain tissue. The steps to achieve this goal are: 1) exclude an intracranial hemorrhage, 2) assess for contraindications to thrombolitics, 3) characterize the infarct. The workup for a patient should first include a history (especially the time when neurologic symptoms began), a physical exam (including the NIHSS), and imaging studies (to rule out hemorrhagic components). In addition, several lab studies can also be obtained including: PT/INR, glucose, complete blood count, metabolic panel, creatine kinase, ECG, echocardiogram, lipid panel, carotid Doppler, MRA or CTA. Acute management of a stroke is primarily focused on stabilizing the patient and allowing as much reperfusion as possible for at-risk brain tissue. Stroke management in the acute setting includes: use of thrombolitics if indicated, and re-assessment to monitor progression. Several trials have been completed in pursuit of safety and effectiveness of intra-arterial stroke therapy for patients outside the recommended thrombolytic time window, but so far they are only experimental treatment options. The best preventative measures for first time or recurrent stroke are: starting or switching antiplatelet therapy, treatment of cardiovascular risk factors (atrial fibrillation and carotid stenosis), optimization of hypertension, dyslipidemia and diabetes mellitus management, and smoking cessation.

Introduction
As of 2010, strokes, or cerebrovascular accidents (CVAs), are the leading cause of disability and the fourth leading cause of death in the U.S. behind cardiovascular disease, cancer, and chronic lung disease. Roughly 800,000 Americans are affected by stroke every year and 130,000 of those strokes are fatal. In other words, a stroke occurs every 40 seconds and someone dies of stroke every four minutes. Since strokes have a large impact on our population, primary care physicians should have some basic knowledge of the different etiologies, risk factors, presentations, treatments, and future developments regarding stroke.

Definitions
The WHO defines stroke as “rapidly developing clinical signs of focal disturbance of cerebral function lasting more than 24 hours with no apparent cause other than of vascular origin.” Transient ischemic attacks (TIAs) are similar to strokes except that TIAs by definition last less than 24 hours and are often less than one hour.

Classification
Strokes are categorized based on their underlying cause and the location of the vascular pathology. Strokes are first divided into two major classifications: ischemic (80 to 87 percent) and hemorrhagic (13–20 percent).

Ischemic strokes can be further divided by mechanism: thrombosis (atherosclerosis), embolism (cardio-aortic), or decreased perfusion (hypotension). Thrombosis occurs when obstruction of blood flow is a direct result of localized vessel pathology and may occur in large or small
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vessels. Thrombotic strokes occurring in larger vessels are usually a result of severe lumen narrowing from atherosclerosis and the most common location for atherosclerotic thrombosis is at the base of the internal carotid arteries. Dissection of larger vessels or chronic inflammation (vasculitis) can also lead to narrowing. On the other hand, thrombotic strokes occur in smaller arteries due to hypertrophy of the vessel media as a result of repeat damage from hypertension and are also known as lacunar strokes. Emboli are made of mobile clot material that is formed proximally and becomes lodged in smaller vessels distally. The most common source of emboli is the heart and occurs in the presence of arrhythmias, structural defects, or other etiologies such as endocarditis and valvular disease. Emboli are most commonly made up of clot material, but air, fat, bacteria, or malignant cells can also embolize to vessels in the brain.4

Hypoperfusion strokes are secondary to decreased perfusion to the brain. Hypoperfusion leads to decreased flow to the watershed areas of the brain and most commonly results from severe carotid artery stenosis, cardiac pump failure after an MI or arrhythmia. Watershed areas are those that receive blood from two terminal ends of larger arteries (i.e., MCA and ACA). Hypoperfusion injuries to the brain are commonly diffuse and bilateral, whereas thrombosis and embolism most often lead to localized and unilateral injuries.4

Hemorrhagic strokes can be further characterized by the location of the bleed: parenchymal (10 percent of all strokes) versus subarachnoid (3 percent of all strokes).2 These classifications are important to understand because they have different sources and different treatments. Subarachnoid hemorrhages usually occur from aneurysms, AVMs, or trauma. Parenchymal, or intracerebral hemorrhage, is usually caused by repeat damage to vessels from hypertension.4

In subarachnoid hemorrhage, treatment is aimed at preventing any subsequent re-bleed. However, in intracerebral hemorrhage, treatment is aimed at minimizing the mass effect of the hematoma by managing hypertension and, if necessary, surgical removal.4

Strokes can also present with a combination of ischemic and hemorrhagic components. Patients with cerebral amyloid angiopathy or endocarditis are at the greatest risk for strokes with ischemic and hemorrhagic pathology.

**Anatomy and Pathophysiology**

**Arterial Circulation to the Brain**

In order to appropriately diagnose and categorize a patient with acute stroke it is important to know some basic anatomy of the brain and the vessels that supply the brain. There are two major arterial divisions that supply the brain known as the anterior and posterior circulation.

The anterior circulation arises from the internal carotid arteries and supplies 80 percent of the brain whereas the posterior circulation is formed from the vertebral arteries and supplies the other 20 percent of the brain. The anterior circulation has two major branches: the middle cerebral artery (MCA), which supplies portions of the frontal and parietal lobes, parts of the temporal lobes, and most of the basal ganglia, and the anterior cerebral artery (ACA), which supplies the medial portions of the frontal lobes and superior medial parietal lobes. The right and left vertebral arteries converge to form the posterior circulation starting as a single midline basilar artery. The posterior circulation fuels the occipital lobes, medial temporal lobes, cerebellum, and brainstem. Knowing these vessels and their distribution as well as the brain functions of each area can give the physician a lot of information about the location of a stroke based on signs and symptoms alone.

**Subtypes of Stroke**

In addition to classifying strokes based on their underlying cause, they can also be separated by location. A total anterior circulation infarct (TACI) presents with speech deficit, homonymous visual deficit, and contralateral motor and/or sensory defect involving face, arm, and/or leg. Posterior circulation infarcts present as any of the following: ipsilateral cranial nerve palsies with contralateral motor/sensory deficits, bilateral motor/sensory deficit, cerebellar dysfunction, or isolated homonymous visual field deficit. Lacunar infarcts (small-vessel occlusions) can present as pure motor, pure sensory, sensory motor, clumsy hand with dysarthria or ataxic hemiparesis.

**Diagnosis**

Several different clinical presentations are possible in acute stroke. These include hemiparesis, hemianaesthesia, aphasia, dysphagia, ataxia, cognitive changes, and cranial nerve palsies in isolation or combination. The most convincing signs of a stroke are a sudden onset of neurologic symptoms with neurologic signs that correlate with the region of cerebral ischemia.

**History**

The most common chief complaints are sudden onset hemiparesis or trouble speaking. When obtaining a patient history it is important to clarify the exact time the neurologic symptoms began because stroke treatments can only be given within a certain time frame. If the time of onset is unknown, such as a patient who wakes up with symptoms, treatment options become more limited.
Symptoms of hemorrhagic stroke may include rapid neurologic deterioration, headache, vomiting, and decreased consciousness.

A few questions can help determine the severity and the best approach to treatment in suspected stroke patients:
1. When was the patient last seen normal? Or when exactly did symptoms begin?
2. What were the circumstances that occurred around the time of stroke?
3. Is there facial muscle weakness? Arm weakness/drift? Trouble with speech? This combination of questions is highly sensitive for stroke.
4. Are there risk factors for atherosclerosis or cardiac disease?
5. Any history of drug abuse, migraines, seizure, infection, trauma, or pregnancy?

**Physical Exam**

Important qualifiers of the physical exam are included in the National Institutes Health Stroke Scale (NIHSS). The NIHSS is a worldwide, reproducible, and reliable 11-item exam which quantifies the severity of a stroke and encompasses five areas of neurologic function: level of consciousness, language and speech (aphasia or dysarthria), motor deficits (arm, leg, or face), sensory deficits, visual field deficits, and headache (concern for elevated ICP in hemorrhagic stroke). See Figure 1.

In addition to the neurologic signs included in the NIHSS, other elements of the physical exam may help determine the cause of the symptoms. For example, tongue injuries or bruising suggest a seizure. Presence of a S3 heart sound, jugular venous distention, or angina would support coronary artery disease (CAD) and/or congestive heart failure (CHF). Bruits heard over the carotid arteries would indicate carotid disease.

Based on the history and physical exam, one can also distinguish between aphasia (cortical) and dysarthria (subcortical). There are five components of aphasia: naming, fluency, repetition, comprehension, and reading/writing. If the patient can comprehend but has trouble speaking, the infarct involves Broca’s area (a superior MCA branch). If the patient speaks fluently, but cannot comprehend information the infarct involves Wernicke’s area (an inferior MCA branch). If the patient does not
Identify Risk Factors

Various modifiable risk factors include:
1. Hypertension.
2. Diabetes mellitus.
3. Atherosclerosis (carotid artery stenosis).
4. Cardiac arrhythmias, prosthetic valves.
5. Hyperlipidemia.
6. Cigarette smoking.
7. Others: cocaine or methamphetamine, obesity, metabolic syndrome, amyloid angiopathy, hyperhomocysteinemia, thrombophilias, sickle cell disease, pregnancy, and exogenous hormones.

Hypertension (HTN) is the major risk factor for both ischemic and hemorrhagic stroke. Age is the second most relevant risk factor for stroke. Diabetes mellitus (DM) is a significant risk factor for ischemic stroke, but has little effect on incidence of hemorrhage. High cholesterol is also a significant risk factor. When treating high LDL cholesterol levels, each 10 percent reduction of LDL leads to a 15 percent reduction of risk for stroke.

Non-modifiable risk factors include:
1. Age (greatest impact at 80 years or older).
2. Family history (twins > siblings > parents).
3. Race (Blacks > Hispanics > Whites).

Initial Assessment

The main goal of treatment is to achieve maximal reperfusion as quickly as possible. The steps to achieve this goal are: 1) exclude an intracranial hemorrhage 2) assess for contraindications to thrombolytics 3) characterize the infarct. A reasonable expectation is to finish an evaluation and make a decision on treatment within 60 minutes of arrival to the ED.

Imaging

The best approach to assessing a patient is to start with the features that will ensure safe and expeditious reperfusion. Since the first task is to exclude an intracranial hemorrhage, along with other contraindications to thrombolytics, a non-contrast CT should be done within 30 minutes of entering the ED. Non-contrast CT imaging can also rule out stroke mimics and assess other possible etiologies. If there is still a high suspicion for hemorrhage with a negative CT, consider obtaining a lumbar puncture.

Although a non-contrast CT is very sensitive for acute hemorrhage, its sensitivity for ischemic infarct is quite low up to 12 hours after onset of symptoms. However, diffusion weighted MRI images (DWI) can detect an infarct within approximately 20 minutes of stroke symptoms onset. In addition to having a rapid time to detection, DWI images also provide the best predictability of treatment efficacy and clinical outcomes.

CT or MR perfusion studies can be used to identify viable “at risk” brain (also called penumbra) versus unsalvageable infarcted cerebral tissue. In theory, the perfusion studies should be able to determine which patients will benefit from interventional therapy. However, there is conflicting evidence whether perfusion studies provide useable information prior to treatment. Currently, perfusion imaging is mostly used as a prognostic indicator and may have a developing role in determining eligibility for treatment in the future.

Laboratory Tests

The following laboratory studies are usually drawn early in the course of acute stroke: Protime/INR, glucose, complete blood count, comprehensive metabolic panel, and creatine kinase/troponin. B-hCG is also useful in women of child-bearing age. After these basic studies are done, including appropriate imaging, the decision to treat should be made promptly. After treatment and continued clinical assessment the physician may begin investigating the cause of stroke. Some of the common tests are shown below in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Acute Stroke Work-up</th>
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<tr>
<td>12 lead ECG &amp; telemetry.</td>
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<td>2D echocardiogram.</td>
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<td>Fasting lipid panel.</td>
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<td>Carotid Doppler.</td>
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<tr>
<td>MRA/ CTA head and neck.</td>
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<td>Blood culture (optional) if suspicious for endocarditis.</td>
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<tr>
<td>Toxicology screen (optional).</td>
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<tr>
<td>Chest X-ray (optional) if suspicious for aspiration.</td>
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Stroke Mimes

Consider other etiologies when stroke is less likely, such as a young patient with a history of hypoglycemic episodes or migraines. Common stroke mimics include hypoglycemia, complicated migraine, Bell’s palsy, hypertensive encephalopathy, Todd’s paralysis (postictal state after a seizure episode), CNS tumors, and psychiatric disorders.
Acute Treatment and Monitoring

1. Managing blood pressure.

In ischemic strokes, the American Heart Association and American Stroke Association (AHA/ASA) guidelines recommend permissive hypertension up to 220 mmHg systolic and 120 mmHg diastolic immediately after a stroke. Blood pressure (BP) should not be allowed to drop more than 15 percent in the first 24 hours to limit the degree of ischemic damage.8

In hemorrhagic strokes, there is a lack of definitive evidence to suggest a specific target BP, so it is most appropriate to handle each case on an individual basis. However, AHA guidelines suggest anti-hypertensives if SBP is greater than 180 or MAP is greater than 130 mmHg with a target of 160/90 to avoid hematoma expansion.8

The ASA supports re-initiating anti-hypertensive medication as early as 24 hours after the onset of stroke symptoms. BP values are thought to be more important than the type of antihypertensive medication used to achieve adequate pressures. Most institutions use antihypertensive medications such as Labetalol 10-20 mg IV, Hydralazine 10-20 mg IV, or Nicardipine 5-15 mg per hour in an acute stroke setting to maintain recommended blood pressure parameters.8

2. Determine eligibility for IV thrombolytics.

The National Institute of Neurological Disorders and Stroke (NINDS) rt-tPA trial of 1995 had revolutionary findings regarding acute treatment of stroke. The study concluded that administration of IV thrombolytics within three hours of symptom onset improved clinical outcomes.9 The decision to administer IV rtPA is based on many factors, but is mostly limited by the exclusions in Table 2. Patients must be 18 years old, demonstrate measurable deficits according to the NIHSS, and have no evidence of intracranial hemorrhage on head CT to qualify.8

Several other studies have attempted to demonstrate clinical usefulness of an extended time window. The Third European Cooperative Acute Stroke Study (ECASS III) trial completed in 2008 demonstrated good outcomes in patients who received IV-tPA in an extended time frame (3-4.5 hours) if they do not meet the following additional exclusion criteria.11

- Older than 80 years.
- History of diabetes and stroke.
- Use of Coumadin regardless of INR value.
- NIHSS greater than 25.

Once a patient has answered “no” to all of the exclusion criteria, then IV-tPA administration may begin.11 The recommended dose of IV-rtPA is 0.9 mg/kg with a max of 90 mg. Ten percent is given as a bolus over the first minute and the rest is given over one hour of total infusion time. Anti-platelets should be avoided in the first 24 hours after IV-tPA administration due to increased risk of bleeding. Neurological assessments should be repeated every 15 minutes during the infusion, then every 30 minutes for the next six hours, and then every hour up to 24 hours after treatment. In addition to monitoring for intracranial hemorrhage, physicians should be cautious of angioedema and airway obstruction which may occur within 15 minutes of infusion.

In 1999, the PROACT II trial demonstrated improved clinical outcomes at 90 days post-stroke with the use of intra-arterial thrombolysis (Ia-tPA) up to six hours since onset of symptoms in patients who were not eligible for IV-tPA. Although the results of this study showed some benefit, they also included an increased risk of ICH.12 Currently, Ia-tPA is offered up to six hours regardless of prior IV-tPA use as a non-FDA approved option.

3. Other acute treatments and monitoring:

- Frequent neurologic reassessment.
- Telemetry for the first 24 hours.
- Control post-stroke fevers due to increased mortality/morbidity with elevated temperature.

### Table 2. Contraindications to IV-tPA16

| Rapidly improving symptoms or only minor symptoms. |
| Seizure at onset of stroke. |
| Stroke or head trauma in the past three months. |
| Major surgery within the past two weeks. |
| Known history of intracranial hemorrhage. |
| Symptoms suggestive of SAH (even with negative CT). |
| Blood pressure is higher than 185/110 mmHg. |
| Known risk of bleeding: |
| - GI/urinary tract hemorrhage within 21 days. |
| - Arterial puncture at a non-compressible site in the past seven days. |

- Heparin given within 48 hours with PTT.
- PT is greater than 15 seconds (INR >1.7).
- Platelet count is less than 100,000/mL.

Serum glucose <50mg/dL or >400mg/dL.

Additional relative exclusion criteria include:

- NIHSS score greater than 22. See Figure 1.
- Large cerebral infarction (mass effect, obliteration of sulci on CT, or involvement of greater than one-third of MCA territory).
- MI within the last three months.10
The Collaborative Atorvastatin Diabetes Study (CARDS) found that adding a statin to diabetic patients’ current regimens had a 24 to 48 percent reduction in occurrence of stroke.4,13 These findings were so significant, the CARD study was actually terminated early so the placebo group could begin receiving treatment. These findings are reflected in the updated AHA cholesterol guidelines (see cholesterol control section on page 8).

3. Prevent clot formation/mobilization.

**Anti-platelet Therapy**

Aspirin is the most commonly prescribed anti-platelet medication for stroke prevention because it is cheap, easy to use, and generally tolerable. Aspirin is frequently used as monotherapy in patients with a low risk (less than 2 percent) of stroke and several studies have demonstrated no difference in efficacy between the 81 mg dose and 325 mg dose. Clopidogrel and Aggrenox are two other anti-platelet medications that are FDA approved for stroke prevention. There are conflicting studies regarding Clopidogrel’s drug-drug interaction with other CYP450-using drugs, such as PPIs, Clopidogrel is better tolerated than its fellow ADP receptor blockers and has no difference in risk of bleeding. In general, one should avoid combining Clopidogrel with proton pump inhibitors or consider other medication options.4 If a patient presents with stroke or TIA symptoms while on aspirin, the patient has failed Aspirin therapy regardless of the Aspirin dose and it is recommended to switch the anti-platelet therapy to Clopidogrel or Aggrenox.

Three recent studies have examined the efficacy of dual therapies. The PROFESS trial from 2008 found that Aggrenox, a dual therapy medication which combines aspirin with extended-release dipyridamole, is equally efficacious to Clopidogrel alone.15 The 2004 MATCH trial demonstrated no difference in clinical outcomes between Clopidogrel alone and Clopidogrel combined with Aspirin.16 In comparison, the ESPRIT trial from 2006 showed a preference of dipyridamole plus aspirin when compared to aspirin alone at preventing recurrent stroke.17

**Atrial Fibrillation**

Nearly 30 percent of strokes in people over 80 years old are attributable to atrial fibrillation.2 The mainstay of preventing cardio-embolic clots from atrial fibrillation is anticoagulation therapy. According to an update published by the ASA in 2013, vitamin K antagonists (or Warfarin) remain first line therapy.18 The risk for stroke associated with atrial fibrillation can be stratified using the CHADS2 score. For patients with more than one moderate risk factor (CHF, DM, hypertension, age greater than 75) or a history of TIA/ stroke, Warfarin is recommended. The goal INR level is 2.0 to 3.0. Patients with one moderate risk factor can either be treated with aspirin or Warfarin.6 Anti-coagulants should generally be withheld for at least 48 hours in the immediate post-stroke period.

Since the initiation of widespread use of Warfarin in atrial fibrillation, the incidence of strokes in patients with atrial fibrillation has nearly halved over the last 20 years.6 However, studies have shown that inhibitors of Factor Xa and thrombin (target-specific oral anticoagulants, or TSOAs) are also safe options. TSOAs have some advantages over warfarin including: a short time to peak effect, few drug interactions, a set dosage, decreased incidence of bleeding, and lack the necessity of monitoring. The disadvantages of TSOAs include the lack of an antidote, limited use in late stage chronic kidney disease, and the absence of an appropriate monitoring test in cases of toxicity.18 Dabigatran (thrombin inhibitor), Rivaroxaban, and Apixaban (factor Xa inhibitors) have been largely insignificant.4

Outside the acute stroke period, blood pressures can be regulated according to the new JNC 8 (Joint National Committee) hypertension guidelines released in February 2014. New recommendations include a BP goal of less than 150/90 for patients over 60 years old and a goal of less than 90 diastolic pressure for patients 30 – 59 years old.

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2. Optimize diabetes management.

Patients with type II diabetes mellitus are at greater risk for developing risk factors for stroke such as atherosclerosis, hypertension, and abnormal lipid levels. Therefore the approach to stroke prevention in diabetics should be multi-factorial. The effect of intensive glycemic control (Hgb A1C less than 6.5 percent) on stroke prevention has been investigated in several clinical trials, but the results have been largely insignificant.4

Investigators of the Heart Protection Study (HPS) and the Collaborative Atorvastatin Diabetes Study (CARDS) found that adding a statin to diabetic patients’ current regimen had a 24 to 48 percent reduction in occurrence of stroke.4,13 These findings were so significant, the CARD study was actually terminated early so the placebo group could begin receiving treatment. These findings are reflected in the updated AHA cholesterol guidelines (see cholesterol control section on page 8).

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been studied as alternatives to Warfarin and have shown higher efficacy and decreased occurrence of intracranial hemorrhage in select studies. However, further investigation is needed to address populations not included in previous trials such as: elderly, moderate-severe kidney disease, patients in need of emergent surgery, and patients who are also on antiplatelet medications.

**Carotid Stenosis**

According to cumulative evidence from the North American Symptomatic Carotid Endarterectomy Trial (NASCET) and the European Carotid Surgery Trial (ECST), symptomatic patients who have greater than a five-year life expectancy (low surgical risk) and 50 to 99 percent stenosis of the carotid arteries are recommended to have carotid endarterectomy (CEA). Asymptomatic patients expected to live longer than five years and have 60 to 99 percent stenosis may also be good candidates for CEA. These studies also showed that patients with mild to moderate stenosis (less than 50 percent) have no increased benefit from CEA versus medical management, but do have increased risk of stroke with surgical intervention.

The AHA/ASA recommends that CEA is performed within six months and preferably within two weeks of a primary stroke to avoid recurrent strokes. Carotid angioplasty with stenting may be an acceptable alternative for symptomatic patients who are less favorable surgical candidates (such as greater than 80 years old, congestive heart failure, previous neck radiation, or contralateral carotid occlusion).

**Atrial Septal Abnormalities**

In theory, a stroke can result from a paradoxical embolism via a patent foramen ovale (PFO). However, studies have demonstrated conflicting data regarding an increased incidence of stroke in patients with a septal abnormality. According to three recent trials (RESPECT, PC, and CLOSURE I) published in the New England Journal of Medicine, surgical closure does not offer any added benefit over medical management for prevention of recurrent stroke in patients with a PFO or atrial septal defect (ASD).

4. Optimize cholesterol levels.

Cholesterol treatment guidelines have been based on target LDL levels for several years. New AHA guidelines released in November 2013 deviated from the previous recommendations and are now based on a patient’s medical history, age, diabetic status, and 10-year atherosclerotic cardiovascular disease (ASCVD) risk. The AHA has identified four main groups of people that would benefit from statin therapy.

1. Anyone with clinical ASCVD (MI, stroke, TIA, or unstable angina).
2. Diabetics aged 40 - 75 years.
3. Diabetics with greater than 7.5 percent estimated 10-year ASCVD risk and no clinical signs of ASCVD.
4. LDL levels greater than 190 mg/dL.

Patients with a history of MI or stroke would have the best risk reduction of recurrence with high-intensity statin therapy (e.g., 40 - 80 mg Atorvastatin or Rosuvastatin). In fact, some studies suggest that diabetics have a 48 percent reduction of recurrent stroke if they begin statin therapy. Additional studies demonstrate a high mortality rate and higher incidence of hemorrhagic stroke with low cholesterol levels (less than 40 LDL). Patients with a low HDL also have a higher risk of stroke.

Baseline fasting lipids, LFTs, and CK should be done prior to starting a statin. Follow-up labs can be done at three to 12-month intervals, but LFTs and CK are generally not recommended after the first year of treatment unless the patient becomes symptomatic. If the LDL level is less than 40 mg/dL consider reducing the dose.

5. Encourage smoking cessation.

Smoking increases the risk of stroke 2-fold and actually creates a higher relative risk of stroke in patients younger than 55. Notably, patients continue to have a higher risk of stroke even after cessation.

### Table 3: Long-term Therapies for Recurrent Stroke Prevention

1. Anti-coagulation.
   - Coumadin with goal INR btw 2.0-3.0.
   - Others: Dabigatran, Rivaroxaban, or Apixaban.
2. Anti-platelet therapy.
   - Aspirin or Clopidogrel or Aggrenox.
   - Stent placement vs. Endarterectomy.
4. Anti-hypertensives.
   - HCTZ, ACEi, BB, CCB.
5. Statin therapy.
   - Atorvastatin 40-80mg or Rosuvastatin 20-40mg if there is history of stroke or MI.
6. Smoking cessation.

### Future Developments

To date, intravenous tPA is the only FDA-approved intervention for hyperacute stroke. However, IV tPA has shown to be least effective in large vessel occlusions which has led to the development of intra-arterial management and mechanical thrombectomy devices. These newer
options are being explored for use beyond the 3 - 4.5-hour restriction that has been recommended for IV tPA. Several generations of thrombectomy devices have been created with only small success so far. The first generation thrombectomy device (MERCI retriever) was developed in 2004 and was designed to capture thrombi via a corkscrew wire that would be wound into the clot matrix, then the thrombus would be extracted en bloc with subsequent recanalization. The second generation thrombectomy device (Penumbra-aspiration) was developed in 2008 and involved repeated probing of the thrombus with a microwire “separator” and aspiration of the showering fragments. The third generation device (Solitaire stent retriever) was released in 2012. It first recanalizes the obstructed vessel by deploying a stent through the thrombus and then the stent is retracted and removes portions of the clot. This maneuver allows early and frequent reperfusion during the clot removal process.

Recent trials have continued to investigate intravascular thrombectomy with little success. For example, the International Management of Stroke (IMS) III, SYNTHESIS, and MR RESCUE trials found no significant difference between IV-tPA and IV combination with endovascular therapy. However, these trials used older generation (MERCI) devices and studies are in progress using the newest stent retrievers. There is another study in progress that is investigating the use of sono-enhanced thrombolysis for recanalization (sonolysis). The CLOTBUSTER trial is a phase III trial that hopes to demonstrate how continuous transcranial ultrasound can significantly increase the rate of recanalization with concomitant use of IV-tPA.

Because the new generation devices are theoretically able to rapidly recanalize cerebral arteries, patients will potentially be triaged for endovascular treatment based on perfusion imaging studies instead of time from onset in the near future. For now, mechanical thrombectomy remains an experimental treatment option.

Summary
Clinical presentations of stroke are quite variable so physicians must keep a high level of suspicion while assessing a patient with sudden onset of neurologic symptoms.

Remember, time is brain! Evaluate and work up a patient quickly to decrease the effects of prolonged ischemia. Once a patient is stable, treat the underlying cause of stroke and if no cause is found, treat empirically with anti-platelet medications and address modifiable risk factors. Once a patient is out of the acute stroke period, physical therapy, speech therapy, and occupational therapy will be crucial for improved quality of life. Antidepressants are also a useful addition to post-stroke therapies. A simplified algorithm of the evaluation of stroke can be seen in Figure 2.
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 Author:
Megan Albertson, MD, Resident Physician, University of South Dakota Sanford School of Medicine.

Jitendra Sharma, MD, MS, Assistant Professor of Neurology, Sanford Neurology/Neurointerventional, Sanford Medical Center, University of South Dakota.
Streamlined Care for Neck and Back Pain
Avera Spine Center Offers a Patient-Centered Approach

Advertorial

Neck and back pain: It’s among the most common reasons for visits to a medical provider, second only to upper-respiratory infections. Yet it’s also not uncommon for patients to go from specialist to specialist without getting plugged into the most appropriate plan for treatment.

The Avera Spine Center, a program of the newly named Avera Brain and Spine Institute, is a new approach to treatment designed to streamline the patient process — getting patients to the appropriate level of care at the right time — and ultimately improve outcomes.

“The program is built around the understanding that more conservative measures are more appropriate for the majority of patients before surgery is considered,” said Henk Klopper, MD, Neurosurgeon with Avera Medical Group Neurosurgery Sioux Falls. “In fact, only about 10 to 15 percent of neck and back pain patients require surgery.”

Avera McKennan Hospital & University Health Center contracted with Marshall Steele, a physician-led health care services firm, to create the program, coordinating all aspects of spine care including neurology, neurosurgery, orthopedics, pain specialists, physical medicine, rehabilitation, physical therapy and more.

The method was founded by Marshall Steele, MD, who asserts that better spine care is dependent upon delivering care based on evidence-based, best-practice standards. The program allows Avera to compare outcomes and track metrics for continual program improvement.

“We have found that we’re doing very well in terms of outcomes,” said Nancy Klinkhammer, PT, Joint and Spine Care Coordinator at Avera McKennan. “Physicians and patients can be confident that referral to the Avera Spine Center will result in the best approach with the best possible outcomes.”

Minor neck and back pain is usually not enough to bring patients to their providers, unless it is prolonged. Patients come in because they have symptoms that are difficult to manage or limit their activities.

Streamlining patient care begins with good triaging and diagnosis, said Thomas Ripperda, MD, Physiatrist with Avera Medical Group Physical Medicine & Rehabilitation Sioux Falls.

Front-line treatment
Conservative, non-surgical approaches are tried first, including medications, physical therapy, steroid injections or a combination of the above. If patients have already tried the conservative routes, they may be a candidate for surgery sooner.

“Most patients will have resolution of symptoms without surgical intervention,” said Dr. Ripperda.
Neck and back pain most often results from muscle strains and sprains; disc problems, most commonly herniation of a disc and degenerative disc disease; and arthritis of the spinal joints.

Pain and functional limitation is the body's way of allowing itself to heal. Symptom control improves function and eases pain during that healing phase. When a herniated disc is healing, it releases chemicals that create a large inflammatory response that can be controlled with steroid injections.

"In the vast majority of cases we see improved symptoms and patients are able to function appropriately while the body is doing most of the work of healing," Dr. Ripperda said.

**Surgical interventions**

Spinal surgeons have a variety of approaches based on the complexity of disease.

Minimally invasive spinal surgeries can correct narrowing caused by arthritis or disc herniation. When this occurs, the narrowing presses on a nerve, causing shooting pain in the back and/or down the legs. "This is the most success we have in spine surgery. We go in through a small tube inserted in a small incision, and remove the material that is pressing on the nerve. The incision is much smaller than in the past and recovery is faster," Dr. Klopper said.

Lumbar decompressive laminectomy is a more extensive surgery to remove bone spurs and thickened ligaments that are causing a narrowing that compresses nerves — a condition known as spinal stenosis.

Fusion surgery is a relatively common class of surgeries for more complex problems not addressed by the above approaches. "This is a major surgery, however, we do have minimally invasive techniques with smaller incisions. The biggest advance in the last 10 years is minimally invasive methods of fusion, yet it's still an evolving practice," Dr. Klopper said.

With any surgery there is some risk of complications. "The most common complications, such as infection, are very treatable. The risk of nerve or spinal cord damage is very low," Dr. Klopper said.

After surgery, spine patients are encouraged to be as active as possible. Yet certain limitations are extremely important, for example, restrictions involving lifting, bending or twisting.

While surgery does not stop the progression of arthritis or degenerative disc disease, it can give patients years of pain-free living, allowing them to remain active at work or play.

When neck or back pain is severe or ongoing, it interrupts your patient's life. The Avera Spine Center is the destination for streamlined, patient-focused care. Count on our specialized team to lead your patient through the steps toward healing.

1. Call the spine navigator at 605-322-8805 to refer patients to the Avera Spine Center.
2. The spine navigator visits with patients to gather a health history and description of symptoms, and determines the most appropriate next step.
3. Patients meet with a specialist to discuss possible treatments.
4. Non-surgical methods, such as physical therapy, medication, altered activities or injections, are tried first to address symptoms and allow the body to heal.
5. Surgery is considered if non-surgical methods are not effective. Patients receive education about the surgical and recovery process.
6. Surgery is performed, and a recovery plan is recommended that may include physical therapy, activity guidelines and follow-up.

To learn more, go to Avera.org/spine. To refer patients to the spine center, call the spine navigator at 605-322-8805.
e-cigarette pros & cons

Electronic nicotine delivery systems (ENDS) are battery-powered devices that provide doses of nicotine and other additives to the user in an aerosol. There are currently multiple types of ENDS on the U.S. market, including e-cigarettes, e-hookahs, hookah pens, vape pens, e-cigars, and others.

Here are some general ENDS guidelines from the 2014 Surgeon General's Report on Tobacco Use:

**ENDS could be **BENEFICIAL **to individuals and society, compared with continued use of cigarettes and combusted tobacco products if they:**
- Are completely substituted for all cigarettes and combusted tobacco products in established adult smokers who would otherwise continue smoking, and
- Assist in a rapid transition to a market with little or no sales of combusted tobacco products

**ENDS could be **HARMFUL **to individuals and society if they:**
- Lead to regular use of nicotine and/or use of cigarettes by young people or non-adult tobacco users
- Lead to relapse among former smokers
- Delay quitting and/or diminish chances a smoker will quit by leading to long term dual use
- Expose children, adolescents, pregnant women, and non-smokers to aerosolized nicotine
- Result in poisonings among users and non-users through ingestion, inhalation, or skin absorption
- Glamorize or renormalize tobacco use and/or undermine enforcement of clean indoor air policies

Go to www.SDQuitLine.com/providers for more information on ENDS from the Surgeon General.

With all the talk about e-cigarettes, remember, the SD QuitLine offers evidence-based tobacco cessation coaching, and access to FDA approved medication.

Know the facts.
Outpatient prescribing of antipsychotics for children and adolescents increased by 22 percent from 2004-2008, according to the Food and Drug Administration (FDA) Pediatric Advisory Committee. The second generation antipsychotics (SGA) are FDA-approved for the indications of schizophrenia in 12-17-year-olds (risperidone, olanzapine, quetiapine, aripiprazole and paliperidone) and bipolar disorder in 10-17-year-olds (risperidone, olanzapine, quetiapine, and aripiprazole). Additionally, FDA approval was given for risperidone (ages 5-16 years) and aripiprazole (ages 6-17 years) for treating irritability in children with autism spectrum disorders. Off-label use for attention-deficit hyperactivity disorder, oppositional defiant disorder, conduct disorder, and Tourette’s syndrome has increased.

The risk of adverse effects such as weight gain, cardiometabolic and hyperprolactinemia cannot be minimized in children and adolescents. Careful monitoring is essential but rarely done. Delate, et al. reported that of 1,023 children and adolescents who were newly started on a SGA, 0.1 percent had the entire recommended monitoring schedule for the adverse effects completed. Of the patients that had some monitoring, 24.2 percent had at least one adverse effect such as weight gain or elevated triglyceride level. Additionally, adverse effects such as sedation, hepatic dysfunction, extrapyramidal side effects (EPS), QT prolongation and neuroleptic malignant syndrome are important to monitor.

**Weight Gain**

Children and adolescents may be at higher risk for weight gain associated with antipsychotics than adults. Cohen, et al. conducted a Bayesian meta-analysis of 41 short term clinical trials (3-12 weeks) assessing the adverse effects of SGA in 4015 children and adolescents. The increase in mean weight + SD with 95 percent credible interval, as compared to placebo, are as follows: olanzapine (3.99 + 0.42 kg), clozapine (2.38 + 1.13 kg), risperidone (2.02 + 0.32 kg), quetiapine (1.74 + 0.38 kg), and aripiprazole (0.89 + 0.32 kg).

The mechanism for antipsychotic induced weight gain is unknown but theories include blockade of 5-HT2c receptors, antihistaminic/antimuscarinic effects, or modifications of hormones such as leptin, adiponectin or melanocortin. Also, patients less likely to be active and more likely to have a poor dietary pattern maybe a contributing factor. Risk factors for weight gain include; increased body mass index (BMI) prior to antipsychotic initiation, parental BMI, genetics (melanocortin 4 receptor gene, polymorphism of 5-HT2c receptor gene), concomitant treatment with other medications that increase weight, i.e., valproic acid, lithium.

**Cardiometabolic**

Antipsychotics have been hypothesized to be associated with type 2 diabetes because of weight gain, increased glucose levels, or insulin resistance. This risk is also been documented in children and adolescents. The objective of the Tennessee Medicaid program retrospective cohort study was to compare the risk of type 2 diabetes mellitus when an antipsychotic was recently initiated in 6-24-year-olds as compared to a propensity score-matched control group. The results revealed a 3-fold increase risk of type 2 diabetes in the antipsychotic group (HR = 3.03 – 95 percent CI = 1.73-5.32) within the first year. The risk also increased with cumulative doses, persisted for up to one year after discontinuation of the antipsychotic and was highly associated with SGA. The SGAs reported by the FDA for a high risk of type 2 diabetes are clozapine, olanzapine, quetiapine and risperidone. Hyperlipidemia, especially an elevation in triglycerides, has been documented with SGA. Clozapine, olanzapine and quetiapine may have significant elevations in children and adolescents.

**Hyperprolactinemia**

Antipsychotic induced hyperprolactinemia may result from blocking dopamine 2 receptors at the tuberoinfundibular level. Symptoms include gynecomastia, galactorrhea, menstrual irregularities and sexual dysfunction. The Canadian Alliance for Monitoring of
Effectiveness and Safety of Antipsychotics in Children (CAMESA) recommends monitoring of serum prolactin because prepubertal children may not present with the classic symptoms of hyperprolactinemia. Others recommend clinical monitoring and obtaining prolactin levels when symptoms occur. Potentially, hyperprolactinemia may lead to sexual or reproductive impairment, breast abnormalities and decreased bone density. Antipsychotic induced hyperprolactinemia is independent of age but more commonly associated with use of a first generation antipsychotic, risperidone, paliperidone, ziprasidone and olanzapine. Aripiprazole is least likely to cause hyperprolactinemia because it is a dopamine 2 partial agonist and may actually lower prolactin levels.

**Monitoring for Adverse Effects with Antipsychotics**

The evidence of significant adverse effects from antipsychotic use in children and adolescents supports the need for consistent monitoring. The reality is that monitoring in this age group is in need of improvement. The CAMESA guideline project reviewed the literature to make evidence-based recommendations of monitoring and has proposed a practical tool for clinical use (TABLE 1). The CAMESA guideline monitoring is more frequent and specific to children and adolescents as compared to the 2004 American Psychiatric Association and American Diabetes Association recommendations. A limitation is that the recommendations are for only the first year of use of a SGA and cost-effectiveness was not addressed. The emphasis should be to implement consistent monitoring of adverse effects with SGA in this age group.

### Table 1. CAMESA Recommendations for Monitoring of Adverse Effects of SGA in Children and Adolescents

<table>
<thead>
<tr>
<th>Monitoring Parameters*</th>
<th>Baseline</th>
<th>1 month</th>
<th>2 month</th>
<th>3 month</th>
<th>6 month</th>
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<tr>
<td>Fasting plasma glucose</td>
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</tbody>
</table>

*Additional recommendations were for fasting insulin levels and TSH with quetiapine only.

#Prolactin monitoring is recommended after three months with risperidone and olanzapine and after six months with ziprasidone.

**REFERENCES**


**About the Author:**
Debra Farver, PharmD, Professor of Pharmacy Practice, College of Pharmacy, South Dakota State University.
Transparency, accountability and responsibility are three tough areas to balance and maintain when working within a team-based environment. And while the personalities and the training levels of all involved add to the complexities of managing the team, the true complexity lies within the supervision and management of the individual team member’s scope of practice.

In most states when a patient brings a negligence claim against a physician, the patient must establish the standard elements of a so called ‘tort’ case. A tort is a violation of a duty imposed by the law on an individual. In medical malpractice, the elements of a tort include the existence of a duty owed to the patient, a breach of duty, and a link between the breach of duty and damages sustained by the patient. The patient must prove either: 1) the physician did not possess and employ the required skill and knowledge or 2) he or she did not exercise the care and judgment of a reasonable person in like cases. In addition, the patient must prove the injury either: 1) resulted from the failure on the part of the physician to possess and employ the required skill and knowledge or 2) resulted from his or her failure to exercise the care and judgment of a reasonable person in like circumstances.

When the breach of duty pertains directly to the acts of the physician, it becomes a question for the jury to decide if the behavior of the physician was, in fact, negligent. A more complicated legal situation arises when the breach of duty is instead related to a third-party (e.g., another physician, resident, nurse, physician assistant or other allied health professional) but assigned to the physician because of the physician’s relationship to the third-party as an employer, supervisor or agent.

In 1949, Pennsylvania became the first state to address this issue when the Pennsylvania Supreme Court decided the case of McConnell v. Williams. In this case, the court determined Dr. Williams could be held liable for damages sustained by an infant he had just delivered even though the injury was not directly caused by him but rather by an intern assisting him – the intern applied silver nitrate to the infant’s eyes while Dr. Williams attended to the hemorrhaging of the infant’s mother.

The court reasoned, “…in the course of an operation…and until the surgeon leaves that room at the conclusion of the operation…he is in the same complete charge of those who are present and assisting him as is the captain of a ship over all on board, and…supreme court is indeed essential in view of the high degree of protection to which an anaesthetized and unconscious patient is entitled…” With this decision, physicians who have the right or responsibility to control the actions of the ‘agents’ or ‘employees’ assisting them have became subject of liability for negligent acts committed by those individuals.

And while the original case for the ‘Captain of the Ship’ doctrine is surgical based, the responsibility, oversight and demonstrated competency of a health care provider to perform a service on behalf of a physician is still applicable. These services are items for which the overseeing physician is ultimately responsible and for which he or she is subsequently seeking reimbursement.

Of note, while the liability for patient injuries may be shared by other personnel, practice groups and hospitals, a physician is reasonably expected to be aware of their responsibility as ‘Captain of the Ship’ to monitor and control clinical situations and the personnel.

In the next issue, we’ll take a closer look at supervising physician assistants.
Since 1996, the South Dakota Health Professionals Assistance Program (HPAP) has assisted with the recovery and return to work of hundreds of health care providers. HPAP is a confidential program designed for regulated health professionals who hold, or are eligible to hold, licensure with the South Dakota boards of Dentistry, Nursing, Medical and Osteopathic Examiners, and Pharmacy.

**Philosophy**
HPAP recognizes that mental illness and substance use disorders are diseases that may negatively impact an individual’s physical, mental, social, vocational, intellectual, emotional, and spiritual well-being. HPAP believe these illnesses can be successfully managed and treated. Compassionate intervention can help save an individual’s career and possibly his or her life. HPAP recognizes that health professionals who are experiencing these illnesses are individuals who have dedicated their lives to helping others, and are now in need of care themselves.

**Mission**
HPAP is dedicated to enhancing public safety and support for professionals by facilitating the early intervention, treatment, continued care, and monitoring of the safe return to practice for professionals who may be unable to practice with reasonable skill and safety if their mental health or substance use illness symptoms are not adequately managed.

HPAP acknowledges a primary concern for public safety. The program attempts to ensure public safety by providing voluntary, confidential alternatives which support health professionals’ recovery efforts. A vibrant assistance program will enhance public safety by reducing risk associated with potentially impairing health conditions, and early intervention and referrals may, over time, decrease licensing board discipline.

**Program Services**
HPAP is a statewide program, and is confidential and professionally staffed.

Services include:
- General outreach;
- Crisis intervention;
- Informal assessment;
- Treatment monitoring; and
- Support for providers who need assistance.

HPAP develops individualized participation agreements with input from many sources including the participant and the HPAP staff physician and evaluation committees. These agreements support adherence to the prescribed treatment plan, and provide opportunity to document sustained recovery.

Ongoing documented recovery through HPAP can provide the basis for HPAP advocacy on behalf of participants.

In addition to voluntary referrals, HPAP provides non-disciplinary options, as well as mandated/disciplinary options for licensing boards when regulated health professionals whose illness of a mental health or substance use disorder requires monitoring and practice limitations. The program follows a non-punitive approach, in which the program staff works in conjunction with, or as an alternative to, other sanctions which a health related board might impose upon the regulated health professional.

HPAP is available to assist – contact Craig Utz, MD, or Maria Eining directly at 605.275.4711.

**Eligibility and Referrals**
Anyone can make a referral to HPAP. Most referrals come from employers and licensing boards; however, in an effort to encourage early intervention and improved outcomes, HPAP encourages self-referrals, referrals from families or peers, or referrals from medical or treatment agencies. If you call HPAP about a colleague, your contact will be held in the strictest confidence. HPAP will serve as a resource to help determine appropriate next steps.

Per SDCL 36-2A, HPAP is available to any individual who, at the time of application:
- Holds a license as a healthcare professional from a participating board in South Dakota;
- Is eligible for and in the process of applying for licensure from a participating board in South Dakota;
- Has not diverted controlled substances for other than personal use;
- Has not been accused of sexual misconduct;
- Has not been terminated from a similar program in this or another state for noncompliance; and
- Does not create too great a risk for the healthcare consumer through continued practice.

**Red Flag Signs that a Health Care Professional May Be Diverting Drugs**
- Volunteers to care for patients with regular pain medications;
- Always volunteers to give medications;
- Excessive amount of narcotics signed out to patients;
- Always gives IM, PRN, & maximum doses when others do not;
- Patients complain of no pain relief from medications given;
- Selected patients will only receive sleeping pills and narcotics when this individual is on duty;
- Discrepancies on medication administration records;
- Narcotics signed off the controlled substance record but not recorded on patient record;
- Borrows narcotics from other units;
- Has frequent wastage, like spilling drugs or breaking vials;
- Unobserved wastage – no co-signature;
- Abnormal number of syringes used or missing;
- Evidence of broken syringes in employee restroom;
- Frequently volunteers for extra shifts and/or other units; or
- Works in an area where drugs are tampered with or missing.

**REFERENCES**

Neurology and psychiatry share a long history together. Many of the early practitioners of neurology in this country were initially trained as psychiatrists. Although the two specialties differ considerably, they share a common accrediting board, the American Board of Psychiatry and Neurology. In their respective tests for board certification, neurologists field questions pertaining to psychiatry and psychiatrists are quizzed on neurologic issues. And certainly in clinical practice, the two disciplines can overlap. For example, patients with chronic neurologic conditions such as Parkinson’s disease or multiple sclerosis may also suffer from emotional issues like depression or anxiety. And not infrequently, patients complain of various neurologic symptoms that ultimately prove to reflect an emotional, somatoform disorder rather than organic disease.

On rare occasion, a patient with an obscure illness may confound both neurology and psychiatry. Anti-NMDA receptor encephalitis is such an entity. It is decidedly uncommon and perplexing, but when recognized may respond dramatically to treatment.

Case Report

A 37-year-old male presented to the emergency room after four days of fever and night sweats. He demonstrated emotional lability and had problems performing normal tasks at work. He missed a scheduled appointment. In an emergency department evaluation he was judged to have psychosis. Note was made that he had no prior history of mental illness and that he was to be married in the next month. He was hospitalized for three weeks on a mental health unit. At times his symptoms seemed bizarre. At one point, he was described as being in a “catatonic state.” The patient himself recalls an occasion in the shower when he called for help because his arms remained “up in the air” and he felt that he could not manipulate them to get out of the shower by himself. Photosensitivity and a 40 pound weight loss were described during this hospitalization. Various psychotropic drugs were tried. His stay in the mental health unit was interrupted by a 24 hour admission to an acute hospital. The treating psychiatrist requested an evaluation to search for organic causes of psychosis. During that acute hospital stay the patient was described as being confused (sometimes not recognizing family members); being “unable to provide meaningful history;” and having “rapidly changing speech patterns.” A CAT scan of the head was normal. A CSF examination revealed 10 white cells (92 percent lymphocytes) and a normal protein of 48 and a glucose of 67. His problem was described as being “consistent with an underlying psychiatric issue” and he was transferred back to the mental health unit. At that point, a neurologist was consulted and noted the patient’s speech pattern to show dysarthria and to demonstrate perseveration with frequent repetition of the last word of a sentence. An EEG and paraneoplastic panel were obtained and proved negative.

Ultimately, his family requested transfer to another tertiary institution and he was admitted to a psychiatry service there. Neurology was again consulted and described the patient as being disoriented and exhibiting a “marked aphasia.” Over the next week, he became increasingly less verbal, reaching a point where he only said a few words such as “yes,” “no,” “exit.” An MRI of the brain was normal and a PET scan was non-diagnostic. An EEG showed mild slowing. A testicular ultrasound was negative, as was a chest X-ray and another paraneoplastic panel. A repeat spinal fluid examination showed nine white cells. Oligoclonal bands were present in the CSF and an IgG synthesis rate was elevated. A N-methyl-D-aspartic acid antibody test was done in the serum and in the CSF and both were positive.

Following these tests, the patient was treated with high dose IV steroids for five days and his symptoms dramatically improved. He became more verbal and started speaking in sentences although cognitive deficits persisted. Plasma exchange was initiated for a total of six treatments and a tapering dose of prednisone was instituted. Additionally, he was started on azathioprine. For the next 10 months, he remained stable as prednisone was decreased, ultimately to 9 mg a day. At that point, over a two-week period, he began to exhibit recurrent personality change. Emotional
lability developed and he had verbal outbursts of anger. He was judged to be somewhat paranoid and at one point locked himself in the basement. His steroids were increased again to 60 mg of prednisone a day and plasma exchange was instituted. Azathioprine was discontinued and rituximab initiated.

During the past year, he has remained stable. His wife and he feel he is back to normal. Periodic treatments with rituximab have been administered. His prednisone was steadily tapered and ultimately discontinued.

**Discussion**

Anti-NMDA receptor encephalitis is a murky and only recently described entity. Most practicing neurologists and psychiatrists have not personally made this diagnosis. I never have. The individual described in this report was referred to me after the diagnosis was made elsewhere. He appreciates the rarity of his condition and appropriately wonders how many other persons with this illness are not correctly diagnosed and successfully treated. But clinician awareness is improving. I recently asked a neurology resident from a major academic center if he had heard of this condition. In fact, he reported, he’d actually seen two instances of it.

As currently understood, anti-NMDA receptor encephalitis is a form of autoimmune encephalitis that may develop as a paraneoplastic phenomenon although debate continues regarding the etiology of the condition. It was first reported in women with ovarian teratomas in 2007, and some 600 cases of anti-NMDA receptor encephalitis have now been described in the literature. The most common age of onset is between 15 – 35 years. The diagnosis can be extremely difficult to make. Most patients present initially with symptoms suggesting a primary psychiatric illness. Psychosis, hallucinations and hypersexuality have all been described. Sometimes nonspecific prodromal symptoms may initially herald the disease. These may include low grade fever as well as transient respiratory or GI complaints. Other symptoms can include memory difficulties, speech problems, abnormal movements and decreased alertness. Approximately one-third of cases occur in children. Adult men, more commonly than women, may have an initial seizure. Screening for an occult malignancy is important. When present, tumors are generally teratomas. Approximately 50 percent of young women with this condition have ovarian teratomas. Other infrequently found tumors include testicular germ cell tumors, small cell lung carcinoma, Hodgkin’s lymphoma and thymic tumors.

The CSF in patients with anti-NMDA receptor encephalitis may reveal a mild pleocytosis and in both of the spinal fluid specimens obtained on the patient in this report the WBCs were slightly elevated. Also somewhat surprisingly, oligoclonal bands may be found in the CSF (as was the case in this patient). While oligoclonal bands are typically associated with MS, it is generally understood that they may also be present in the CSF of various other neurologic conditions as well.

When this diagnosis is suspected, it is crucial to obtain antibody testing (N-methyl-D-aspartic acid antibody) in the serum and CSF. The presence of the NMDA antibody in CSF is considered to be very specific for the disease. When the diagnosis is confirmed, consensus first line therapy is high dose steroids, followed by plasma exchange or immunoglobulin (IVIG). Thereafter some form of immunosuppressive therapy is recommended and rituximab or cyclophosphamide are favored.

**Conclusion**

Anti-NMDA receptor encephalitis is rare and baffling. Often there is considerable delay in starting immunosuppressive treatment as clinicians attempt to deal with what seems to be a psychiatric illness. This condition is so uncommon that neither psychiatrists, neurologists or primary care providers usually even consider the possibility early on. Given the bewildering symptoms at the onset, this illness can serve as an allegory for all diagnostic and therapeutic conundrums. For any of us, the best hope of recognizing a truly obscure illness is persistence in seeking a satisfactory explanation for a patient with atypical symptoms. The prickle of diagnostic uneasiness we may feel should be heeded. Of course, it is also important to be reminded that psychiatric symptoms can be a reflection of underlying organic disease. While most neurologists and psychiatrists will probably never care for a patient with this condition, both specialties should view the possibility of anti-NMDA receptor encephalitis as a cautionary reminder. Indeed, all clinicians need to be open to the unanticipated explanation and to a need for collaborative consultation when normal probabilities seem somehow askew.

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**About the Author:**

Jerome W. Freeman, MD, FACP , is Professor and Chair of the Department of Neurosciences, USD Sanford School of Medicine and with Sanford Clinic Neurology.
South Dakota Foundation for Medical Care (SDFMC), in conjunction with the Centers for Medicare and Medicaid Services, organizes its work around the triple aim of “Better Health, Better Care and Lower Health Care Costs.” This is a difficult task for those working with people with one or more chronic diseases such as depression, arthritis, diabetes, breathing problems, and heart disease amongst others.

These goals can be recognized, however, in an evidenced-based chronic disease self-management program by Stanford University. The South Dakota Department of Health, in cooperation with the South Dakota State University Extension, SDFMC, and several other health care partners has launched a statewide initiative to introduce the program to health care consumers. The Stanford program known as “Better Choices, Better Health” is a workshop that consists of six 2½-hour sessions, and is the result of these endeavors.

By implementing practical ways to manage their condition, participants in the program will experience:
• Better overall health;
• More energy and less fatigue;
• A more active lifestyle; and
• Fewer visits to the doctor, hospital or emergency room.

Topics of the workshop include:
• Managing symptoms;
• Managing pain, fatigue and stress;
• Tips for healthy eating;
• Personal exercise plans;
• Relaxation techniques;
• Medication management;
• Dealing with emotions; and
• Working better with your doctor and care team.

Several studies have examined the issue of financial sustainability of the program and found moderate reduction in health care cost through fewer emergency room visits, a reduction in hospital utilization and outpatient visits. A savings of $740 per person1 who attends the program has been estimated.

Over 20 professionals, volunteers and community members have recently completed training provided by Stanford to offer workshops across the state. To recognize the savings in healthcare dollars for South Dakota, program promotion, support, recruitment and endorsement is needed by providers, nurses and community educators.

Assisting health care consumers to learn new ways to take charge of their life to live healthy each and every day should be the goal of every health care provider. Through promotion of “Better Choices, Better Health,” we can encourage consumers to successfully take a step toward this goal.

For more information or to find a workshop near you, call 888.484.3800 or visit goodandhealthysd.org/betterchoices-betterhealth.

REFERENCES


“Quality Focus” is a monthly feature presented by SDFMC, South Dakota’s Quality Improvement Organization. For more information about the SDFMC, visit their website at www.sdfmc.org.
She was one of those outgoing personality types who would have fun, no matter what, and people liked to be around her because some of that fun always rubbed off. My wife and I met her when she was in her 60s, and indeed it was a pleasure to be her friend.

Then came the gradual intrusion of Parkinson’s disease. Since we only saw her once every six months or so at meetings, the manifestations of the disease became more obvious to us than to those who saw her every day.

Over time, her facial expressions became less spontaneous; her left hand developed a rolling tremor; her voice became quieter; and her walking gate became halting and rigid. I remember thinking how her symptoms seemed to be on a rollercoaster according to the timing of her medicines, as she seemed to move easier in the mid-morning, but became almost frozen in the late afternoon. None of this affected her spirit and sense of humor however, until much later.

It was at an after-banquet formal ball several years ago when I noticed her sitting alone, so I asked her to dance. The disease had progressed significantly by this time, but I thought that the music was so good, she would enjoy just getting out on the floor and feeling the rhythm…what did she have to lose? So she left her walker, and shuffled out with me onto the floor.

And then something almost magical happened: she could dance. We two-stepped all over the floor with relative ease, to her and my surprise and delight. She told me that directions for the movement of dance must come from a different part of her brain.

I’ve read since how dance and music therapy has become quite standard and usual for patients with Parkinson’s disease. But that night, there was nothing standard or usual about how she discovered moving to the sound of music once again.

Take home message:
1. Parkinson’s disease is characterized by progressive rigidity, tremor, and the loss of spontaneous movement;
2. Medicines are useful but can cause a waxing and waning of symptoms according to the timing of when they are taken;
3. Music and dance therapy is particularly helpful for those with Parkinson’s disease.
Much of what DAKOTACARE does as a managed care company, such as authorizing care, managing referrals, or reviewing medical necessity, is simply to remind and reinforce what good physicians do anyway – provide high quality, medically necessary care in the most cost-effective manner possible. With that in mind, here are a few thoughts to consider:

Preauthorization is sometimes a necessary part of managed care to assure that the use of a service, drug, or supply is carefully considered. It isn’t meant to slow down or prevent necessary medical care. Through the years we have added and subtracted items from the “Preauthorization Required” list as the medical system evolved and situations changed. However, in certain areas of medical care, preauthorization is still a useful and necessary process. Our main goal today is to streamline the process whenever possible, usually by using technology such as web-based preauthorization platforms. Since this often requires you and your staff members to change and learn new processes as well, we thank you for your efforts, and encourage you to ask questions (and have patience) as necessary.

DAKOTACARE prides itself on having the most comprehensive physician network in South Dakota and in the region. Indeed, nearly every physician specialist in the state is a participating DAKOTACARE provider. If you find it necessary to refer a DAKOTACARE member for specialty care, please think of the network(4,9),(996,987)

Most health insurance payers today use software to do analysis, or code editing, of physician claims. The purpose is not simply to reduce payment, but rather for fairness; to insure that standard coding and billing rules, as accepted by the vast majority of providers and payers in the nation, are applied to all claims. All services, or components of services, may not be billed the same; but should be paid the same.

The American Board of Internal Medicine is currently sponsoring a program called “Choosing Wisely,” which is aiming to promote goals similar to ours: medical care that is supported by evidence, not duplicative, free from harm, and truly necessary. You can read more about it on their website at www.choosingwisely.org, where you can also find lists from various specialty provider organizations which focus on specific services.
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Child & Adolescent Neurology
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Don’t forget to send in your favorite scenic photo for South Dakota Medicine front cover consideration.
Send photos to ereiss@sdsma.org.
Although the confirmed cases of Ebola in the U.S. are few, state and federal health officials want to make sure physicians are prepared. Early recognition of Ebola is critical for infection control and optimal care. Health care workers need to be vigilant in asking about travel to western Africa (specifically the Ebola-affected countries of Liberia, Sierra Leone and Guinea). Patients who have visited these countries and are exhibiting Ebola symptoms should be isolated in a private room with a private bathroom.

Health care workers should implement standard, contact and droplet precautions (gown, facemask, eye protection, and gloves). If you have a suspected case, consult the South Dakota Department of Health. Find additional resources at www.cdc.gov.

Source: CDC

Early Recognition of Ebola Critical for Infection Control

Physicians to be Docked 2% of Medicare Pay if Violating PQRS

Beginning next year, Medicare will begin docking physician’s pay via a 2 percent penalty if providers decline to report on quality measures under the Physician Quality Reporting System (PQRS). A major complaint voiced by physicians, including those associated with the Medical Group Management Association trade group, is that practitioners “had little time to analyze their 2013 data to help choose their best option for PQRS reporting for the next 12 months.”

The PQRS requirements for 2015 will not be known until the release of the final 2015 Medicare physician fee schedule this November, thereby rendering feedback received for 2013 performance uselessness.

Source: Modern Healthcare

SDSMA President Dr. Milroy Visits Medical Districts

SDSMA President Dr. Mary Milroy’s Presidential District Visits are underway. Dr. Milroy and physicians attending are discussing issues facing physician practices, the challenges faced in health care in South Dakota and nationwide, and the ways physicians can work together toward common goals.

So far, Dr. Milroy has been hosted by Aberdeen, Black Hills, Mitchell, and Watertown/Whetstone Valley.

Please consider attending your district’s meeting. Dr. Milroy wants to hear your concerns about challenges that affect care for South Dakotans and to gather ideas on how to work together to represent physicians both at the state and federal levels.

Source: SDSMA staff
The SDSMA’s Doctor of the Day program is a huge success every legislative session. During the legislative session, the SDSMA commits to providing a physician member to serve as Doctor of the Day for the State Legislature in Pierre. This volunteer commitment involves one day of service at the State Capitol by providing basic medical assistance to legislators and staff as needed.

As Doctor of the Day, you’ll have the unique opportunity to interact with legislators on the House and Senate floors and get a first-hand look at the legislative process and how it affects the practice of medicine. Your presence at the Capitol shows legislators not only your expertise but also your concern for the health of South Dakotans.

The SDSMA is in need of volunteers willing to spend a day to serve as Doctor of the Day. Each year we receive requests from physician assistants and advanced practice nurse practitioners who wish to participate in the program; it is critical that volunteer physicians are serving each day of session. South Dakota’s 2015 Legislative Session opens on Jan. 13. If you are interested and available to volunteer, please contact SDSMA Vice President Mark East at 605.336.1965 or meast@sdsma.org.

Source: SDSMA staff

SDSMA Sends Letter to U.S. House Leaders Urging SGR Repeal

The SDSMA has sent a letter to Speaker John Boehner and U.S. Rep. Nancy Pelosi urging a permanent repeal of the flawed Medicare sustainable growth rate (SGR) formula and reform of the Medicare delivery system to promote high quality and high value care. The letter commends the House and Senate leadership in developing bipartisan legislation to repeal the SGR and urges both parties to make repeal a top legislative priority for the upcoming session of Congress.

The cost of repealing the SGR is less than half of what it was two years ago. If not passed now, Congress will need to continue passing additional, last minute patches (17 SGR patches have been passed to date, creating uncertainty in the Medicare program and at a cost of $169.5 billion on temporary patches).

Source: SDSMA staff

Reporting Impaired Drivers

If a physician believes an impaired driver is a serious imminent threat to a person or the public, the physician should make a report to the Department of Public Safety. Many states have statutes in place that compel physicians to report impaired patients to the requisite governmental agency when they feel that a continuation of their driving privileges presents substantial risk to both themselves and the public at large. South Dakota is not one of those states; however, South Dakota physicians have a general ethical obligation to protect the health and welfare of the public.

HIPAA permits disclosure of confidential health information in certain circumstances. A physician may disclose confidential health information to avert a serious threat to health or safety. A physician who qualifies as a covered entity under HIPAA may use or disclose protected health information if the covered entity, in good faith, believes the use or disclosure is necessary to prevent or lessen a serious and imminent threat to the health or safety of a person or the public. The permissive disclosure described in HIPAA is subject to the limitation that such disclosure must be consistent with the applicable law and standards of ethical conduct for your jurisdiction.

The American Medical Association (AMA) has issued an ethics opinion concerning a physician’s duties in regard to patients whom they believe to be impaired drivers. The AMA recommends that the physician undertake a “tactful but candid discussion with the patient and family about the risks of driving” before independently reporting. The AMA recommends this conversation address additional treatment or therapy, or encourage the patient and family to decide on a restricted driving schedule, if possible. Reporting is only recommended in situations where clear evidence of substantial driving impairment implies a strong threat to patient and public safety, and where the physician’s advice to discontinue driving is ignored. The AMA also recommends that physicians disclose and explain to their patients their responsibility to report.

For more information, download the SDSMA legal brief Reporting of Impaired Drivers at www.sdsma.org. Through the SDSMA Center for Physician Resources, the SDSMA develops and delivers programs for members in the area of practice management, leadership and health and wellness.

Source: SDSMA staff
Primary Care Enhanced Payments Update

The federal government has not extended the Affordable Care Act-mandated enhanced primary care payments beyond Dec. 31, 2014. Due to a provision in the Affordable Care Act (ACA), states were required to reimburse eligible primary care physicians at an enhanced rate for certain services in 2013 and 2014. Unless the state of South Dakota or the federal government acts, enhanced payments will return to the customary rate paid by South Dakota Medicaid effective for dates of service occurring on or after Jan. 1, 2015. The SDSMA has sent letters urging that reimbursement keeps pace with inflation. Eligible primary care physicians and advanced practice clinicians may continue to attest until Dec. 31, 2014 for enhanced payments for eligible services provided through Dec. 31, 2014. Visit the South Dakota Department of Social Services website at dss.sd.gov for an 2014 attestation form.

SDSMA Foundation Officers Elected

At its September board meeting, the SDSMA Foundation elected its 2015 officers. The following will serve as officers:
- President – H. Thomas Hermann, Jr., MD
- Jem Hof, MD – Vice President
- Trevor Meaney, MD – Secretary/Treasurer
- John Fritz, MD
- Dale Gunderson, MD
- Steve Schroeder, MD

The SDSMA Foundation funds scholarships for medical students attending medical school in South Dakota. The Foundation annually provides scholarships intended to offset the rising costs of tuition. To date, the SDSMA Foundation has supported more than 100 medical students in their pursuit of becoming physician leaders.

Visit www.sdsma.org to make an online contribution to the SDSMA Foundation, or contact Laura Olson at lolson@sdsma.org.

Source: SDSMA staff

Webinar: Patient Safety and Reducing Risks at Transitions of Care

The SDSMA Center for Physician Resources invites you to its free webinar, “Patient Safety and Reducing Risks at Transitions of Care” at 7 p.m. CT Thursday, Nov. 13.

Whether you’re a medical student, a young physician just out of residency, or you’ve been actively practicing medicine for five, 10 or 15 years, it’s important to know how to protect yourself against liability claims by identifying and mitigating risk in your clinical practice.

This webinar will provide key information on:
- Common patient injuries associated with ineffective patient handoffs that can lead to mitigation;
- Areas within the healthcare patient handoff process in which issues are likely to occur; and
- Risk reduction techniques specific to transitions of care.

To register for this WebEx presentation, visit www.sdsma.org. A link to register can be found on the calendar along the right-hand side of the page.

Source: SDSMA staff
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If not, contact us to reach over 2,000 physicians!

**CONTACT:**
Elizabeth Reiss,  
South Dakota Medicine  
PO Box 7406,  
2600 W. 49th Street, Suite 200  
Sioux Falls, SD 57117-7406  
605.336.1965  
E-mail: ereiss@sdsma.org
## November 2014

**Nov. 5**  
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**Nov. 5**  
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**Nov. 5**  
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**Nov. 6**  
Pediatric Grand Rounds  
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**Nov. 12**  
Suicide: Making Sense of the Reality  
AMA PRA Category 1 Credit(s)™ available  
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**Nov. 14**  
OB/GYN Grand Rounds” Redesigning the System: Is Centering Healthcare Worth the Effort?  
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**Nov. 19**  
Internal Medicine Grand Rounds: Evaluation and Management of Sports-Related Concussion  
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Register online: usdssom.learningexpressce.com

## December 2014

**Dec. 3**  
Internal Medicine Grand Rounds: Colorectal Cancer Screening  
AMA PRA Category 1 Credit(s)™ available  
Register online: usdssom.learningexpressce.com

**Dec. 10**  
Internal Medicine Grand Rounds: Treatment for Bipolar, ADD, Depression, Anxiety  
AMA PRA Category 1 Credit(s)™ available  
Register online: usdssom.learningexpressce.com

**Dec. 17**  
VA Tumor Conference  
AMA PRA Category 1 Credit(s)™ available  
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**Dec. 18**  
Trauma Case Review – Region 4  
AMA PRA Category 1 Credit(s)™ available  
Register online: usdssom.learningexpressce.com

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**DO YOU HAVE A CME EVENT COMING UP? WOULD YOU LIKE TO HAVE IT LISTED HERE?**

Contact: Elizabeth Reiss, South Dakota Medicine, 2600 W. 49th Street, Suite 200, Sioux Falls, SD 57105  
Phone: 605.336.1965  
Fax: 605.274.3274  
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Lornell Hansen, M.D., is Board Certified by the American Board of Venous and Lymphatic Medicine and has a background in family medicine. Dr. Hansen performs vein procedures in Sioux Falls, Sioux City, Sioux Center and Watertown.

Jeff Heier, M.D., is a Board Certified Internist specializing in Phlebology. Dr. Heier performs vein procedures in Sioux City, Sioux Center and Watertown.

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