June 2022
Volume 75
Number 6

South Dakota medicine

THE JOURNAL OF THE SOUTH DAKOTA STATE MEDICAL ASSOCIATION

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Contents

June 2022
Volume 75 | Number 6

Cover photo by Katie Archer

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The Journal of the South Dakota State Medical Association

Office of Publication
2600 W. 49th Street, Suite 100
Sioux Falls, SD 57105
605.336.1965
Fax 605.274.3274
www.sdsma.org

Editor
Keith Hansen, MD

SDSMA President
Lucio N. Margallo II, MD

Chief Executive Officer
Barbara A. Smith

Staff Editor
Elizabeth Reiss, MS
–ereiss@sdsma.org, 605.336.1965

Advertising Representative
Elizabeth Reiss, MS
–ereiss@sdsma.org, 605.336.1965

South Dakota Medicine
(ISSN 0038-3317)
Published 12 times per year with one special issue by the South Dakota State Medical Association.

The SDSMA thanks the University of South Dakota Sanford School of Medicine for its financial contributions toward the production of *South Dakota Medicine*.

Subscription price: $50 per year domestic
$65 per year foreign, $8.95 for single copy

Periodicals postage paid at Sioux Falls, South Dakota and additional mailing offices.

Postmaster: Send address changes to
South Dakota Medicine
2600 W. 49th Street, Suite 100
Sioux Falls, SD 57105

SDSMA Home Page: www.sdsma.org

AMA Home Page: www.ama-assn.org

Printer:
Walsworth
P.O. Box 370
Fulton, Missouri 65251-0370

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WHAT JUMPING OUT OF AN AIRPLANE TAUGHT ME ABOUT INVESTING

DANIEL HAWTHORNE MS *Advisory Team Manager*

I served 24 years in the United States Air Force and was fortunate enough to have a lot of amazing life experiences during that time. Among those was the opportunity to jump out of perfectly good airplanes hundreds of times over the years. As with many things in life, there are usually lessons to be learned from our experiences that can be carried over into other aspects of life. Here are a few things jumping out of an airplane taught me about investing.

Embrace Uncertainty

We face a lot of uncertainly in life, and choosing to jump out of an airplane only serves to increase that feeling. I had always dreamed of attending the U.S. Army Airborne and Military Freefall Schools. However, when the aircraft door opens on the very first jump, it's easy to start forgetting why you wanted to jump out of an airplane in the first place. In some cases, people refuse to jump and deprive themselves of an awesome experience.

Investors constantly face uncertainty as they strive to achieve their financial goals. War in Ukraine, global pandemic, and high inflation are just a few things they have faced recently. These types of events can challenge your tolerance for investment risks. However, capital markets have prevailed through many such occurrences. It's important to stay the course in order to realize your goals. Having wise counsel can help you embrace uncertainty, and your Foster Group advisor is here to walk alongside you in that journey.

Diversify Risk

In most cases, you jump out of an airplane with two parachutes. Your "main" parachute and your "reserve" parachute. Those who've had to use a reserve parachute understand how important it is to diversify risk because when it comes to jumping, diversification can literally save your life. I still remember a night jump over the Nevada desert when one of our jumpers had a main parachute that didn't open. Had his risk not been diversified, he wouldn't be here today.

For investors, diversification can help reduce your portfolio's risk, so no single sector, stock, or asset class impacts the entire portfolio in the same way at the same time. With a well-diversified portfolio, you may win over the long run by increasing your risk-adjusted return.

Time Matters

My very first skydive was a tandem jump where two people are connected. Soon after jumping out of the airplane, our drogue chute (small parachute to stabilize and slow you down) wrapped around us as it was deployed. It was a bad situation that could have had catastrophic consequences. Fortunately for us, we were over 2 miles above the earth's surface, and we had time to clear the malfunction well before we were in danger of impacting the ground. Had we been closer to the ground, the circumstances would have been much different. For the investor, the more time one has, the more risk one can bear.

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My Family and the American Dream

Lucio N. Margallo II, MD
SDSMA President

The Declaration of Independence proclaims that all men are created equal, endowed with the unalienable rights to life, liberty and the pursuit of happiness. And the preamble of the U.S. Constitution secures the blessings of liberty to us and our posterity. My family has thought of these as the American Dream that the Statue of Liberty has beaconed us to aspire to.

The fulfillment of the Dream began on Jan. 3, 1973, when, from Manila, Philippines, we (my 5-month-old daughter Farah, wife Claudette, and myself) arrived in Seattle, Washington at 0-degree temperature, under blizzard conditions and crystal-icy roads. We only had $100 in our pocket and our luggage was filled with cloth diapers, medicines and powdered milk. It was a long 7,778-mile flight from a normal 90-degree Fahrenheit Philippine weather.

Unsure, but I was ready. I had three years of experience in general surgery in rural Philippines, following graduation from medical school in 1970 at the University of Santo Tomas, Manila (the Catholic university, run by the Dominican Order, was founded in 1611, making it older than Harvard and the oldest university in the Far East). Before that, I had had a one-year rotating internship in the countryside, often ministering to the casualties, from both sides, of a long-running armed rebellion.

The wheel of fortune has turned faster than our fondest dreams. The American experience started when I accepted the rare opportunity to serve as medical director of the Redfield State Hospital and School (institution caring for those with mental illnesses) from 1974-1977 under temporary license. After completing three years of residency in internal medicine at the University of South Dakota (USD) in 1980, I have spent the last 40 years as a general internist with Delaney Clinic and Avera Medical Group in Mitchell. Perseverance, struggles and in-betweens, I have also served as clinical assistant professor at USD Sanford School of Medicine, clinical professor at the USD PA program, professor at Dakota Wesleyan University (DWU) Athletic Training and Sports Medicine Program, medical director at Avera Brady Health and Rehab, and the Cardio-Pulmonary Service at the Avera Queen of Peace Hospital. I have been equally proud serving as a team physician for the DWU Tigers and Mitchell Kernels.

My wife, Claudette, is a retired RN, and now is a full-time homemaker. She has served in several medical missions. We happily celebrated our golden wedding anniversary last year, having been blessed with four outstanding children: Farah, a teacher (spouse Nick, also a teacher); Justin, a small-business proprietor; Chris, a Columbia University DPT graduate, (as is his wife Rux) has attended to U.S. Olympians in foreign assignments; and Jonelle, a Broadway actor, and grandkids Kira and Owen.

My Dad (Lucio I), a public defender, judge, and college dean, never had the opportunity to set foot and live in America. Mom (Isabel), a PhD and public school administrator, did; so all but one of their eight children who were already a physician, engineers (three of them), teacher, lawyer, architect and police officer when they came to the land of great promise and furthered the Dream – to become a nuclear engineer, IT associate, published author, building maintenance engineer, architectural project director, pastor, INEOA Medal of Valor recipient, and South Dakota State Medical Association president.

Prior to being SDMA president, I have been humbled on being bestowed these recognitions: 1) Distinguished Service Award (South Dakota State Medical Association, Mitchell School District); 2) Children's Champions Award (Abbott House); 3) Humanitarian Award (United Iriguenos Inc.); and 4) Hall of Fame Inductee (Dakota Wesleyan University, Mitchell High School Athletic Booster Club).

My parents-in-law, Victoriano (WWII hero and Korean War veteran) and Tita (a church administrator), and all four of their children, all professionals themselves (lab technologist/dietician, mechanical engineer and Vietnam veteran, RN, and doctor of dentistry) have been partakers of the same American Dream. We are honored to be Americans, and, in our humble capacities, we will continue to be of service to this divinely ordained nation that has adopted us.

As the 141st president of SDSMA, I am extremely proud to represent this organization, and I undertake to perform wholeheartedly all the responsibilities appertaining to the office: To promote the art and science of medicine, protect and improve the health of the public, and advocate for the well-being of patients and the best environment for physicians to advance quality health care – for ourselves and our posterity.

Editorial

Together in Teaching, Innovation and Compassion

Jason Kemnitz, EdD

Swiss psychiatrist Carl Jung once penned, "Your visions will become clear only when you can look into your own heart. Who looks outside, dreams; who looks inside, awakes." For the last year, The USD Sanford School of Medicine has done just that. Under the guidance of the American Association for Medical Colleges (AAMC), we have completed a comprehensive cultural climate survey. The results were enlightening. Of the many suggestions, one rose above the rest: to create shared conciseness, the SSOM needed a compelling inspirational vision statement. Something all students, residents, faculty, and staff could rally around. The USD SSOM surveyed all stakeholders and, after an exhaustive search and some additional help from USD Marketing, the inspirational statement was formed: **Together in teaching, innovation and compassion.** But what does that mean, and will we truly awaken after we have looked inside?

Perhaps the most important word in this phrase to me is the first word, **TOGETHER**. In the initial planning stages, there was some thought given to the word *leaders* in place of together. I prefer the word together because leaders imply a sense of individualism, and that is who we are or what we are about. One of the many strengths of the USD SSOM is that we work together to offer the best medical education that we can. Each one of us should draw upon our team's strength to complement our own, becoming the best faculty, residents, and students we can be. Second, while we have campuses in every part of the state, we are not individuals; we are the school without walls. We are together.

Together in Teaching. This is what we do and who we are. We teach. This teaching expresses itself in not only the academic sense of teaching medical students, but in educating patients, colleagues, and staff to create the best possible environment for all involved in medical care. But our teaching does not stop there. Our students teach each other, formally through supplemental instruction sessions, and informally through conversations they have when they seek guidance from one another. In addition, our students, residents, and staff should teach us as well. The best teaching is not top-down, but a free flow of information from all involved in which we learn from each other together.

Together in Innovation. The SSOM is no stranger to innovation, whether pioneering the Longitudinal Integrated Curriculum in Yankton, to our top-performing F.A.R.M. program, to the research being done around the state in labs and classrooms. As an institution, it does not satisfy us to be good enough, or "perform as expected", rather we look for a way to improve and innovate on what we do well already. In the instance that we find a need, we work to find innovative solutions. An example of this is the pre-residency boot camp run by Dr. Gary Timmerman. Dr. Timmerman has gathered a team of SSOM faculty together to help our graduates be as prepared as possible for their residency program, addressing the many unique educational ideas students need to be exposed to before beginning residency that they may not see during their time at the SSOM.

Together in Compassion. In their book "Compassionomics: The Revolutionary Scientific Evidence That Caring Makes a Difference," Trzeciak and Mazzarelli relate: When a physician is compassionate, patients heal better and faster, and the doctors are happier and less burned out. This compassion, the ability to be kind, warm, and have concern for others is the core of who we are. As a physician, compassion, along with skilled knowledge, is how you heal your patients. At the core, teaching is simply compassion combined with an altruistic desire to advance and share your knowledge.

Perhaps Jung is correct. We have awakened and now have a clear vision. What we choose to do from this point forward sets what we can become as a school.

Special congratulations to the USD SSOM Class of 2022. May your future be bright, and your path clear. We look forward to adding you to the ranks of our faculty in the future.

About the Author:

Jason J. Kemnitz, EdD, Associate Dean, Academic Development and Faculty Affairs; Assistant Professor, Family Medicine, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Diminishing a Profession: The Power of Words

To the editor:

In a well-written commentary (*South Dakota Medicine* 75(4):147) on the term "provider," SDSMA President Kara Dahl argues persuasively that physicians should abjure the use of the term because its "negative consequences…are far reaching and potentially devastating." I wholeheartedly agree with her analysis.

Dr. Dahl writes that the term was first introduced by the Nazis in the 1930s. That assertion, also found in an Israeli article (Saenger P, Jewish pediatricians in Nazi Germany: Victims of persecution. *Israeli Med Assn J* 8:324-28, 2006) does not have a persuasive historical basis. In the Saenger article, the author describes the replacement of the designation *Artz* by the designation *Behandler* which he translates as "provider."

Saenger's translation is simply a translator's interpretation, however. The actual word prescribed by the Nazis in late 1938 was *Krankenbehandler* which can be translated as *medic*, *practitioner*, *treater of the sick, health care handler* and so on. The introduction of the term followed shortly after the issuing, in July 1938 of the 4th Regulation on the Reich Citizen Act, a regulation effectively disenfranchising Jewish physicians.

> "Bestallungen (Approbationen) jüdischer Ärzte erlöschen am 30. September 1938. Juden, deren Bestallung (Approbation) erloschen und denen eine Genehmigung nach § 2 nicht erteilt ist, ist es verboten, die Heilkunde auszuüben." (Licenses of all Jewish physicians expire on 30 September 1938. Jews whose licenses expire and have not received a special exception under item 2 above [by the Reichsminister] cannot practice medicine).

The use of *Krankenbehandler* and its implications were thoroughly described by Rebecca Swoch in her 2006 book **Jüdische Ärzte als Krankenbehandler: in Berlin zwischen 1938 und 1945.** In it she writes (p. 14), "Als er mir ein altes, sehr verwittertes Blech-Schild seines Vaters zeigte, sah ich zum ersten Mal das Schild eines Krankenbehandlers. Als ich darauf den Satz.Zur arztlichen Behandlung ausschliesslich von Juden berechtigr las, …" (When he showed me an old, very weathered tin office sign of his father, I saw for the first time the sign of an Krankenbehandler which included the sentence, 'For the medical treatment exclusively of Jews'…).

The Nazi's systematic assault on medicine and society generally, as Leo Alexander described it in 1949 (Medical science under dictatorship. *NEJM* 241:39-47) included the rebranding of a class of physicians as something inferior to what they were, creating a new designation for these "lesser" doctors, fit only to treat a "lesser" race and then only by dint of a special license. Although the Nazi's did not use a term that can be rendered *only* as "provider" and, thus, did not introduce the word, they used their term to diminish a group of physicians for a sociopolitical purpose, a core parallel in Dr. Dahl's article to our circumstance today and a signal reason why we should all heed her warning.

Henry Travers, MD, FACP

Uncovering an Uncommon Diagnosis: Relapsing Adolescent Catatonia

Kate Waligoske, MD; Hannah Otten, PMHNP; and Vivek Anand, MD

Abstract

Catatonia in the pediatric population is a historically overlooked syndrome. Accurate recognition is complicated by a broad differential diagnosis and co-morbid substance use, particularly in adolescent patients. Prompt treatment is vital to avoid life-threatening complications such as malignant catatonia. This article summarizes a case of relapsing adolescent catatonia and discusses the pathway of diagnosis and treatment.

Introduction

The unique neuropsychiatric syndrome of catatonia is frequently overlooked in the diagnostic workup of children and adolescents. Once considered rare, evidence suggests that catatonia in the child and adolescent population frequently goes unrecognized and therefore is more common than believed.[1] There is evidence that pediatric catatonia accompanies Tourette syndrome, substance use, psychotic disorders, severe affective disorders, autoimmune processes, and neurological conditions like anti-N-methyl D-aspartate (NMDA) receptor encephalitis.[2,3] However, catatonic symptoms may also be erroneously attributed to other neuropsychiatric disorders and conditions such as anaclitic depression (physical and psychological impairment of an infant after separation from a caretaker), quasi-autism (shared attributes, but not a primary autism diagnosis), and reactive psychosis due to acute stress or trauma.[4]Additional disorders that may masquerade as catatonia include depression, selective mutism, social anxiety, intellectual disability, seizure disorders, traumatic brain injury (TBI), conversion disorder, and medication- or toxin-related extrapyramidal symptoms. Misattributing catatonic symptoms to an incorrect disease process or inciting event may lead to delayed diagnosis, underutilization of effective treatments, and increased length of hospital stays, re-hospitalizations, and group-home placements.[5]

Catatonia encompasses the diagnostic subtypes of withdrawal or stupor, excited, and malignant. Catatonic withdrawal or stupor has clear components of psychomotor delay such as immobility, mutism, and withdrawal from stimuli (including food), whereas excited catatonia includes motor hyperactivity, disorganized thought patterns, and hyperverbal presentations.[6] Delayed recognition of catatonia puts the patient at risk of malignant catatonia, a subtype associated with increased morbidity and mortality and characterized by autonomic dysfunction.[6]

The Diagnostic and Statistical Manual of Mental Disorders (DSM) version 5 outlines the common symptoms and associated comorbid conditions.[7] Regardless of the underlying causative process of catatonia, the syndrome is currently defined uniformly by the presence of at least three of 12 possible signs (Table 1). Once recognized, catatonia symptoms should be quantified and objectively measured by validated rating scales to help with initial diagnosis and measure symptom improvement with treatment. The Bush-Francis Catatonia Rating Scale (BFCRS) is commonly used in assessment of catatonia in adults. The BFCRS contains the DSM-V criteria as well as several more to assist in differential diagnosis (Table 2).[8] A modified version of the BFCRS, the Pediatric Catatonia Rating Scale, is also available and

Table 1. DSM-V catatonia.[16]

Catatonia is defined as having three or more of the following:

1. Catalepsy – limbs may be placed into rigid positions.
2. Waxy flexibility – minor and consistent resistance to positioning.
3. Stupor – no interaction with environment.
4. Agitation – without external cause.
5. Mutism – minimal to no verbal responses.
6. Negativism – minimal response to instructions or stimuli.
7. Posturing – spontaneous and active, against gravity.
8. Mannerisms – exaggerated actions.
9. Stereotypes – frequent and repetitive movements without apparent goal.
10. Grimacing- facial expression.
11. Echolalia – mimicking of speech.
12. Echopraxia – mimicking of movements.

Diagnostic criteria cited from Tandon R, Heckers S, Bustillo J, Barch DM, Gaebel W, Gur RE, Malaspina D, Owen MJ, Schultz S, Tsuang M, van Os J, Carpenter W. Catatonia in DSM-5. Schizophr Res. 2013 Oct;150(1):26-30.

Table 2. Bush Francis catatonia rating scale.[17,18]

Each item assigned a score of 0, 1, 2, or 3 for a maximum score of 69:

1. Excitement – hyperactivity, non-purpose full motor unrest
2. Immobility/stupor
3. Mutism
4. Staring
5. Posturing/catalepsy
6. Grimacing
7. Echopraxia/echolalia
8. Stereotypy
9. Mannerisms
10. Verbigeration – repetition of words or phrases
11. Rigidity – despite efforts to be moved
12. Negativism
13. Waxy flexibility
14. Withdrawal – refusal to eat, drink, make eye contact

If a total score of greater than or equal to 2 in the above, continue to next column.

15. Impulsivity
16. Automatic obedience – exaggerated response to requested movement or spontaneous continuation

Scored only as 0 (absent) or 3 (present)

17. Passive Obedience (Mitgehen) – able to be moved easily despite contrary instruction
18. Muscle Resistance (Gegenhalten) – automatic resistance to passive movement proportional to strength of the stimulus
19. Ambitendency – stuck in indecisive/hesitant movement
20. Grasp reflex -per neuro exam
21. Perseveration – on topic or movement
22. Combativeness
23. Autonomic abnormality

Rating scale cited from Bush G, Fink M, Petrides G, Dowling F, Francis A. Catatonia. I. Rating scale and standardized examination. Acta Psychiatr Scand. 1996 Feb;93(2):129-36. Online tool available from MedCalc Statistical Software version 19.2.6. MedCalc Software bv, Ostend, Belgium; https://www.medcalc.org; 2020.

widely utilized.[9,10] The treatment of catatonia across patient age groups involves benzodiazepines and electroconvulsive therapy (ECT).[11]

We present a case of relapsing adolescent catatonia in a patient with underlying psychiatric disease, significant history of emotional and sexual trauma, and ongoing marijuana use.

Case Report

The patient was a 15-year-old Caucasian female admitted to an inpatient child and adolescent psychiatric unit. She presented to a local emergency department (ED) with a history remarkable for major depressive disorder and at least five prior hospitalizations for related symptoms. The patient had a history of psychiatric residential treatment facility placement for three years and had prior diagnoses of generalized anxiety disorder, post-traumatic stress disorder related to sexual abuse, and cannabis use disorder. She had been regularly using cannabis since 11 years of age, smoked tobacco for last seven years, and used alcohol intermittently with sporadic binges from age 8 until 14 years of age. She asserted complete abstinence from alcohol for the prior nine months. Her medical history was significant for migraine headaches, Raynaud's syndrome, scoliosis, and a drug-induced seizure after intentional overdose. The patient's family history was remarkable for bipolar disorder in her mother and maternal grandmother. The patient had no history of intellectual disability, neurodevelopmental disorders including autism, Tourette syndrome, TBI, seizures, encephalitis, bipolar disorder, schizophrenia, or other psychotic disorders.

On presentation to the ED, the patient appeared tearful and somewhat stuporous. She made only two statements of complete sentences unrelated to the present situation. She made stare-like eye contact and appeared generally confused. Her family reported that she seemed disoriented and showed decreased verbal interaction, and observed a similar episode one week ago that resulted in hospitalization at a different hospital. The patient's family noted prior similar episodes which were intermittent, acute-onset, and debilitating in nature. The patient's vital signs were within normal limits. The patient's laboratory workup was negative for ethanol, acetaminophen, and salicylates. Complete metabolic panel was remarkable for a potassium of 3.2 mmol/L. Complete blood count and urinalysis were within normal limits. Urine drug screen was positive for delta-9-tetrahydrocannabinol. Pregnancy and coronavirus disease (COVID-19) tests were negative. The patient's home medications included mirtazapine 7.5 mg nightly, citalopram 30 mg per day, and recently initiated lamotrigine 25 mg daily.

On admission, the patient received a one-time dose of olanzapine 5 mg for an unexplained "psychotic" presentation. There was no improvement in symptoms with the antipsychotic. After psychiatric hospitalization at our tertiary

center, there was continued uncertainly of the etiology of her presenting symptoms. Mirtazapine and lamotrigine were discontinued and citalopram dose was reduced to 20 mg per day to reduce the medication burden. Further medical workup revealed normal creatine kinase level, mild to moderate dehydration, and vitamin D deficiency. Her thyroid profile, serum folate, serum cyanocobalamin were within normal limits. Clinically, the patient appeared downcast with blunted affect along with intermittent anxiety, confusion, tearfulness, minimal verbal interaction, intermittent staring like eye contact and paucity of motor or verbal responsiveness. On the second day of psychiatric hospitalization, the patient appeared moderately stuporous and continued to exhibit negativism (lack of response to external stimuli). She displayed slow to no responsiveness to commands, was mostly mute with speaking only a fraction of a sentence during a 20-minute interview and occasional slight nodding of the head. She displayed posturing: when given a pen and asked to write her name, she held the pen with much delay in a writing grip without any further motor movement for 7 minutes at which time the task was concluded. She displayed withdrawal from her surroundings and had minimal oral intake.

The patient was diagnosed with catatonia on day two of her hospitalization. Her symptoms were quantified and she scored 25 points on the BFCRS indicating a greater severity of catatonia. The patient was given lorazepam 1 mg orally. After benzodiazepine administration, she showed considerable improvement in social interaction, verbal conversation, affect, mood, motor movement; she scored 1 on BFCRS during reassessment two hours later. Soon-after, the patient began eating, drinking, and swallowing medications without difficulty. She also started writing and participating in psychotherapeutic programming.

The patient, however, had re-emergence of her symptoms towards the latter part on day 2 of her hospitalization and had a complete relapse of catatonic symptoms on day 3. She again displayed paucity of motor movements with inadequate response to her surroundings. Lorazepam 1 mg oral per day was initiated for four days. The benzodiazepine resulted in prompt resolution of symptoms during which she was more interactive and provided further information, including sharing that she regularly used marijuana in the form of smoking cannabis bowls and wax. On scheduled lorazepam, the patient became organized and participated in psychotherapeutic programming without any relapse of symptoms while hospitalized. Following four days of lorazepam 1 mg oral daily, the patient showed a 100 percent reduction in the BFCRS score (BFCRS score = 0) indicating a positive treatment response. Lorazepam was discontinued and the patient was thereafter observed for subsequent catatonic relapse. She showed no further symptoms of catatonia for four more days of inpatient treatment and was subsequently discharged home. The patient and guardian were contacted within 60 days of discharge for permission of this case study, and they denied any further concerns regarding catatonia symptoms.

Discussion

The patient in this case had several factors which could have precipitated or contributed to catatonia, including cannabis use, mood disorder, and history of trauma.[12,13] Catatonia is characterized by motor symptoms and other behavioral symptoms, and the clinical presentation can include psychomotor retardation, catalepsy, extreme negativism, motor immobility, excessive purposeless motor activity, mutism, unusual or peculiar involuntary movements, echolalia and echopraxia. Effectiveness and safety have been established for treatment of pediatric patients with lorazepam and electroconvulsive therapy (ECT).[14,15] ECT is appropriate for patients with severe catatonia refractory to benzodiazepine treatment. Although it often accompanies other psychiatric, neurological and developmental disorders, catatonia should be diagnosed independently to facilitate timely treatment.

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

About the Authors:

Kate Waligoske, MD, PGYI, Psychiatry Residency Program, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Hannah Otten, PMHNP, Avera Medical Group, University Psychiatry Associates, Sioux Falls, South Dakota.

Vivek Anand, MD, Child, Adolescent and Addiction Psychiatrist, Avera Medical Group, University Psychiatry Associates, Sioux Falls, South Dakota; Associate Professor, Division of Child and Adolescent Psychiatry, Department of Psychiatry, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

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Eagle's Syndrome: A Rare Case of Cervicofacial Pain Due to Elongated Styloid Process

Nathan A. Blaseg, MD; and Eugenio B. Matos, MD

Abstract

This report describes the presentation and management of a case of Eagle's syndrome in a 30-year-old male. This disease is a rare cause of unilateral cervicofacial pain due to elongated and calcified styloid process. This patient was managed with trans-oral styloidectomy after an extensive workup involving multiple specialties. One month post-surgery, the patient is doing well and reports resolution of symptoms with no recurrence or complications.

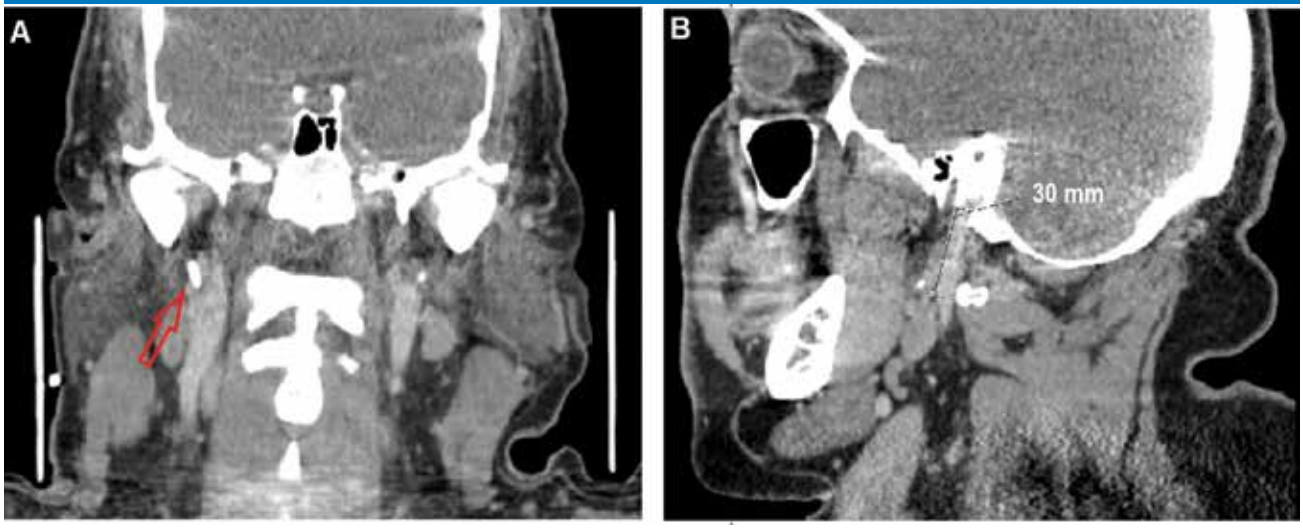
Introduction

Unilateral cervicofacial pain elicits a broad differential diagnosis including, but not limited to, trigeminal neuralgia, temporomandibular joint dysfunction, headaches, or infectious processes. One rare cause of cervicofacial pain is Eagle's syndrome (ES), which is an uncommon constellation of neurovascular symptoms caused by a pathologically elongated or calcified styloid process.[1] These symptoms develop as a result of compression of local anatomic structures which include cranial nerves V (trigeminal), VII (facial), IX (glossopharyngeal), and X (vagus). Compression of vessels including the internal carotid artery, maxillary artery, and internal jugular vein may also occur.[1,2] The resulting symptoms may include pain in the neck radiating to the ear, facial pain, headache, vertigo, hoarseness of voice, syncope, or bradycardia.[3] Due to the wide differential elicited by such a range of symptoms, diagnosis is often difficult and only accomplished after elimination of more common pathologies. Frequently, a host of different medical specialties including otolaryngology, neurology, and neurosurgery are consulted. In this report we describe a case of ES in a 30-year-old man who presented with unilateral cervicofacial pain.

Case Presentation

A 30-year-old male with a previous medical history of obesity (body mass index: 54.7) initially presented to an otolaryngology specialist with complaints of right ear pain and tinnitus which had been occurring for several weeks. He reported that this pain was sharp, often occurred with movement of the head and neck, and would occasionally radiate down into the neck and face. Evaluation revealed tenderness with palpation and range of motion of the temporomandibular joint on the right side. He was prescribed a trial of non-steroidal anti-inflammatory therapy for presumed diagnosis of TMJ joint inflammation. Three weeks later, the patient visited his primary care provider and reported that his symptoms had not resolved. He was subsequently referred to a neurology specialist. Evaluation from a neurological perspective revealed no focal neurological deficits, and the patient reported that his tinnitus had resolved at this time. He also denied any vertigo or changes in balance, voice, gait, or vision. Further evaluation via contrast and non-contrast magnetic resonance imaging (MRI) of the brain revealed no acute intracranial processes and normal internal auditory canals. No further recommendations were given at the time. One year later, the patient again returned to an otolaryngology specialist for his recurrent and intractable right ear and facial pain. At this time, computed tomography (CT) and MRI imaging of the soft tissue of the neck were obtained for suspected diagnosis of chronic laryngitis or chronic tonsillitis. This imaging revealed a nonspecific elongated right styloid process but no other significant findings. Exam at this time revealed tenderness with deep palpation of the right tonsil. At this visit, a diagnosis of ES was considered but not formally decided upon. The patient was prescribed a trial of gabapentin (75 mg twice daily). After another year, the patient again returned to a neurology specialist. He reported no symptom improvement with a trial of gabapentin. His neurological examination revealed no focal deficits. A CT scan with contrast was obtained to evaluate the soft tissue of the neck. This imaging revealed asymmetric mineralization of the right styloid process, measuring approximately 3.0 cm in length (Figure 1). The left styloid process measured 2.6 cm in length. No other abnormalities were identified. A referral to an otolaryngology specialist was made for a presumptive diagnosis of ES. Further evaluation by this otolaryngology specialist included MRI of the cervical spine for a potential

Figure 1. Preoperative images: coronal (A) and sagittal (B) computed tomography (CT) images demonstrating an irregularly calcified right styloid process measuring 3.0 cm in length (red arrow).



differential diagnosis including cervical rootlet compression by disk disease. This did not reveal any spinal pathology.

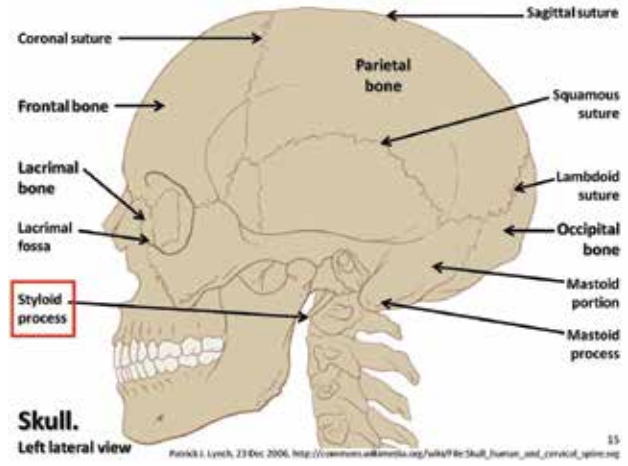
Following patient discussion, the decision was made to pursue a transoral surgical approach to remove the right styloid process. This was done under general anesthesia, with a vertical incision made just lateral to the tonsillar fossa. Blunt dissection was then used to expose the styloid process, of which 80 percent was removed using a rongeur device. Upon follow-up visit one month after the procedure, the patient reported resolution of symptoms.

Discussion

Clinical symptoms associated with elongated styloid process were first described in 1652 by Italian surgeon Marchetti.[3] The definitive syndrome, however, was first described in 1937 by W.W. Eagle, who further described more than 200 cases over the subsequent decades.[4,5] An estimated 4 percent of the general population has elongated styloid process, and a further 4 percent of those patients develop symptoms, making ES a rare entity.[6–8] Most commonly, ES affects patients in the third or fourth decade of life, with a 3:1 female predominance.[8,9] While our patient did have a body mass index (BMI) which categorized him as obese (54.7), there has been no published link between obesity and the incidence of ES.

The styloid process is a needle-like bony projection off the inferior aspect of the petrous temporal bone. It lies lateral to the jugular foramen, posterior and lateral to the carotid canal, and anterior and medial to the stylomastoid foramen, which transmits the facial nerve. It offers attachments to several

Figure 2. Relevant Anatomy of the Skull.



Skull diagram, lateral view with labels part 1 - Axial Skeleton Visual Atlas, p. 15 by Rob Swatski is licensed with CC BY-NC 2.0. To view a copy of this license, visit https://creativecommons.org/licenses/by-nc/2.0/. Edited for emphasis.

muscles and ligaments involved in movement of the tongue, pharynx, larynx, hyoid bone, and mandible. These include the stylohyoid, stylopharyngeus, and styloglossus muscles as well as the stylohyoid and stylomandibular ligaments. The styloid process is surrounded by various neurovascular structures. Medial to the styloid process lie the internal jugular vein, internal carotid artery, branches of the trigeminal nerve (CN V), glossopharyngeal nerve (CN IX), vagus nerve (CN X), and accessory nerve (CN XI). Lateral to the styloid process lie the facial nerve (CN VII) and hypoglossal nerve (CN XII).[1,10] The average length of the styloid process ranges widely in the published literature and may even differ between sides in the same individual.[11] Nonetheless, a styloid process longer than

3 cm is considered abnormal and confers an increased risk of ES.[1,12] Additionally, increased medial deviation of the styloid process has been implicated as a potential risk factor for the development of ES.[5]

ES may present with a host of non-specific symptoms, including dysphagia, globus sensation, facial or neck pain, ear pain, or throat pain.[1,4,6] This pain is usually dull and constant and may be aggravated by neck movement, swallowing, or yawning. A vascular variant of ES, known as stylocarotid artery syndrome, may present with neurologic symptoms such as transient ischemic attack (TIA), syncope, stroke, or even sudden death.[1,2]

Evaluation of ES requires a high clinical suspicion, as the vague nature of the presenting symptoms produces a broad differential diagnosis. Clinically, the elongated styloid process may be palpated in the tonsillar fossa. This palpation may also recreate the particular neuralgic pain described by the patient.[1,13] Upon clinical suspicion, diagnostic imaging should be pursued via lateral view plain radiograph or CT scan of the head and neck. The ideal imaging modality is spiral CT of the neck and skull base, which allows for three-dimensional reconstruction of the styloid process and a proper assessment of the impact it may be having on local structures.[14] These radiologic studies will reveal an elongated or abnormally calcified styloid process or stylohyoid ligament.

ES may be managed with surgery or more conservative measures. Conservative measures are considered first-line and may include injections of corticosteroids or local anesthetics or the use of oral agents such as gabapentin, amitriptyline, valproate, or carbamazepine.[1,15] Minimally invasive techniques such as radiofrequency treatment have also shown some promise in providing symptomatic relief.[16] In patients who do not respond adequately to conservative management, surgery in the form of styloidectomy is usually pursued. This may be done via an open or transoral approach. These surgeries may be effective in improving symptoms in up to 90 percent of cases.[6,17] Recurrence, while possible, is extremely rare.[18]

In summary, this report describes a case of cervicofacial pain in a 30-year-old male caused by elongated styloid process, a pathology known as ES. This case highlights a little-known disorder that should be considered as a differential diagnosis for a host of cervicofacial complaints.

Acknowledgements – The authors thank Dr. Jerome Freeman for his revisions and advice.

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About the Authors:

Nathan Blaseg, MD, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Eugenio B. Matos, MD, Clinical Associate Professor, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota; Department of Neurology, Sanford Health, Sioux Falls, South Dakota.

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Presentation and Management of Metastatic Periacetabular Disease: A Case Report

Austin Benson, MD; C. Dustin Bechtold, MD

Abstract

Multiple myeloma is a malignancy of blood cells that commonly metastasizes to bone. Metastasis to the acetabulum can cause significant patient distress due to pathological fractures that can be extremely painful and affects patients' ability to ambulate. The lytic lesions are unique and often require surgical management in order to restore normal anatomy to allow for weight bearing. A multidisciplinary approach is necessary to establish patient goals and optimize treatment plans. This report describes the presentation and treatment of an elderly patient with multiple myeloma and an unstable acetabular fracture with a large lytic lesion of the pelvis.

Introduction

Multiple myeloma (MM) is a malignancy involving the proliferation of plasma cells that stem from a B-cell lineage.[1] It accounts for approximately 1-2 percent of cancers but 17 percent of hematological cancers.[2] MM primarily affects elderly patients as the median age of diagnosis is 65-74 years old.[1,2] Great advances have been made in the treatment of MM in the past decades, significantly increasing the average number of years survived after diagnosis.[3] Commonly, patients with MM present with metastatic lesions to the bone. With increasing survival times lytic bony lesions that had previously not been problematic now commonly cause fractures that require treatment.[1] These lesions can be a significant cause of increased pain and disability for patients.[4] While adjunctive therapies can help reduce pain from bony metastasis, they cannot restore anatomy that allows for weight bearing that was lost due to pathological fractures or lytic lesions.[5] Metastasis to the acetabulum can be especially problematic for patients as they can greatly impact hip function and ability to ambulate. A multidisciplinary approach to treatment of pathological fractures due to MM is crucial in order to ensure the best outcome for the patient.

Case Report

An 88-year-old female originally presented to her PCP in April 2020 with increasing hip pain, thought to be from osteoarthritis. The pain had been chronic in nature and managed conservatively with medication. Due to the chronicity of the pain and apparent worsening of symptoms an X-ray was ordered and showed a suspected lesion in the ilium (Figure 1). Further investigation with CT showed a 6 cm lucent lesion in the left anterior iliac region. At this time, the patient was able to control her pain with tramadol and was independently ambulating. She scheduled an outpatient follow up appointment with hematology/oncology for further investigation. Over the course of the next week her symptoms progressively worsened. While she was weight bearing an audible crack was heard and the patient subsequently experienced greatly increased pain in her hip and inability to bear weight. Due to concern for malignancy and inability to obtain a biopsy for three days the patient was transferred to our facility for further workup. Upon admission X-rays were taken that revealed a mildly displaced and impacted pathological fracture of the left superior acetabulum and that there was superior migration

Figure 1. Initial AP pelvis X-ray from April 2020. Blue arrow points to the region of the fracture within the superior acetabulum. Red arrows point to lytic lesion in left ileum.

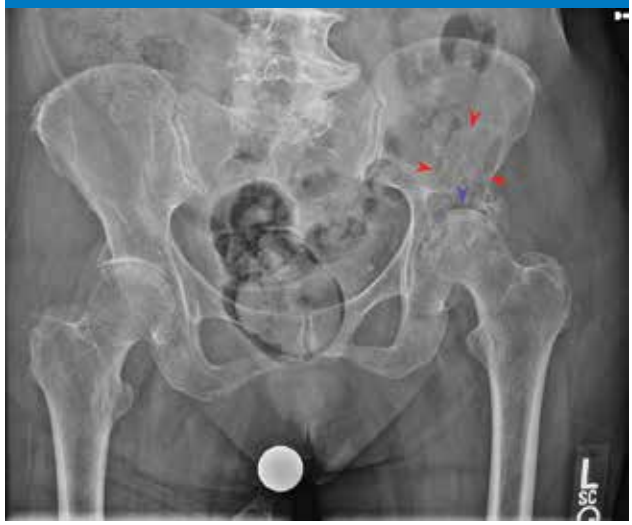
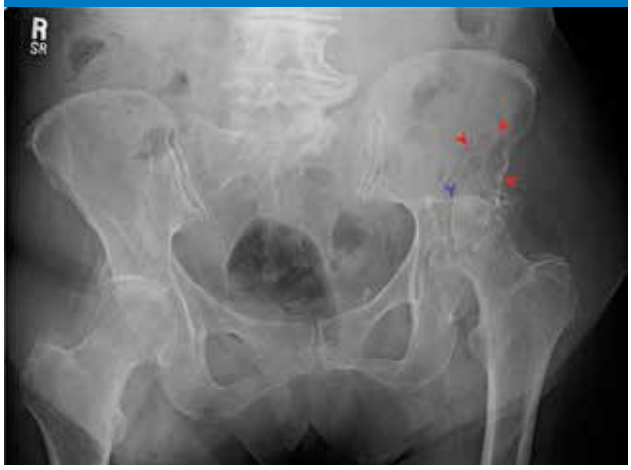


Figure 2. Follow up AP pelvis x-ray from May 2020 showing worsening of the pathological fracture. Blue arrow points to further displacement of the femoral head within the acetabulum and worsening of pathological fracture. Red arrows point to stable lytic lesion in left ileum.



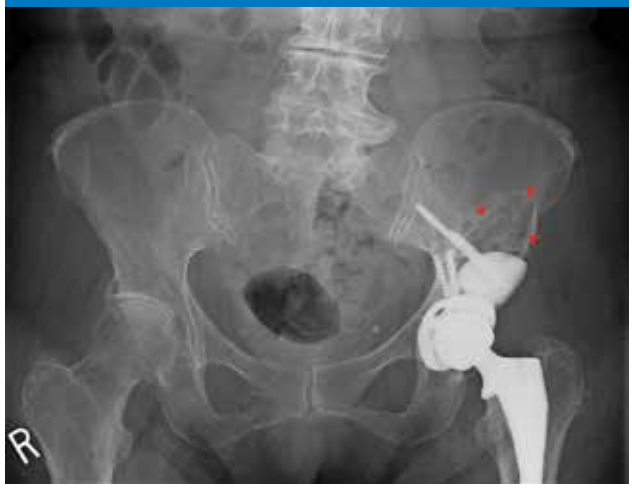
of the femoral head within the acetabular defect. Biopsy of the lesion revealed a plasmacytoma consistent with multiple myeloma. After a multidisciplinary workup and further discussions with the patient and family it was decided to pursue radiation therapy in order to help alleviate some of the patients' pain and to stabilize the lesion for bone recovery and to prevent further destruction. At this point in time the patient did not desire having a major operation to reconstruct her pelvis fracture. The patient was eventually discharged home and appeared to be doing better on the treatment regimen laid out by her hematology/oncology physicians, although she did have to remain non-weightbearing on her left leg. In May 2020, the patient's pain continued to progress despite conservative management. X-ray showed worsening of the fracture and further displacement (Figure 2). At this time, the patient decided to move forward with surgery. From the time of initial diagnosis the patient was treated with bisphosphonates, which optimize bone health by inhibiting osteoclast activity in order to prevent bone breakdown.

The main goal of surgery was to reconstruct the hip in a fashion that would allow the patient to ambulate, all while reducing pain levels. Extensive pelvic exposure would be required to properly assess the pathologic acetabular fracture and subsequent defect. In order to accomplish these goals, the patient would require total hip arthroplasty with further augmentation of the lytic lesion of the ileum.

In July 2020, the patient underwent her procedure. A standard posterior approach with some_extension was utilized to expose the joint. Further inspection of the acetabulum revealed that a portion of the posterior aspect of the lesion was a mobile cortical shell, after removal there was still some additional stable bone deep to that region. The anterior aspect of the lesion also appeared to have some mobile bone but was supported by a central column. This column also supported the superior aspect of the lesion. The native acetabulum was able to accommodate an acetabular component and three screws. In order to further stabilize the construct an acetabular augment was utilized. Originally it was thought that cement augmentation of the lesion might be needed in order to further support the augment. Upon further evaluation and discussion, it was determined that cement would limit bony ingrowth and not provide much additional benefit. Two screws were placed into solid bone through the acetabular augment to provide fixation. Cement was used to further unify the augment and acetabular component. The femoral component was placed in the usual fashion. Upon completion of the reconstruction, the joint did not have any impingement nor any instability.

Post operatively the patient would have to remain with minimal weightbearing for the first six weeks followed by gradual increases in loading the hip. The patient did quite well following the procedure. She reported minimal pain in her hip although she remained on narcotics due to other pains. She worked with physical therapy and was able to get up using a walker. Overall, she stated she was pleased with the result of the operation. Follow up X-rays at four weeks, six weeks, and four months revealed unchanged components with no evidence of loosening of the prostheses. The lytic lesion in the iliac bone also appeared to be stable (Figure 3). The patient continues to work with physical therapy to

Figure 3. Post op four months AP pelvis X-ray showing total hip arthroplasty with acetabular augmentation. Red arrows point to stable lytic lesion in left ileum.



advance weight bearing and continue with ambulation.

Discussion

The management of lytic lesions due to multiple myeloma depends on a wide variety of factors, including stage of disease, functional disability, pain levels, patient goals, among others. Lesions of the acetabulum are often classified according to the Harrington classification system. First described in 1981, Harrington classified type 1 lesions as defects in which the articular surface was affected but the walls and columns of the acetabulum were intact.[6,7] Type 2 lesions involve defects in the medial wall and quadrilateral plate. Type 3 lesions involve defects in the roof and acetabular rim. The classification of the lesion largely affects the treatment options. In this case, the patient had a large lytic lesion in the supraactebulum which would classify it as a type 3 lesion. Treatment options for type 3 lesions can vary but historically included Steinmann pins in cement along with total hip arthroplasty, often utilizing a flanged cup or cage.[7] Intraoperative evaluation in this case revealed mobile bone in the posterior and anterior regions of the acetabulum. Upon removal of this unstable portion, solid bone was discovered and appeared to be well supported by a partial vertical column. This allowed the acetabular component to be fixed using three screws as well as an acetabular augment to fill the space left by the lytic lesion superiorly. Additional screws would be ideal, but the available remaining bone did not allow further screw fixation.

While a small amount of cement was used to unify the augment and acetabular component, it was not used for fixation to bone. The goal of this technique is to create a unified acetabular construct that allows for maximal bony ingrowth. Additionally, the patient has continued with medical therapies by taking denosumab which prevents bone breakdown by binding the RANKL and disrupting the RANKL to RANK interaction which is vital for normal function and survival of osteoclasts. This provides a similar result as bisphosphonates. Following surgery, the patient was given the choice to continue with bisphosphonate therapy or switch to denosumab, the latter was chosen due to personal preference.

While lytic lesions of the acetabulum are not uncommon, each case can be extremely unique depending on a variety of factors. Our patient was initially against undergoing a major operation and instead elected to try and manage conservatively. After some time, the pain and inability to ambulate eventually become too much to handle and she elected to undergo a procedure. Undergoing a total hip arthroplasty with an acetabular augment provided this patient with the pain relief and stability to bear weight that she desired. It took a multidisciplinary team and an understanding of what the patient's goals were in order to accomplish this task. Overall, the patient is very pleased with the outcome and subsequent X-rays have revealed solid components with no evidence of loosening.

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About the Authors:

Austin Benson, MD, University of South Dakota Sanford School of Medicine, Vermillion, South Dakota.

C. Dustin Bechtold, MD, Sanford Orthopedics, Sioux Falls, South Dakota; Associate Professor, Department of Surgery, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

ECMO helps critically ill young patients

The Sanford Children's Hospital in Sioux Falls is the only hospital in South Dakota that offers Extracorporeal Membrane Oxygenation (ECMO) treatment to critically ill and injured young patients.

When DJ Veldkamp became severely injured in a motorcycle accident in Sioux Falls, his family was thankful ECMO was available close to home. Because of his injuries, flying to a larger city for treatment would have been dangerous.

Veldkamp's care team decided to put the 21-year-old on ECMO when his health declined in the intensive care unit (ICU). They quickly moved him to Sanford Children's.

"Because of his age and size, we took him to the pediatric ICU to do the ECMO," says Lesta Whalen, MD, medical director of Sanford Health's Extracorporeal Life Support Program."

"Without ECMO, he had a 50% chance of survival," remembers Veldkamp's mom, Nona.

ECMO can be used to treat severe pneumonia, heart failure, trauma, respiratory failure, sepsis and other overwhelming infections. The heart-lung bypass machine pumps and oxygenates a patient's blood outside of their body.

Veldkamp was hooked up to the ECMO machine for five days. He responded well to the treatment and recovered.

"If we didn't have ECMO, DJ may have survived, but his lungs would have been irreparably damaged from trying to use a ventilator to support him," says Dr. Whalen.

The ECMO team at Sanford Children's includes nurses, specialty doctors and respiratory therapists who provide around-the-clock access to pediatric critical care.

Dr. Whalen works with the team to ensure the ECMO circuit is working while it's running. She approves candidates for ECMO and helps coordinate their care.

"Whether we're treating a baby, a 3-year-old or a 30-year-old young adult, the ECMO circuit runs the same," Dr. Whalen says. "The machine is versatile."

ECMO is an important treatment that saves lives.

"I think the fact that this is the region's only ECMO program is a big deal," says Dr. Whalen. "You can stay closer to family and still get top care. It's an amazing resource to have at Sanford."

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  - Persistent Pulmonary Hypertension
  - Pneumonia
  - Respiratory Distress Syndrome
  - Sepsis

A patient needs to be on ECMO until:

- The heart and lungs get better
- The treatment fails to work

This could take a few days or many weeks.

Things that affect how long a patient is on ECMO:

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- How much damage there is before starting
- Illnesses or complications while on ECMO

When a patient shows signs of getting better:

- The amount of ECMO support is lowered slowly. This is called weaning.
- There will be times when the team tries to take the patient off ECMO. This is called trial off. Ventilator support is increased to help with breathing.
- ECMO support is stopped when the lungs and heart have healed enough.
- When ECMO support is stopped, a surgeon takes out the tube(s).

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Teledermatology in South Dakota: Uses and Patient Centered Improvement in a Rural Setting

Brooklyn L. DeVries, MD; Karly R. Brodersen, MD; Halie N. Mechels, MD; Jonah D. DeVries, MD; and B.D. Knutson, MD

Abstract

Dermatologic conditions account for a large proportion of healthcare visits in the United States, yet there continues to be barriers to dermatologic care particularly among the rural and underserved populations. Patients among these populations are particularly vulnerable to poor outcomes and increased morbidity. Teledermatology offers a potential solution to increase access to high-quality dermatologic care. Studies have previously examined the convenience, cost-effectiveness, and clinical efficacy of teledermatology compared to in-person dermatology visits. There is a need to assess which populations are appropriate and in what settings teledermatology can be most effective. We surveyed patients of a South Dakota dermatology practice to assess perceptions and experiences with teledermatology visits in the context of the COVID-19 pandemic. Significant factors leading patients to prefer in-person visits compared to teledermatology were being over the age 65 (OR 2.9 95 percent CI 1.9,3.8 and p-value 0.036) or experiencing technical difficulties during the visit (OR 2.9 95 percent CI 1.9,3.9 and p-value 0.048). We found the chief complaint played an important role in patient preference for visit modality. Patients with acne or acne follow up compared to all other chief complaints had a strong preference for teledermatologic visits (OR 4.7 95 percent CI 4.0,5.4 and p-value 0.000018) whereas patients with possible malignant lesions strongly preferred having an in-person visit (OR 6.6 95 percent CI 5.5,7.8 and p-value 0.0004). Based on these results, we suggest a targeted use of teledermatology with pre-visit screening measures to maintain a patient center approach and avoid redundant visits.

Introduction

Dermatologic conditions account for approximately one third of all office visits in the U.S.[1,2] Despite the growing demand, there remains significant barriers to access of dermatologic care, particularly among rural and underserved areas.[3,4] Currently, there is a shortage of dermatologists to accommodate the high demand along with a maldistribution favoring urban areas in the U.S. In a survey by the American Academy of Dermatology (AAD), 33 percent of dermatologists (and 48 percent in rural areas) reported that the number of dermatologists in their community is not enough to meet patient demand.[5] Studies have shown that patients in rural areas often travel more than 200 miles for the nearest dermatologic care.[6] Wait times have also gradually increased in recent years and are a growing concern among patients and providers alike.[7] Altogether, this leads to poor clinical outcomes and reduced quality of life.[8] Teledermatology is a rapidly expanding model of care that can meet this demand while maintaining high-quality care.

Literature supports the potential for teledermatology to increase access to dermatologic care while maintaining clinical efficacy and cost-effectiveness. Evidence supports that the implementation of a teledermatology platform leads to a reduction in wait time by up to 64 percent for clinic visits and treatment along with 33 percent increase in referral fulfillment .[9,10] At the same time, the implementation of an effective teledermatology platform has shown to be cost effective, particularly among patients who live farther away from specialist care. While there may be up-front costs, including equipment and training, these are balanced by decreased staff costs of in-person visits for the clinic. Furthermore, the cost benefit extends to the patient with decreased transportation costs, decreased lost work productivity, and drawbacks of delayed diagnosis.[10,11] Most importantly, teledermatology has been shown to be clinically effective with high diagnostic concordance rates between in-person visits and teledermatology, especially among chronic conditions such as psoriasis, acne, and atopic dermatitis.[8,12,13] However, it has shown less efficacy for other conditions such as the diagnosis of possible malignant skin lesions.[14]

Currently, teledermatology is experiencing a rapid expansion. A large factor is the recent expansion in telemedicine

reimbursement from the Centers for Medicare and Medicaid Services (CMS).[15] Currently, CMS has stated they recognize the value of this care and its expansion is a top priority. A second factor is the growing usage of telemedicine in light of the COVID-19 pandemic.[16]

While telemedicine provides a viable solution to increasing dermatological access while maintaining clinical efficacy, effective implementation is key. Previous studies have called for additional research assessing how and in what settings teledermatology can be most effective. Thus, our study's objective was to evaluate patients' experience with teledermatology implementation, particularly in the rural setting of South Dakota.

Methods

Avera's Determination of Human Subjects Research qualified that this project did not constitute human subjects research and therefore did not need an institutional review board approval. This is a health quality improvement project that is carried out in the setting of a relatively rural population during the current pandemic. Information was collected on all patients that had seen by an Avera dermatologist virtually between March 1, 2020 and Sept. 30, 2020. Information collected included name, date of encounter, type of appointment, provider seen, reason for visit, address, phone number, and email address. After identifying all patients who received tele-dermatology visits, each patient was called by phone from one of four medical students and administered a survey about their tele-dermatologic care. The survey questions were created in a focus group of four medical students centered on the largest barriers to tele-dermatologic care in South Dakota. Common themes identified as possible barriers included patient gender, age, distance to nearest dermatologist, reason for a dermatology visit, inexperience with the telehealth services, and whether patients were experiencing technologic difficulties. In order to ensure consistency of survey responses and the recording of survey answers, a standardized script was followed by each medical student and answers recorded into a pre-made electronic database. Patient data was de-identified immediately upon recording into the pre-made database. If the patient did not answer the call, a voicemail describing the survey and requesting to call back was left on the patient's phone. Patients who did answer were screened for eligibility. Eligible patients were above the age of 18 or had a legal guardian that could consent to the survey and seen virtually by Avera dermatology within the study timeframe. If they were determined eligible, patients were given the opportunity to participate or decline participation. Patients that agreed to participate were read a standardized verbal consent that outlined the risks and benefits. Based on the barrier to tele-dermatology themes identified in the focus group, patients were asked their age, sex, whether they lived within thirty miles of Sioux Falls, their chief complaint for the visit, whether this was their first virtual dermatology visit, their reasoning for choosing a virtual visit, whether they experienced any technical difficulties, whether they preferred in person visits and their rationale, and whether they would use the virtual service in the future as well as their rationale. In post-survey analysis, the patient's "reason for visit" were placed into six categories of "acne", "rash", "suspicious lesion", "surgery follow up", "psoriasis" or "other" if it did not clearly meet these categories. Additionally, to determine if age was a factor in patient visit preference, a cut-off of age 65 was used to classify patients as seniors based on Medicare's criteria. Odds ratio were calculated for patient's age (above or below 65), technology difficulties, distance to Sioux Falls, and acne or suspicious lesion as a chief complaint with the primary outcome of both "prefer in person" and "use in future". A 95 percent confidence interval and p-value from a Fischer's exact test were used to determine significance.

Results

Among 635 patients that received teledermatology visits between March 1 and Sept. 30 of 2020, 22 percent (139) elected to participate in the quality improvement survey. Unreturned voicemails accounted for 64 percent (409) patients and 14 percent (93) declined to participate. Among the 232 patients verbally contacted, 60 percent agreed to participate in the survey (Table 1).

Demographic and background data were collected on those who agreed to participate in the survey. The average age

Table 1. Response rate among eligible survey patients.

	Total	Percentage
All patients		
Consented to survey	139	22%
Declined to participate	93	14%
Unreturned voicemail	409	64%
Verbally contacted		
Consented to survey	139	60%
Declined to participate	93	40%

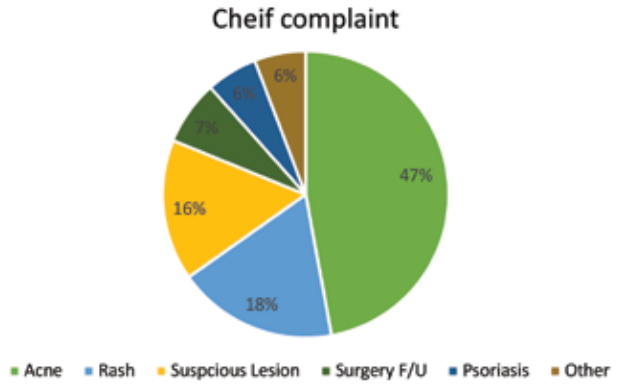
among survey participants was 36 years old and median age was 31 years old. Approximately 58 percent of survey participants were female and 42 percent male. Approximately 64 percent of the participants lived within 30 miles of the dermatology clinic. This was the first teledermatology visit for 95 percent of participants. Participants completed an average of 1.4 virtual visits. Among reasons for choosing a teledermatology visit compared to in-person, 93 percent opted for the virtual visit due to COVID-19 and 7 percent due to convenience. Technological difficulties occurred in 25 percent of participants teledermatology visits (Table 2). Common responses when asked for follow up on technological difficulties included "I couldn't get the appointment to connect" or "the camera and connection kept cutting out." Patients with multiple visits also reported using a "different platform" for their second visit that "didn't have as many issues."

Table 2. Demographics and background on survey participants experience.

Age	
Average	36
Median	31
Sex	
Female	58%
Male	42%
Distance to clinic	
Within 30 miles	64%
Outside 30 miles	36%
First tele-derm visit	
Yes	95%
No	5%
Number of visits	
Average	1.44
Median	1
Reasons for virtual	
COVID	93%
Convenience	7%
Other	0%
Technology difficulties	
Yes	25%
No	75%

The chief complaint for each participant's teledermatology visit was record and placed into six categories. Acne was responsible for 47 percent of visits, rash for 18 percent, suspicious lesion for 16 percent, surgery follow up for 7 percent, psoriasis for 6 percent and all other visits were 6 percent (Figure 1).

Figure 1. Frequency of six main chief complaints in participants teledermatology visits.



Patient experience and satisfaction with their teledermatology was estimated by if they would have preferred an in-person visit or if they would use the teledermatology service again in the future. A majority of participants preferred the teledermatology visit (53 percent) and a majority said they would use the service again in the future (86 percent) (Table 3).

Patients were also asked their rationale on why they would prefer in-person compared to virtual visits. Common responses for preferring in-person were "the connection didn't work", "the physician couldn't see what I was showing him on the camera", or "the visit was impersonal." Common responses for patients that preferred teledermatology visits

Table 3. Participant visit preference and future use.

Preference	
In-person	47%
Tele-dermatology	53%
Future use	
Would use	86%
Wouldn't use	14%

were "convenient for acne follow up", "it saves time", and "safer during COVID-19." When asked if patients would use teledermatology again in the future, many responded with "yes, but, only if I have to." They also frequently clarified with "yes, depending on the issue" or "yes, it was great for follow up". Patients who wouldn't use in the future frequently responded with things like "No, I had a better exam and visualization in person", "they weren't able to see the skin lesion", or simply "face to face is better."

The probability a patient preferred a teledermatology visit or if they would use teledermatology again in the future was assessed for all background/visit factors. Of note, it was found that patients above age 65 were more likely to prefer in-person visits (OR 2.9 95 percent CI 1.9,3.8 and p-value 0.036). It was also noted that patients who experienced technology difficulties were more likely to report not using teledermatology again in the future (OR 2.9 95 percent CI 1.9,3.9 and p-value 0.048). In addition, chief complaint for the visit was examined. Patient's being evaluated for acne were more likely to prefer a teledermatology visit (OR 4.7 95 percent CI 4.0,5.4 and p-value 0.000018). Patient's seen for a suspicious lesion were more likely to prefer in-person (OR 6.6 95 percent CI 5.5,7.8 and p-value 0.0004). Important to note is that patients greater than 30 miles from the clinic were not more likely to prefer a teledermatology visit (OR 0.8 95 percent CI 0.4,1.6 p-value 0.60).

Discussion

With growing demand for dermatologic care and a shortage of providers, innovative and cost-effective solutions are required so all patients have access to high-quality care in a time sensitive manner.[3,4,7]Growing technology enables teledermatology to potentially fill the care gap in rural and underserved areas such as South Dakota especially through the use of smartphone enabled platforms in areas where high-speed cable internet access cannot be achieved.[17] Previous research has confirmed that teledermatology provides high-quality care that is equivalent to in-person visits for a variety of conditions while decreasing both cost and wait times.[10-14] While previous research has confirmed teledermatology as a viable solution, effective implementation is paramount to wide-spread acceptance of this care model.

Overall, teledermatology was associated with a high level of satisfaction among patients with 53 percent stating they preferred the teledermatologic visit to a traditional in-person appointment and 86 percent of those that preferred teledermatologic visits. Patients who preferred this model of care responded with common themes that the virtual visit was "great for follow up", "saved time", and was "safer during the pandemic". This data provides a unique perspective as a large number of in-person visits were shifted to the virtual platform due to safety concerns during the COVID-19 pandemic. In fact, 93 percent of patients opted for a virtual visit due to the COVID-19 pandemic and this was the first teledermatology for 95 percent of patients surveyed. The preference for teledermatologic care and high rates of willingness to use in the future among this population further cements teledermatology as a patient centered model of care.

While teledermatology was regarded highly among survey participants, not all teledermatology patient demographics or visits were created equal. For patients' above age 65, they were more likely to state they preferred an in-person appointment (OR 2.9 95 percent CI 1.9,3.8 and p-value 0.036). This finding is at odds with the goal of providing easier access to dermatologic care in an aging population. Furthermore, patient's that experienced technological difficulty during their encounter were more likely to report they would not use the service again in the future (OR 2.9 95 percent CI 1.9,3.9 and p-value 0.048). Most patient's that reported technology difficulties struggled with "connecting to the service". Throughout the study period, the dermatology clinic switched virtual from Live-Interatvie to Store and Forward telehealth models and anecdotal responses from patients who used both services reported decreased technological difficulty at follow up appointment after the switch. Based on these findings, it appears that patients age and experience with technology are important considerations and possible barriers to widespread acceptance when recommending teledermatology visits in the future.

A further consideration when recommending teledermatologic care is the chief complaint for the visit. We found that patients who were seen for acne or acne follow up compared to all other chief complaints had a strong preference for teledermatologic visits (OR 4.7 95 percent CI 4.0,5.4 and p-value 0.000018). Previous studies have demonstrated that teledermatology may be as effective as in-person visits for acne and other chronic skin conditions.[8,12,13] Combining patient experiences with clinical efficacy, it is evident that teledermatology may have an effective role in acne and potentially other chronic dermatologic lesions. However, patients that were seen for possible malignant lesions strongly preferred having an in-person visit (OR 6.6 95 percent CI 5.5,7.8 and p-value 0.0004). Previous studies have demonstrated higher diagnostic discordance

rates between teledermatology and in-person visits for diagnosis of skin cancer.[13,14] Placed together, both patient preference and clinical efficacy points to the need to triage evaluation of suspicious lesions to in-person visits over teledermatology visits. They also provide support for the idea that teledermatologic care in the future should be tailored to the individual to ensure satisfaction.

Through the findings of our survey, we have identified several interventions that could improve this already popular model of care. Specifically, implementing a triage protocol to determine which patients are eligible to receive a virtual visit could improve clinic efficiency and patient satisfaction. Screening which patients are eligible for teledermatologic visits based on their age, technological literacy, and chief complaint could help reduce the number of patients who are dissatisfied with their care or require redundant visits for the same chief complaint. Additionally, ensuring that teledermatology services are utilizing a reliable and user-friendly platform is essential for patient acceptance.

While this survey provides evidence that teledermatology is a preferred and popular model of care, several limitations exist. Overall, survey response rate was high among those eligible to participate. However, a majority of patients not responding to our voicemail indicates sampling bias could exist. Furthermore, while the COVID-19 pandemic provided a unique opportunity to survey patients who may not have chosen a teledermatology visit on their own, the pressure to choose tele-visits during this time may be a confounding variable for patient motivations in the study. Finally, multiple teledermatology platforms were used by the clinic during this study period which could confound results regarding technological difficulties.

While this study focused on patient experiences and perceptions, it is also crucial to take into account provider experiences. Previous studies have examined provider experiences, but in order to achieve effective teledermatology implementation in a rural setting, it will be necessary to examine provider experiences in this context.[18] Overall, further research is required to analyze the effectiveness of triage protocols in improving patient experience and outcomes with teledermatology.

Conclusions

There is a growing demand for dermatologic care. Despite the demand several barriers hinder access to this care including the shortage of dermatologists, their maldistribution, and a history of limited reimbursement. These barriers to accessible dermatologic care result in poor clinical outcomes, increased morbidity, and increased healthcare costs overall.[12] Teledermatology has become a potential solution to increase access to high-quality dermatologic care. Evidence supports teledermatology as a convenient and timely solution while maintaining clinical efficacy and cost-effectiveness. Our study also supports patient satisfaction in particular settings and expands on previous research calling for studies assessing which populations may be more or less well suited for dermatology and how and in what settings teledermatology can be most effective.[19] In order to continue to improve care, future direction will be aimed at assessing provider experiences with teledermatology and triage protocols, particularly in a rural and underserved area such as South Dakota.

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About the Authors:

Brooklyn L. DeVries, MD, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Karly R. Brodersen, MD, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Halie N. Mechels, MD, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Jonah D. DeVries, MD, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

B.D. Knutson, MD, Division of Dermatology, Department of Internal Medicine, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Effects of the COVID-19 Pandemic on Breastfeeding Rates in a Single Tertiary Health Center

Jena Preszler, MD; Morgan Schriever, MD; and Margaret Terveen, MD

Abstract

Introduction: The coronavirus pandemic has posed many challenges for healthcare facilities. One patient population particularly affected was pregnant women who delivered during the 2020 year. Many antenatal and postpartum services normally available were altered during the pandemic, including the number of available lactation consultants. This change in the availability of lactation consultants led to a decrease in face-to-face breastfeeding education and support for postpartum women. This study aimed to identify if the coronavirus pandemic had a negative effect on breastfeeding prevalence in a single tertiary healthcare center.

Method: This study was a retrospective chart review with data collected from March 1, 2019-March 1, 2021. The study population was defined as pregnant women age 18 and older who delivered at a single hospital. The prevalence of women who stated they intended to exclusively breastfeed during the pandemic (March 1, 2020-March 1, 2021) was compared to the pre-pandemic year (March 1, 2019-Feb. 29, 2020) as a control. This breastfeeding prevalence was also compared to monthly county-specific coronavirus cases from the South Dakota Department of Health.

Results: The prevalence of women who stated they intended to exclusively breastfeed at the time of delivery during the study population was statistically less when compared to the previous pre-pandemic year.

Conclusions: The exclusive breastfeeding prevalence was negatively affected during the coronavirus pandemic in this single tertiary health center. Knowledge of this demonstrates patient fears regarding breastfeeding during a pandemic and the importance of lactation education and consultation.

Background

The COVID-19 pandemic has provided many challenges. As of May 28, 2022, there have been more than 525 million cases of the disease and more than 6.2 million deaths worldwide. The U.S. accounts for nearly 83 million confirmed cases, and South Dakota has confirmed more than 239,000 cases.[1,2] Fear due to uncertainty influenced many individuals from the start of the pandemic. Regarding lactation, fear of SARS-CoV-2 transmission to their infants was a concern for women as they decided whether or not to breastfeed.[3]

Healthcare facilities were fundamentally affected by the pandemic. In addition to masking and limited visitors, hospitals made staffing and personnel changes for the health and safety of those giving and receiving medical care. In some cases, the standards of care were affected by this. Support for breastfeeding women in the antenatal and postpartum periods is essential for the exclusivity and duration of feeding. Characteristics of adequate support are face-to-face interactions with trained personnel, scheduled support visits, and care tailored to the individual.[4] Women in this population have been particularly vulnerable to the changing recommendations, care guidelines, and medical accessibility in the last year. The pandemic diminished many necessary support measures as facilities transitioned to less face-to-face care, decreased staff, and more virtual and telephone consultations.[3] Data on the impact of the COVID-19 pandemic on breastfeeding outcomes is limited. A deeper understanding of this relationship is essential to reinforce the requirement of providing proper support for pregnant women and new mothers desiring to breastfeed their infants.

To help quantify the effects of the COVID-19 pandemic at our institution, we sought to evaluate the exclusive breastfeeding prevalence during the pandemic and compare it to the prevalence of the previous pre-pandemic year. During this time, lactation services at this institution consisted of primarily phone consultations. Additionally, prenatal classes including breastfeeding education were either canceled or converted to an online format. Due to a decrease in lactation

consultation services at this institution during the pandemic, we expected to find a decrease in exclusive breastfeeding prevalence compared to the pre-pandemic year. Knowledge of this relationship will help our institution make changes to provide women with the services they need. With better awareness of the need for quality lactation services, these relationships', breastfeeding prevalence, and longevity will improve. Thus, this study aimed to identify if the coronavirus pandemic had a negative effect on exclusive breastfeeding prevalence in a single tertiary healthcare center.

Methods

Design

A retrospective sampling study was conducted to explore the effect of the COVID-19 pandemic on the exclusive breastfeeding prevalence at a single tertiary hospital system in South Dakota. This design was selected to analyze a unique event in time. Patient data was collected from Avera Health's EMR, Meditech. To ensure accuracy, the data was obtained with the help of an Integration Engineer in the Avera Information Technology (IT) department. Data was collected using a piloted form based on previous labor and delivery statistics reports from the Avera Data Repository. The data used in this study consisted of required components of EMR documentation and thus no missing data was encountered. The final report was manually inspected for missing data to ensure completeness. The data report was generated on the Avera Data Repository and was directly downloaded to a single, password-protected Microsoft Excel spreadsheet. All documents were stored on Avera Health's secure network. Approval was granted by the IRB at Avera Health on April 28, 2021 (2021.034 - 100892). Patient consent was waived given the retrospective nature of the study.

Sample

The inclusion criteria for this study were defined as pregnant patients who were delivered at a single tertiary hospital in South Dakota between March 1, 2019-March 1, 2021. There were no exclusion criteria. The study group (n=2,017) was defined as March 1, 2020-March 1, 2021 (pandemic). The control group was defined as pre-pandemic; March 1, 2019-Feb. 29, 2020 (n=2,180). These dates were chosen to encompass the initial start of the pandemic and the peak of COVID-19 case numbers.

Measurement, Data Collection, Data Analysis

The algorithm generated by the Avera IT department reported the following variables: patient's age, ethnicity, date of admission to labor and delivery, date of discharge, and inpatient response to feeding type. The demographic data was used to compare study populations. The primary outcome measured was the prevalence of women who identified as having an intention to breastfeed exclusively. This variable was extracted from the patients' charts as reported by nursing staff during their inpatient stay. The options on the chart were as follows: exclusively breastfeeding, breastfeeding with formula supplementation, pumping and feeding, and formula-fed. For simplicity, we used the response exclusively breastfeeding to mean no additional or alternative nutrition sources were used for the infant. This variable was documented on every patient during their delivery stay.

Statistical analyses were computed using IBM SPSS (version 28.0). The prevalence of women who identified as exclusively breastfeeding at the time of delivery was calculated for March 1, 2019-Feb. 29, 2020 (pre-pandemic), and compared to March 1, 2020-March 1, 2021 (pandemic). The prevalence of women who identified as exclusively breastfeeding was analyzed using a one-sample binomial success rate (Clopper-Pearson) with a 0.05 p-value. A 95 percent confidence interval was generated. The study timeframe was also broken down to a monthly prevalence of women who identified as exclusively breastfeeding and graphed with COVID-19 infection data from the South Dakota Department of Health for Minnehaha County.

Results

The control group and study group were analyzed using patient age at the time of delivery and patient identified ethnicity to identify possible confounding variables. The average age was 29.36 years and 29.21 years for the control group and study group, respectively. A similar distribution of patient-identified ethnicities was found in the study and control populations (Table 1).

Mothers indicated their feeding preference during their inpatient stay as one of the following categories: exclusively breastfeeding, breastfeeding with formula supplementation, pumping and feeding, or formula-fed. The prevalence of each category is listed in Table 2. The data showed an exclusive breastfeeding prevalence of 78.2 percent in the study group (pandemic). This prevalence of women exclusively breastfeeding decreased significantly from the previous pre-pandemic year 80.6 percent (p 0.05; 95 percent CI 0.789 to 0.823).

The prevalence of women who identified as exclusively breastfeeding in the pandemic year was stratified by month and graphed alongside the confirmed monthly COVID-19

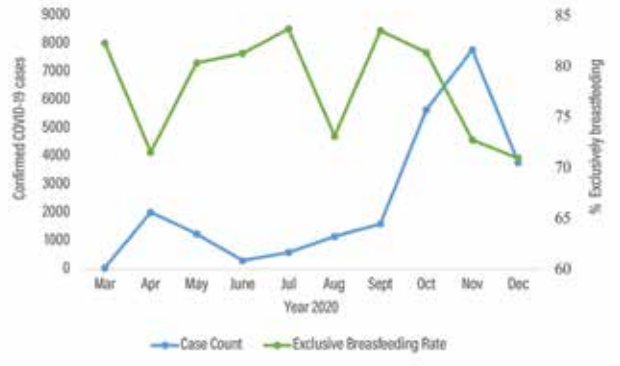
Table 1. Patient identified ethnicity in control and study populations.

Ethnicity	Control n=2,180	Study n=2,017
White/Caucasian	1618 (74.2)	1465 (72.6)
Black/African American	199 (9.1)	186 (9.2)
American Indian/Alaskan Native	87 (4.0)	84 (4.2)
Pacific Island/Native Hawaiian	3 (0.1)	3 (0.1)
Asian	44 (2.0)	48 (2.4)
Unknown	44 (2.0)	36 (1.8)
Other	180 (8.2)	187 (9.3)
Declined	5 (0.2)	7 (0.3)

Table 2. Distribution of mother's response to inpatient feeding preference.

	Control n=2,180	Study n=2,017
Exclusively breastfeeding	1,758 (80.6)	1,577 (78.2)
Breastfeeding with formula supplementation	195 (8.9)	252 (12.5)
Formula fed	181 (8.3)	149 (7.4)
Pump and feed	46 (2.1)	39 (1.9)

Figure 1. Percentage of women exclusively breastfeeding compared to confirmed COVID-19 cases reported by the South Dakota Department of Health in Minnehaha County in 2020.



case numbers in Minnehaha county seen in Figure 1.[2] The data displayed in Figure 1 shows the trends of COVID-19 case numbers as well as the prevalence of exclusive breastfeeding by month. When stratified by month, the exclusive breastfeeding prevalence shows a decrease in the month of April and August of 2020 and a downward trend in the last three months of the year. In an attempt to quantify the state of the pandemic, confirmed COVID-19 case numbers in the same county as the hospital system were graphed. The confirmed COVID-19 case count increased in the month of April and had an upward trend from September to November of 2020.

Discussion

The American Academy of Pediatrics (AAP) recommends exclusive breastfeeding for six months, followed by continued breastfeeding with age-appropriate foods for up to one year. This should be continued as long as mutually desired by both infant and mother. The most recent AAP policy statement on Breastfeeding and the Use of Human Milk reviews the associated benefits of breastfeeding to mothers and infants.[5] Mothers who breastfeed are known to have decreased postpartum blood loss and more rapid involution of the uterus initially after delivery. Additionally, they benefit from lactational amenorrhea and decreased rates of postpartum depression. Infants who were exclusively breastfed for four to six months had significantly decreased rates of gastrointestinal disease, otitis media, respiratory illness, and atopic disease.[5,6]

Early discontinuation of breastfeeding is often associated with difficulties in breastfeeding, lack of confidence in one's ability to breastfeed, or lack of resources and support throughout the process. Investigators conducted a randomized controlled trial to evaluate the effectiveness of antenatal breastfeeding education and postnatal lactation support compared with routine care in improving exclusive breastfeeding rates. They compared breastfeeding rates in a control group receiving care consistent with the Baby-Friendly Hospital Initiative to an intervention group receiving individualized lactation support via telephone follow-up from discharge to four months postpartum. The primary outcome of this study showed that at four months, 70.9 percent of women in the intervention group were exclusively breastfeeding compared with 46.2 percent of women in the control group.[7]

The use of lactation consultants and counselors increased the number of women initiating breastfeeding, improved any breastfeeding rates, and improved exclusive breastfeeding rates.[6] It is suggested that intrapartum and postpartum breastfeeding support, when delivered via face-to-face interactions in the hospital, in the clinic, at home, or via telephone contact from lactation consultants, improves breastfeeding outcomes and maternal satisfaction with breastfeeding overall. The United States Lactation Consultant Association recommends 1.9 full-time lactation consultants per 1,000 deliveries per year for the inpatient setting at a tertiary care facility.[8] Based on these recommendations, the facility where the study was completed would require approximately 3.8 full-time employees in lactation based on the 2019-2020 delivery numbers. The COVID-19 pandemic created many challenges, including unanticipated staffing shortages that were not specific to our institution.

In a survey of breastfeeding mothers by the Department of Public Health, Policy, and Social Sciences in the United Kingdom impacted by the COVID-19 pandemic, experiences, and support with feeding practices were documented and analyzed. Concerning cessation of breastfeeding, 72.6 percent of mothers who gave birth during the pandemic attributed a lack of face-to-face support, 22.0 percent worried about the safety of breastfeeding, and 12.5 percent their symptoms of COVID to stopping breastfeeding compared with 42.9 percent, 9.6 percent, and 0 percent, respectively, of those who gave birth before it. However, women's experiences with the COVID-19 pandemic appear to be mixed regarding feeding practices during the lockdown. 41.8 percent of mothers surveyed reported a positive experience with breastfeeding during the lockdown, while 29.5 percent had neutral feelings and 27.0 percent had a negative experience.[9] Interestingly, the FMR Global Health market research study found that a mother's willingness to breastfeed after birth was not affected by the pandemic; it actually increased from 85 percent to 87 percent. However, lack of bedside support, earlier discharge times, and overall increased stress appear to have contributed to a decrease in breastfeeding rates.[10] This is because adequate support and interventions during the initial postpartum weeks are essential for confidence and longevity with breastfeeding.[11] While our study did not qualify the reasons for lower breastfeeding prevalence, these recent publications help to identify pandemic-related changes to medical care that may have influenced these patients.

Support for mothers and their new infants in the initial postpartum period is crucial to maintaining breastfeeding rates. Although the COVID-19 pandemic posed many challenges within healthcare facilities, it has provided an opportunity to improve breastfeeding support for lactating mothers. Due to the significant decrease in exclusive breastfeeding prevalence upon discharge, we can see that inpatient lactation support is crucial to initiating a successful breastfeeding relationship. Infants who room in with their mothers in the first hours of life will have a stronger bond than those who spend more time in the hospital nursery. Additionally, individualized lactation consultation provided at the bedside will help to ensure that mothers feel adequately supported. This would require that the facility has enough lactation staff to appropriately care for the number of deliveries that occur each year; however, many institutions across the country did not achieve this ratio due to the pandemic.

One result of the COVID-19 pandemic on lactation services has been a shift towards more virtual options. To facilitate higher rates of follow-up support for patients after delivery, lactation consultants could also implement scheduled phone or video visits in the first few weeks at home. A study conducted in 2020 by a breastfeeding coalition in the northeastern U.S. provides qualitative evidence for the strengths and limitations of virtual lactation services.[12] Participants endorsed advantages such as convenience and reduced travel time, benefits of continuous, immediate support, and increased comfort for mom and baby. Disadvantages of virtual lactation visits included difficulty with technology and limitations to assisting with latch and positioning.[12] To further promote long-term breastfeeding, having a lactation consultant present in the clinical setting to meet with patients at their postpartum visit would be beneficial for answering questions and working through difficulties with latch or supply. These changes would require that healthcare facilities maintain a larger cohort of full-time lactation consultations; however, in the long run, the benefits of continued breastfeeding will be seen with overall healthier mothers and infants.

Strengths of this study include a large sample population, ease of access to desired information, and cost-effectiveness. Our ability to compare the monthly exclusive breastfeeding prevalence to the corresponding COVID-19 case numbers in the same county provides an interesting correlation. It helps to reinforce the fact that the decrease in breastfeeding upon discharge is likely due to the pandemic-related changes and less likely to be due to confounding variables. Further areas for research include a qualitative analysis regarding patient experiences with lactation consultation during their hospital stay and accessibility of follow-up care after discharge. It would be interesting if other larger institutions performed a similar study in areas more severely affected by COVID-19.

Limitations

This study was limited because its design did not include an investigation for exact causes for the decreased breastfeeding prevalence. Confounding variables that may have influenced breastfeeding ability are gestational age, socioeconomic status, maternal medications, maternal illness or disease, and personal preferences. Data used in our analysis only included patients from one healthcare institution. We were not able to assess statewide data from other facilities. While we may generalize that the COVID-19 pandemic negatively affected breastfeeding prevalence, we cannot say the exact reasons for not initiating or discontinuing breastfeeding in this population.

Conclusion

The COVID-19 pandemic posed many challenges for society in 2020. All aspects of healthcare were affected, and support for pregnant and lactating mothers is no exception. This single tertiary healthcare center investigated decreased lactation support staff, face-to-face lactation education, and lactation consultation. We investigated the exclusive breastfeeding prevalence identified by women before and during the pandemic. We found a statistically significant decrease in exclusive breastfeeding from pandemic to pre-pandemic years when comparing the prevalence. A possible variable that could have influenced the prevalence of breastfeeding includes fear surrounding the pandemic. Additionally, lactation support is needed for proper education and guidance. Healthcare facilities' services to breastfeeding women are essential to foster healthy breastfeeding relationships between mothers and infants. Facilities should maintain adequate lactation consultation staff, engage in face-to-face interactions when possible, and individualized schedule follow-up to promote longevity. These measures will help to preserve the overall breastfeeding prevalence in this area and contribute to healthy lifestyles for years to come.

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About the Authors:

Jena Preszler, MD, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Morgan Schriever, MD, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Margaret Terveen, MD, Avera McKennan Hospital and University Health Center, Sioux Falls, South Dakota; Clinical Instructor, Department of Obstetrics and Gynecology, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Examination of Early Endotracheal Aspirate Cultures in Children with Acute Respiratory Failure Due to Presumed Acute Respiratory Tract Infection

Gokhan Olgun, MD; Lesta D. Whalen, MD; Ashley R. Sandeen, MD; Fernando J. Bula-Rudas, MD; and Saquib A. Lakhani

Abstract

Objective: To determine the yield of early endotracheal aspirate cultures in mechanically ventilated pediatric patients with acute respiratory failure due to acute respiratory tract infection and endeavor to guide antibiotic choice in acute respiratory failure with concern for infectious etiology.

Results: One-hundred ten admissions were included. Of those samples, 61 percent (67 out of 110) had bacterial growth in tracheal aspirate samples. Ninety percent (99 out of 110) patients have received antibiotics and in 47 percent (53 out of 110) antibiotics were optimized or discontinued according to the culture results. There were no difference in duration of mechanical ventilation or PICU stay in patients with positive versus negative cultures (p: 0.613, P: 0.337).

Conclusions: Our study shows a high yield of positive tracheal aspirate cultures in infants, children and adolescents with acute respiratory failure. The cultures identify common organisms, helps to guide initial antibiotics choice, as well as later optimization or antibiotic discontinuation.

Introduction

Respiratory infections in children leading to acute respiratory failure can be severe and lead to intensive care unit admission and mechanical ventilation.[1] According to Williams et al., 21 percent of children with community acquired pneumonia had moderate or severe outcomes, indicating intensive care unit admission and/or mechanical ventilation.[2] Despite the impact of these infections, there are no clear guidelines for their diagnosis and management. Illustrative of this, antibiotic prescription patterns among institutions and providers differ significantly, with variability in initial choice of antibiotics, subsequent tailoring of antibiotics, and length of therapy.[3] One study showed that patients admitted from the emergency department (ED) are started on third or fourth generation antibiotics in the ED 59 percent of the time and that patients being admitted were kept on broad spectrum antibiotics 40 percent of time during their hospital stay.[4]

Given this practice variability, it may be helpful to have a tracheal aspirate culture to target specific organisms and provide information to help target antimicrobial therapy. In fact, in children with severe or life-threatening pneumonia, the Infectious Disease Society of America (IDSA) and the Pediatric Infectious Diseases Society strongly recommend obtaining tracheal aspirates with gram stain and cultures as well as testing for viral pathogens, though the quality of evidence for these recommendations is low.[5] In addition to primary community acquired pneumonia, tracheal aspirate cultures may also be used to identify secondary bacterial respiratory infections in pediatric patients with viral bronchiolitis.[6-9] Bacterial superinfection in tracheal aspirate cultures of patients with RSV bronchiolitis ranges between 28-78 percent.[10-15]

Given the lack of clear evidence guiding antibiotic management, we sought to add to the data available from children with severe community-acquired respiratory infections leading to PICU admission and endotracheal intubation. The aim of this study, therefore, was to assess the yield and identification of bacteria in tracheal aspirate cultures, as well as the associated antibiotic prescribing patterns, in pediatric patients requiring mechanical ventilation in the setting of acute respiratory tract infection.

Methods

This study was approved by the institutional review boards of Sanford Health and Sanford Research.

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This was a retrospective cross sectional study involving infants, children and adolescents up to 18 years of age, admitted to the 12-bed pediatric intensive care unit (PICU) in a tertiary care children's hospital in the upper Midwest with approximate 750 annual admissions, between January 2014 to December 2018. As practice in our PICU, all patients requiring new invasive or noninvasive respiratory support are provided an International Classification of Disease 9th edition diagnosis code of "acute respiratory failure." Patients with this diagnosis code were queried in the electronic medical record, and only those patients who had undergone endotracheal intubation and initiation of invasive mechanical ventilatory support were included. The study was further limited to patients whose acute respiratory failure was due to presumed acute respiratory tract infection, as determined by reading of admission histories and early progress notes. A pediatric intensivist determined presumed acute respiratory infection based on presence of fevers, increased respiratory secretions and new onset cough and respiratory symptoms. Patients with acute respiratory failure due to noninfectious causes were excluded. In addition, patients with tracheostomy and patients with respiratory cultures that were not obtained or that were obtained beyond the initial twenty-four hours of intubation were excluded. As per our institution's reporting standard, the presence of greater than 25 polymorphonuclear leukocytes per low field on respiratory gram stain was defined as a "high" number of leukocytes; anything less than that was defined as "low."

For this study, we only evaluated tracheal cultures obtained within 24 hours of endotracheal intubation. As a standard in our unit, the bedside nurse obtains an endotracheal culture via a sterile suction catheter and trap when ordered. Reporting of the primary pathogens for lower respiratory cultures were completed according to the American Society of Microbiology Guidelines.[16] Viral polymerase chain reaction analysis were obtained with nasopharyngeal swabs. Testing was performed by multiplexed nested PCR and melting curve analysis on the FilmArray instrument.

Diagnosis of pneumonia was based on chart review of chest X-ray (CXR) interpretation by pediatric radiologists. All patients receive a CXR at our facility at the time of intubation and/or admission to confirm endotracheal tube placement. If available, CXR data from up to 24 hours before intubation was included. If differentiation between atelectasis and pneumonia was not possible on the initial CXR, interpretation by pediatric radiologists on follow up CXR were reviewed to make a conclusion. CXR without airspace disease or with findings thought to be related to a viral infection by the radiologists, were considered as not having pneumonia.

At our institution, initial antibiotic choice is at the discretion of the attending provider. Regional antibiograms (adult and pediatric combined) are updated annually and non-meningitic streptococcus pneumonia penicillin resistance is 1-3 percent. If initial broad-spectrum antibiotic coverage was narrowed or if double coverage was discontinued in favor of a single antibiotic, antibiotics were defined as "optimized."

Continuous variables are presented as medians and interquartile percentiles and analyzed with the Mann Whitney U test due to the non-normality of the data. Categorical variables are compared by chi-square test or Fisher's exact test as appropriate. A 5 percent type I error level was used to infer statistical significance. Calculations were done with IBM SPSS 25 software.

Results

There were 436 admissions with acute respiratory failure during the study time period, with 173 leading to endotracheal intubation (Figure 1). Sixty of these were due to non-infectious causes and were hence excluded, as were three who were transferred out from our institution and therefore had incomplete data, leaving 110 admissions. Median age was 0.6 years (IQR=[0.2, 2]), 38 percent (42 out of 110) of the patients were female, and 22 percent (24 out of 110) had a history of prematurity (Table 1). The majority of patients were Caucasian (70 percent), followed by Native American (23 percent) and African American (3 percent) heritage.

Figure 1. Screening and selection of eligible patients.

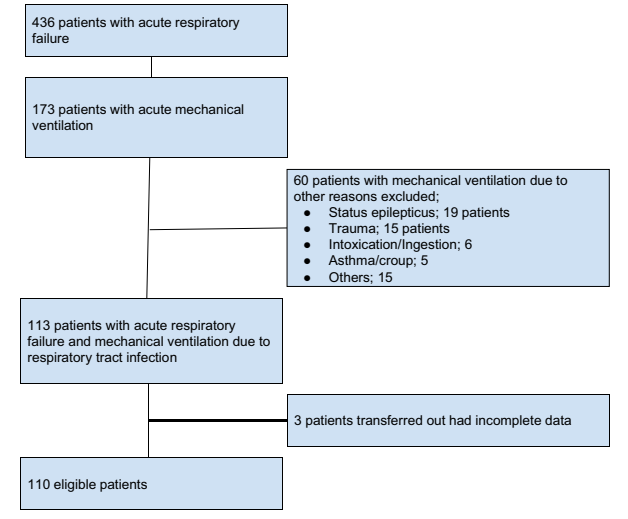

Table 1. Patient characteristics.

	Value	Percentage
Age(median)	0.6 months[0.2,2]	
Ethnicity		
Caucasian	77	70
African American	3	3
Native	25	23
Hispanic	3	3
Other	2	2
Gender		
female	42	38
male	68	62
Gestational age		
<37 weeks	24	22
≥37 weeks	86	78

Table 2. Patient outcomes and procedures.

	Overall
Duration of mechanical ventilation, median [IQR])	6 [4, 8]
PICU stay, median [IQR]	9 [6,12]
Death (n (%))	3 %(3/110)
Tracheal cultures sent	98%(108/110)
Viral nucleic acid detection tests	83%(91/110)
Pneumonia	64%(70/110)

Median duration of endotracheal intubation was six days (IQR=[4, 8]), median duration of PICU stay was nine days (IQR=[6, 12]), and three patients died (Table 2). Tracheal aspirate cultures were sent within 24 hours of intubation for 98 percent (108 out of 110) of patients. Tracheal cultures were positive for 61 percent (67 out of 110) of patients, with some cultures yielding more than one organism. Haemophilus influenza (nontypeable or type A) was grown from 35 percent of the cultures (39 out of 110), Moraxella Catarrhalis from 23 percent (25 out of 110), Streptococcus pneumonia from 12 percent (13 out of 110), group A streptococcus from 4 percent (4 out of 110), Pseudomonas eruginosa from 4 percent (4 out of 110), and Staphylococcus aureus (all methicillin sensitive) from 3 percent (3 out of 110). Gram staining results were available for 77 percent (85 out of 110) of samples. Forty-nine of the samples had greater than 25 polymorphonuclear leukocytes per low powered field on gram stain. Of the samples with greater than 25 polymorphonuclear leukocytes per low powered field on gram stain, 82 percent (40 out of 49) had positive endotracheal aspirate culture. Furthermore, 60 percent of positive cultures were associated with >25 polymorphonuclear leukocytes per low powered field.

Findings consistent with pneumonia on initial CXR were noted for 64 percent (70 out of 110), and 61 percent of these patients (43 out of 70) had positive tracheal aspirate cultures. Positive CXR findings of pneumonia were not associated with positive tracheal aspirate cultures (p=0.957).

Viral nucleic acid detection tests were sent for 83 percent (91 out of110) of patients (Table 2). Of these 91 patients, 51 percent (46 out of 91) were respiratory syncytial virus (RSV) positive, 12 percent (11 out of 91) were rhinovirus/enterovirus positive, and 8 percent (six out of 91) were influenza positive. Sevent-two percent of the patients with RSV infection had positive tracheal aspirate cultures and patients with RSV were more likely to have positive tracheal cultures than those patients without RSV (p=0.038), whereas there was no difference in positive bacterial culture rates for patients with rhinovirus/enterovirus or influenza as compared to those patients without these viruses (p=0.519 and p=0.416, respectively). There was no difference among patients with acute respiratory failure due to RSV versus those without RSV in regards to duration of mechanical ventilation (p=0.21) and PICU length of stay (p=0.89).

There was no significant difference between patients with positive tracheal aspirate cultures and those with negative tracheal aspirate cultures in median duration of mechanical ventilation (six vs. six days, p=0.64) and PICU length of stay (8.5 vs. 10 days, p= 0.38).

Antibiotics were started either before or immediately after obtaining tracheal aspirate cultures in 90 percent (99 out of 110) of patients. Of these, 36 percent (40 out of 110) finished the original antibiotic regimen. Antibiotics were optimized, as defined in the methods, in 47 percent of patients (53 out of 110). In 5 percent (six out of 110) of patients antibiotics were discontinued after negative tracheal culture results. Another 6 percent (seven out of 110) were initially not on antibiotics, but had antibiotics started after positive culture results. The most commonly used antibiotic was vancomycin (47 percent), almost exclusively in combination with another antibiotic, followed by ceftriaxone (31 percent) and piperacillin/tazobactam (24 percent). Median duration of antibiotics was seven days (IQR=[7, 10]).

Discussion

Amongst children in our PICU with acute respiratory failure and mechanical ventilation due to a presumed respiratory tract infection, 61 percent (67 out of 110) had positive endotracheal aspirate cultures. This is similar to 56 percent positivity rate reported in adults aged older than 18 years of age admitted to a medical intensive care unit.[17] Haemophilus influenza and Moraxella catarrhalis were the predominant organisms in our population, similar to what has been reported in broncheoalveolar lavage fluid from children with acute nonresponding or recurrent community-acquired pneumonia.[18] Clearly we lacked a gold standard to

determine whether these positive cultures reflected an actual acute infection or simple colonization, though we attempted to reduce the rate of finding colonizing bacteria through our practice of obtaining cultures within 24 hours of intubation.

Interestingly, the positive rate of tracheal cultures was the same (61 percent) in patients with or without positive CXR findings of pneumonia as determined by a pediatric radiologist. This suggests that CXR is not a useful distinguishing factor to help determine the presence of bacterial infection in this patient population. There are several potential explanations for this, including poor inter-reader agreement and low negative predictive value for negative CXRs.[19] Also viral pneumonia can cause consolidations and can make it impossible to differentiate from bacterial pneumonia by CXR(20).

Sixty-five (69 percent) of our patients had positive viral PCRs, mostly RSV. In those patients with RSV, 72 percent had positive tracheal aspirate cultures which is similar to the previously reported 78 percent rate.[12] Compared to rhinovirus and influenza, patients with RSV were more likely to have positive tracheal aspirate cultures. A recent practice survey reported that 60 percent of pediatric intensivists or infectious disease specialists would use five days or more of antibiotics in patients with suspected pneumonia, sepsis or meningitis despite having positive viral PCR, indicating a concern for a secondary bacterial infection.[8,21] Another study showed that 94.4 percent of pediatric ICU patients with RSV bronchiolitis and acute mechanical ventilation were prescribed antibiotics, which was associated with a decreased hospital length of stay and shorted duration of mechanical ventilation; this benefit was only seen in patients with RSV bronchiolitis started on antibiotics within 48 hours of mechanical ventilation, and not in those started later on antibiotics.[14] Although only 42 percent of our patients were found to be infected with RSV, the high rate of positive endotracheal cultures that we observed appears to support the practice of instituting empiric antibiotics for intubated patients with RSV.

Antibiotic stewardship programs are commonly being established in PICUs and have found to be efficacious in multiple studies to decrease antibiotic duration and coverage.[22-23] In our cohort 95 percent of the patients received antibiotics. Broad-spectrum antibiotics were used predominantly but given the concern of developing antibiotic resistance,[6,24] a change in this practice may be warranted. For example, we did not have any instances of MRSA, which suggests that it would be safe to move away from frequent usage of vancomycin. Aside from resistance concerns, vancomycin used alone or in combination with other antibiotics like piperacillin/tazobactam is associated with renal injury[25,26] and its use must be justified. However, we did show that with the help of tracheal cultures we were able to optimize or discontinue antibiotics in 53 percent of the patients. Furthermore, we did not detect any difference in duration of mechanical ventilation for PICU patients with positive endotracheal cultures versus negative cultures. Although this study was not designed to test this hypothesis, it is possible that early cultures and institution of empiric antibiotics in nearly all our patients may have improved recovery from bacterial infections.

Our study has several weaknesses. First, it is a retrospective study from a single center, which could prevent generalizability of our results. Second, we acknowledge that the trachea is not sterile and that the lower respiratory tract may have its own unique flora.[27,28] A positive culture may not necessarily indicate an active infection, but may reflect colonization or contamination.

Conclusion

Our study showed a high yield of positive tracheal aspirate cultures in infants, children and adolescents with acute respiratory failure from suspected infection. The cultures identified common organisms, helped to guide initial antibiotic choice as well as later optimization or antibiotic discontinuation. We also identified common viral pathogens, noting that RSV infection was associated with a higher incidence of positive tracheal cultures. Finally, this research supports the appropriate use of antibiotics to decrease unnecessary medication use as well as limiting antibiotic resistance.

Conflict of Interest Statement: SAL is part owner of Qiyas Higher Health, a startup company unrelated to this work. Other authors have no conflicts of interest to disclose.

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About the Authors:

Gokhan Olgun, MD, Sanford Children's Hospital, Sioux Falls, South Dakota; Department of Pediatrics, University of South Dakota School of Medicine, Sioux Falls, South Dakota.

Lesta D. Whalen, MD, Sanford Children's Hospital, Sioux Falls, South Dakota; Department of Pediatrics, University of South Dakota School of Medicine, Sioux Falls, South Dakota.

Ashley R. Sandeen, MD, Sanford Children's Hospital, Sioux Falls, South Dakota; Department of Pediatrics, University of South Dakota School of Medicine, Sioux Falls, South Dakota.

Fernando J. Bula-Rudas, MD, Sanford Children's Hospital, Sioux Falls, South Dakota; Department of Pediatrics, University of South Dakota School of Medicine, Sioux Falls, South Dakota.

Saquib A. Lakhani, Department of Pediatrics, Yale University School of Medicine.

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A Case of Pulmonary Tumor Thrombotic Microangiopathy: A Rare and Fatal Phenomenon

Muhammad Hamza, MD; Muhammad Danial Siddiqui, MD; Mahum Shahid, MD; Swaminathan Perinkulam Sathyanarayanan, MD; and Anthony J. Hericks, DO

Abstract

Pulmonary tumor thrombotic microangiopathy (PTTM) is a pulmonary hypertensive arteriopathy thought to be caused by activation of the coagulation cascade at the surface of circulating tumor microemboli along with intimal proliferation in small pulmonary arteries in patients with metastatic carcinomas. The subsequent stenosis of the pulmonary vasculature leads to pulmonary hypertension (PH) and, cor pulmonale with eventual respiratory compromise leading to respiratory failure. PTTM is always a nearly fatal disease with most cases diagnosed post-mortem. Most cases reported on this condition are from Japan where the incidence of gastric malignancy is relatively higher than other parts of the world. We report a case of a Caucasian man with a classic presentation of PTTM to help make physicians aware of this rare, rapidly progressive and usually fatal phenomenon.

Introduction

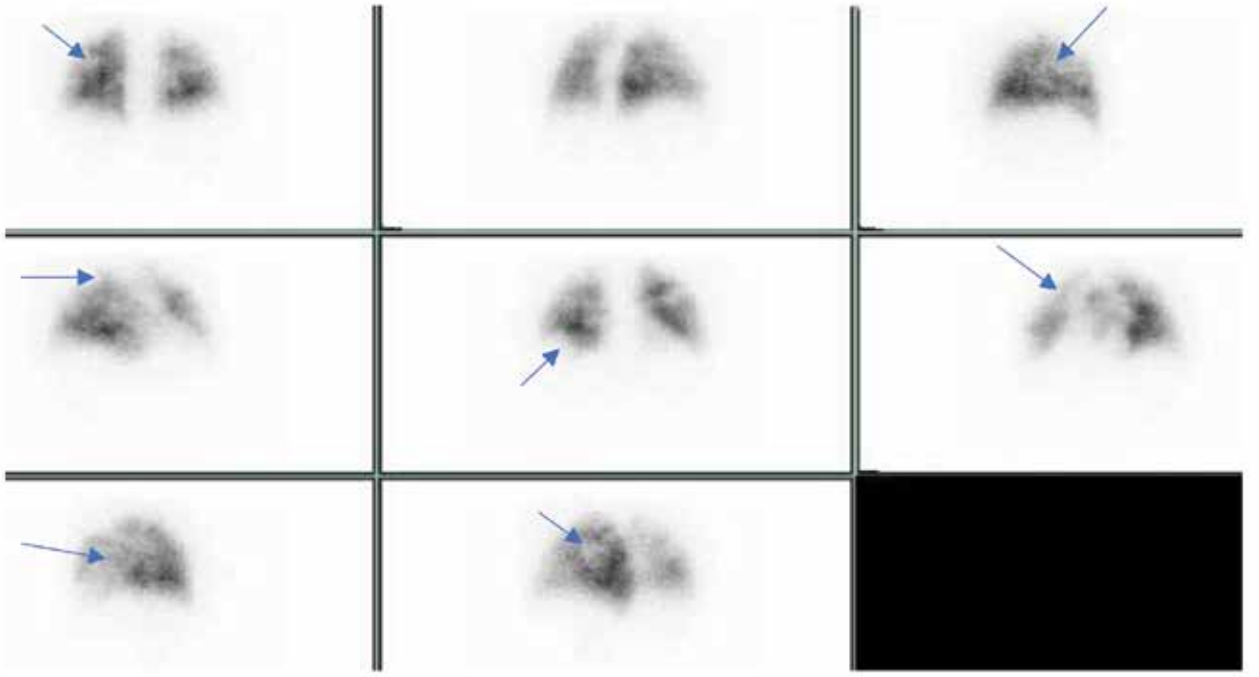
Pulmonary tumor thrombotic microangiopathy (PTTM) was first reported in 1990 by Von Herbay et al.[1] It is a pulmonary hypertensive arteriopathy thought to be caused by activation of the coagulation cascade at the surface of circulating tumor microemboli along with intimal proliferation in small pulmonary arteries in patients with metastatic carcinomas. The subsequent stenosis of the pulmonary vasculature leads to pulmonary hypertension (PH) and, cor pulmonale with eventual respiratory compromise leading to respiratory failure. The most common malignancy associated with this phenomenon is gastric cancer. The deterioration of clinical status is very rapid and usually the condition is mislabeled as pulmonary hypertension of unknown origin, particularly in patients without a cancer history.[2] The true prevalence of this phenomenon has not been established and antemortem diagnosis has been the biggest challenge with most cases being diagnosed postmortem. Most cases reported on this condition are from Japan where the incidence of gastric malignancy is relatively higher than other parts of the world.[3] Here, we report a case of a Caucasian man with a classic presentation of PTTM to help make physicians aware of this rare, rapidly progressive and usually fatal phenomenon.

Case Description

A 66-year-old Caucasian male presented to the emergency department (ED) with complaints of progressively worsening shortness of breath of two weeks duration. He also reported back pain for two weeks, decreased appetite, and weight loss of 35 pounds in the last 4 months. He denied cough, chest pain, fevers or chills. He had no previous history of any chronic lung diseases or heart diseases. He was an active smoker with a 15 pack-year smoking history, but denied excessive alcohol consumption or recreational drug use. He had been recently diagnosed with metastatic carcinoma of unknown origin based on the workup he underwent for multiple blastic lesions found in his axial and appendicular skeleton on bone scan done for back pain and weight loss. This had been confirmed by CT-guided biopsy of his right iliac crest. Biopsy was most consistent with malignancy of gastrointestinal or pancreaticobiliary origin as controlled immunohistochemical stains revealed tumor cells to be positive for GATA-3 and CK-7, and negative for CDX2, calretinin, GCDFP-15, p40, CK5/6, ER, S-100p, CK20, PSA, TTF-1, PAX-8 and CD10.

On physical examination, vital signs showed tachypnea with respiratory rate of 24/min and oxygen saturation 82 percent on room air. Lung examination revealed bilateral crackles over the bases, prolonged expiratory phase and use of accessory muscles on respiration. Laboratory workup on admission showed a platelet count of 107,000 cell/uL (normal range 150,000 to 400,000 cells/uL), total bilirubin 2.8 mg/dL (normal level <1.2 mg/dL), Alanine aminotransferase 155 U/L (normal range 7 to 55 U/L), aspartate aminotransferase 149 U/L (normal range 5 to

Figure 1. Perfusion component of VQ scan of lungs showing multiple patchy bilateral perfusion defects as indicated by blue arrows.



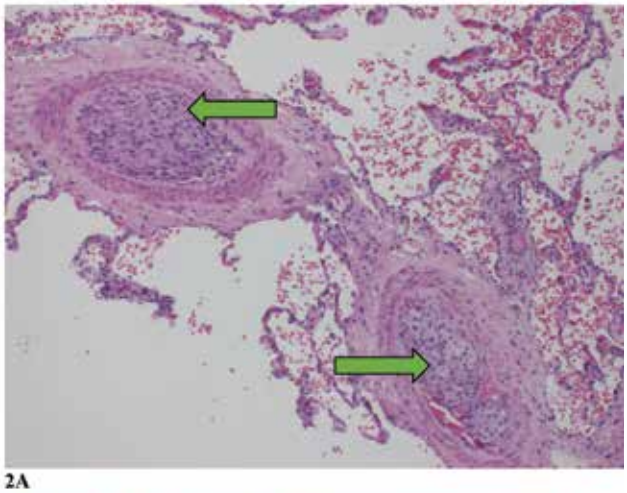
40 U/L), alkaline phosphatase 526 U/L (normal range 44 to 147 U/L). Computed tomography angiography (CTA) of the chest was negative for pulmonary embolism, but was significant for pulmonary vascular congestion with nodular appearing ground glass parenchymal opacities. Transesophageal echocardiogram showed an ejection fraction of 55-60 percent without wall motion abnormalities, but with mild right atrial and moderate right ventricular dilatation. Right ventricular (RV) systolic pressure was estimated to be 76 mmHg. These findings were consistent with moderate to severe pulmonary hypertension (PH). To further evaluate the cause of his pulmonary hypertension, ventilation-perfusion scan (V/Q scan) (Figure 1) was done which demonstrated multiple peripheral sub-segmental wedge-shaped areas of decreased to absent perfusion bilaterally in the lungs with normal ventilation in the same areas. Since pulmonary embolism could not be definitively ruled out based on the patient's history of malignancy, a heparin drip was initiated empirically.

His respiratory distress continued to worsen and he was started on Bilevel positive airway pressure (BiPAP) ventilation to maintain oxygen saturations >92 percent. A multidisciplinary team involving pulmonary medicine and oncology discussed the case and recommended initiating chemotherapy for potential pulmonary tumor thrombotic microangiopathy (PTTM). The rationale was to decrease tumor burden which could potentially improve his respiratory status. The risks and benefits were discussed with the patient; however, concerns were raised about starting chemotherapy given the patient's oxygen requirements, poor functional status and liver dysfunction. Because of the rapidly progressive decline in his respiratory status, the patient opted for palliative care. He sustained a cardiac arrest shortly thereafter and passed away. An autopsy was performed which on microscopic evaluation showed extensive pulmonary tumor emboli involving small and medium sized pulmonary vasculature (Figures 2A, 2B, 2C). Additionally, he had multiple metastatic foci in the liver and gastroesophageal, right inguinal and periaortic lymph nodes positive for poorly differentiated metastatic carcinoma. These autopsy findings correlated with the clinical impression of acute onset pulmonary hypertension and progressive hypoxia and were consistent with pulmonary tumor thrombotic microangiopathy (PTTM).

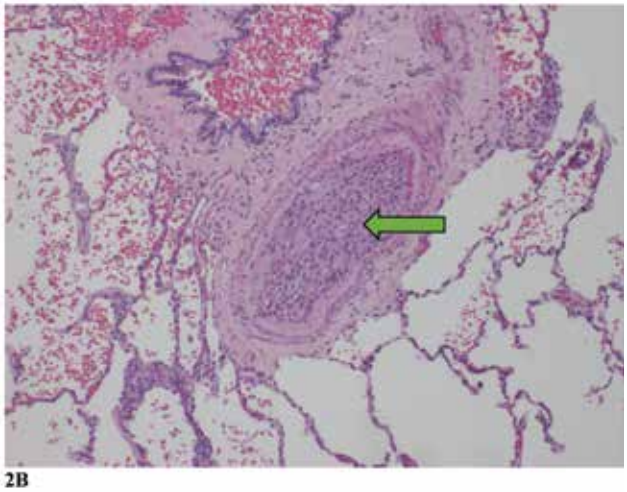
Discussion

PTTM is a nearly always fatal disease with most cases diagnosed post-mortem. Fifty-two percent of PTTM cases are attributed to gastric cancer.[1] The purpose of this case report is to highlight the necessity of early diagnosis of this rare disease and to aid in achieving antemortem diagnosis in the future. We describe here a 66-year-old man with recently diagnosed metastatic carcinoma of unknown primary origin

Figure 2. Cross section of medium size pulmonary arteries showing extensive tumor cells within the lumen (green arrows) – 20X magnification (Figures 2A and B). Magnified image of tumor cells (blue arrow) within the lumen of small to medium sized pulmonary arteries (yellow arrow) – 40X magnification (Figure 2C).



2A



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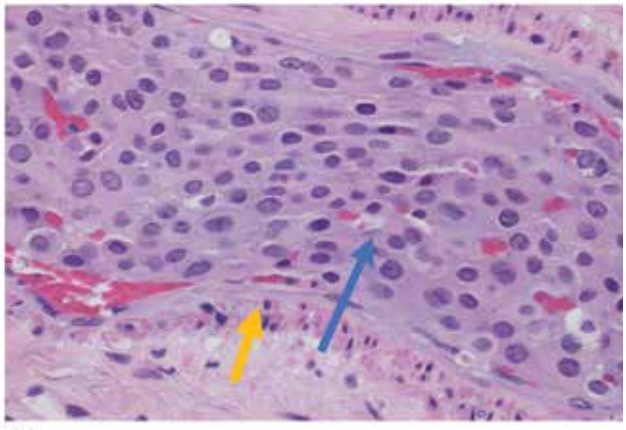

2C

presenting with extensive pulmonary emboli and newly diagnosed pulmonary hypertension. PTTM is a rare, and usually fatal complication of malignancy that has been described as the process of tumor cells diffusely metastasizing to the pulmonary microvasculature.[2] The pathophysiology of this condition involves coagulated tumor cells with surrounding fibro-intimal proliferation that ultimately lead to vessel occlusion.[3] Pulmonary hypertension can develop secondary to progressive and massive pulmonary vascular stenosis and occlusion.[4]

A series of autopsies in patients with carcinomas suggests that prevalence is as high as 1-3 percent.[5] High tumor burden, as in extensive metastatic disease for instance, could theoretically increase risk of such a process. Nonetheless, there is insufficient data to determine whether untreated or advanced carcinomas are associated with an increased risk for tumor embolism to the pulmonary arteries. Accurate diagnosis is difficult as symptoms can be easily confused with other etiologies, such as pulmonary embolism. Therefore, histologic examination is needed to differentiate PTTM from other entities. Until recently, diagnosis was mostly established post-mortem; however, as more cases are being reported physicians are becoming more aware of this disease. Progressive dyspnea, dry cough, hypoxia and pulmonary hypertension are found to be the most common clinical manifestations. The mechanism of dry cough is still uncertain, but thought to be associated with tumor infiltration of airway mucosa.[6,7] It is postulated that tumor cells embolize to pulmonary arterioles thus activating the coagulation cascade leading to release of cytokines from platelets and endothelial cells. Cytokines thought to be involved include platelet-derived growth factor (PDGF) and vascular endothelial growth factor (VEGF). Luminal occlusion occurs due to tumor cells, fibrin deposition, and intimal hyperplasia leading to increased pulmonary vascular resistance (PVR) which in turn causes PH. PH leads to increased right ventricular (RV) afterload and a decrease in RV cardiac output (CO). All of this explains the rapidly evolving progressive dyspnea. Hypoxemia ensues because of increased shunting which results in patients requiring supplemental oxygen. The extent of metastatic disease/stenosis determines the severity of hypoxemia and PH. PTTM is usually classified under the miscellaneous category (Group 5) from the World Health Organization classification of PH, which signifies multifactorial or unclear etiology of PH.[8,9]

Laboratory workup usually shows elevated lactate

dehydrogenase (LDH), anemia from shearing of erythrocytes, elevated D-dimer from activation of coagulation cascade, and thrombocytopenia from increased sequestration/DIC or an unknown mechanism. These abnormalities develop as the disease progresses and a single abnormality such as an elevated LDH or D-dimer may be the only significant finding at presentation.[10] It is important to observe the time course of these laboratory abnormalities to better understand the progression and severity of the disease in future cases of this rare phenomenon to be better guided by these markers. Among imaging modalities, chest X-ray usually appears normal (in 70 percent of cases). Chest CT usually reveals ground glass opacities (from tumor infiltration), septal thickening and mediastinal/hilar adenopathy (from engorgement and drainage of lymphatic channels). Use of fluorodeoxyglucose positron emission tomography (PET) scan and V/Q scan in aiding the diagnosis is limited, but one case reported wedge-shaped defects on perfusion scanning in a patient with PTTM similar to our case.[8,11] Echocardiogram is used to assess the severity of PH and RV dysfunction; however, it is non-specific for PTTM. In most of the cases, right heart catheterization (RHC) is not performed due to the rapid decline in clinical status. RHC may be a guide in assessing hemodynamics, in initiation of PH therapy and response to antineoplastic drugs.[12] Also, cytological analysis can be done on blood drawn from a wedged pulmonary artery catheter which is reported to be 80-88 percent sensitive and 82-94 percent specific for the diagnosis of PTTM.[8] Review of literature has shown that immunohistochemical staining is mostly positive for PDGF, VEGF, tissue factor and osteopontin. PDGF and VEGF have also been used as serum markers to assess response to treatment. One case report showed reduction in PDGF levels after initiation of imatinib.[13] The average time to death is approximately 9.5 weeks from the onset of symptoms. As more cases are being reported antemortem, heightened suspicion enables initiation of aggressive chemotherapy to treat the underlying cancer. The rationale for chemotherapy is to decrease the tumor burden in order to lessen the stimulus for fibro-intimal proliferation. Some reports suggest that imatinib, a tyrosine kinase inhibitor, may prolong survival in PTTM.[12,13] Its mechanism of action is blocking phosphorylation of PDGF receptor and inhibiting downstream cell proliferation.[8] Although there is no evidence that conventional pulmonary vasodilators used to treat PH would be effective in PTTM, they are still used to potentially alleviate some pulmonary vasoconstriction.[12] One case of gastric cancer induced PTTM showed complete resolution when glucocorticoids in combination with chemotherapy and anticoagulation were utilized. [14]

Conclusion

PTTM is a rare condition with a very poor prognosis. There should be high suspicion of PTTM in patients presenting with metastatic cancers in the setting of pulmonary hypertension to aid in earlier diagnosis. Further cases need to be reported to better understand the pathophysiology and management of this frequently fatal disease.

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About the Authors:

Muhammad Hamza, MD, Internal Medicine resident, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Muhammad Danial Siddiqui, MD, Internal Medicine resident, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota

Mahum Shahid, MD, Internal Medicine resident, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Swaminathan Perinkulam Sathyanarayanan, MD, Internal Medicine resident, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota.

Anthony J. Hericks, DO, Clinical Associate Professor, Department of Internal Medicine, University of South Dakota Sanford School of Medicine, Sioux Falls, South Dakota; Director of Pulmonary and Critical Care, Avera McKennan University Hospital, Sioux Falls, South Dakota.

Review on Short Term Dual Antiplatelet Therapy Following Percutaneous Coronary Intervention with Drug Eluting Stent

Jeffrey Wilson, MD; Mansi Oberoi, MD; Tom Stys, MD; and Adam Stys, MD

Abstract

The optimal duration of dual antiplatelet therapy (DAPT) after percutaneous coronary intervention (PCI) have been a debatable topic for several decades. With the newer generation drug eluting stents, risk of major adverse cardiovascular events (MACE) has significantly reduced and hence, shorter duration of DAPT (one to three months) is now recommended especially in patients with high bleeding risk. Our review highlights the current guidelines and the recommendations from the recent trials.

Introduction

Dual antiplatelet therapy (DAPT) with aspirin and a $P2Y_{12}$ inhibitor reduces the risk of major adverse cardiovascular events (MACE) after percutaneous coronary intervention (PCI) but can be associated with increased bleeding risk. The ideal duration of DAPT after PCI with stent placement is dependent on the patient's ischemic and bleeding risks along with the type of stent used. Studies have shown that DAPT for longer periods may increase risk of bleeding,[1] particularly seen more with prasugrel and ticagrelor as compared with clopidogrel. Newer generation of drug eluting stents (DES) are associated with lower risk of stent thrombosis as compared with bare metal stents[2] and first-generation DES.[3] Since the risk of stent thrombosis is maximum immediately after the PCI and within first 30 days, shortened duration of DAPT is now recommended. Several randomized controlled trials (RCTs) have been done to compare long term DAPT of 12 months with short (less than six months) and midterm DAPT (six months) in preventing stent thrombosis, major adverse cardiac events (MACE) along with decreasing

Table 1. Academic Research Consortium Major and Minor Criterion for High Bleeding Risk.[4]

Major	Minor
Anticipated use of long-term oral anticoagulation*	Age ≥75 years
Severe or end-stage CKD (eGFR <30 mL/min)	Moderate CKD (eGFR 30–59 mL/min)
Hemoglobin <11 g/dL	Hemoglobin 11–12.9 g/dL for men and 11–11.9 g/dL for women
Spontaneous bleeding requiring hospitalization or transfusion in the past six months or at any time, if recurrent	Spontaneous bleeding requiring hospitalization or transfusion within the past 12 months not meeting the major criterion
Moderate or severe baseline thrombocytopenia† (platelet count $<100\times10^9$/L)	Long-term use of oral NSAIDs or steroids
Chronic bleeding diathesis	Any ischemic stroke at any time not meeting the major criterion
Liver cirrhosis with portal hypertension	
Active malignancy (excluding nonmelanoma skin cancer) within the past 12 months	
Previous spontaneous ICH (at any time) Previous traumatic ICH within the past 12 months Presence of a brain AVM Moderate or severe ischemic stroke (NIHSS ≥ 5) within the past 6 months	
Nondeferrable major surgery on DAPT	
Recent major surgery or major trauma within 30 days before PCI	

* Excludes vascular protection doses

AVM, arteriovenous malformation; CKD, chronic kidney disease; DAPT, dual antiplatelet therapy; eGFR, estimated glomerular filtration rate; HBR, high bleeding risk; ICH, intracranial hemorrhage; NSAID, nonsteroidal anti-inflammatory drug; and PCI, percutaneous coronary intervention.

Table 2. Bleeding Academic Research Consortium (BARC) Definitions.[5]

Type 0	No bleeding
Type 1	Bleeding that is not actionable and does not cause the patient to seek treatment
Type 2	Any clinically overt sign of hemorrhage that "is actionable" and requires diagnostic studies, hospitalization, or treatment by a health care professional
Type 3	a) Overt bleeding plus hemoglobin drop of 3 to < 5 g/dL (provided hemoglobin drop is related to bleed); transfusion with overt bleeding b) Overt bleeding plus hemoglobin drop < 5 g/dL (provided hemoglobin drop is related to bleed); cardiac tamponade; bleeding requiring surgical intervention for control; bleeding requiring IV vasoactive agents c) Intracranial hemorrhage confirmed by autopsy, imaging, or lumbar puncture; intraocular bleed compromising vision
Type 4	CABG-related bleeding within 48 hours
Type 5	a) Probable fatal bleeding b) Definite fatal bleeding (overt or autopsy or imaging confirmation)

risk of bleeding in high bleeding risk (HBR) patients.

High Bleeding Risk (HBR) Definition

According to the Academic Research Consortium for High Bleeding Risk (ARC-HBR) 2019, patient is at HBR if one major or two minor criteria (Table 1) for major bleeding defined by Bleeding Academic Research Consortium (BARC) are present. If the risk of BARC 3 or 5 bleeding (Table 2) is predicted to occur at a rate of ≥ 4 percent or great at one year or risk of intracranial hemorrhage of ≥1 percent at one year, patient is considered to be at HBR.[4]

Current Guidelines

According to American College of Cardiology (ACC)/ American Heart Association (AHA) guidelines (2016), patients with stable ischemic heart disease (SIHD) and acute coronary syndrome (ACS) (non-ST elevation- ACS or ST elevation myocardial infarction [STEMI]) undergoing PCI with DES implantation should receive DAPT for at least six months and 12 months respectively (Class I recommendation).[6] However, in patients with high bleeding risk, DAPT may be discontinued after three months (Class II recommendation).[6] The European Society of Cardiology guidelines (2017) similarly recommends DAPT for six months in SIHD and one to three months of DAPT for patients with high bleeding risk.[7]

Evidence from Randomized Controlled Trials (RCTs)

A. Trials involving high bleeding risk (HBR) patients

Nearly one-third of the patients in clinical practice are at HBR which necessitated trials for safety and efficacy of short term DAPT after PCI in this population.[4] In patients with stable coronary disease undergoing PCI, clopidogrel is the preferred $P2Y_{12}$ receptor blocker while in patients with ACS, a more potent $P2Y_{12}$ inhibitor (ticagrelor or prasugrel) is preferred due to the higher ischemic risk.

1) Onyx ONE RCT and Onyx ONE Clear U.S./Japan study (non-randomized), 2020: Of total 1796 HBR patients enrolled, 1,506 (85.1 percent) met one-month clear criteria defined as DAPT adherence and without major adverse events during the first month following PCI with zotarolimus-eluting stents. The primary end point of cardiac death or MI from one month to one year was 7.0 percent. The one-sided upper 97.5 percent CI was 8.4 percent, less than the performance goal of 9.7 percent (P<0.001). This trial demonstrated favorable safety and efficacy of one-month DAPT in HBR patients following PCI with DES.[8,9]

2) ZEUS, LEADERS FREE and SENIOR trials found favorable outcomes in HBR patients receiving DAPT for 1 month following PCI with DES compared with BMS.[10-12]

B) Trials which compared DAPT versus P2Y12 receptor inhibitors monotherapy

1) TICO trial (2020) involving 3,056 patients with acute coronary syndrome demonstrated three months of DAPT followed by ticagrelor monotherapy resulted in statistically significant reduction in composite outcome of major bleeding and cardiovascular events compared with 12 months DAPT.[13]

Table 3. Trials of DAPT versus P2Y12 inhibitor monotherapy.

STUDY	Comparison	Results (Grp 1 vs. Grp 2)	Conclusion
TICO trial (2020) NCT02494895	Grp 1:3 months DAPT f/b ticagrelor plus placebo Grp 2: 12 months DAPT	1) Major bleeding and adverse cardiac and cerebrovascular events (MACCE): 3.9% vs. 5.9% (HR 0.66, 95% CI 0.49-0.92) 2) Major bleeding: 1.7% vs. 3% (HR 0.56, 95% CI 0.34-0.91);	3 months of DAPT f/b ticagrelor monotherapy in ACS patients had lower MACCE as compared to 12 months of DAPT
TWILIGHT trial (2019) NCT02270242	Grp 1:3 months DAPT f/b ticagrelor plus placebo Grp 2: 15 months DAPT	1) BARC type 2, 3, or 5 bleeding: 4.0% vs. 7.1% (HR 0.56, 95% CI 0.45-0.68) 2) Death from any cause, nonfatal MI, or nonfatal stroke was similar in both groups	3 months of DAPT f/b ticagrelor monotherapy had lower rates of major bleeding than 15 months of DAPT without increased risk of death, MI, or stroke
SMART-CHOICE trial (2019) NCT02079194	Grp 1: 3 months DAPT f/b P2Y12 inhibitor monotherapy Grp 2: 12 months DAPT	1) All-cause death, MI, or stroke: 2.9% vs. 2.5% (HR 1.19, 95% CI 0.76-1.85) 2) BARC types 2 to 5 bleeding: 2.0% vs. 3.4 % (HR 0.58, 95% CI 0.36-0.92)	3 months of DAPT f/b P2Y12 inhibitor monotherapy had noninferior rates of major adverse cardiac and cerebrovascular events as compared with 12 months of DAPT
STOPDAPT-2 trial (2019) NCT02619760	Grp 1: 1-month DAPT f/b clopidogrel mo notherapy Grp 2: 12 months DAPT	1) Cardiovascular death, MI, ischemic and hemorrhagic stroke, definite stent thrombosis, or TIMI major or minor bleeding: 2.36% vs. 3.7% (HR 0.64, 95% CI 0.42-0.98) 2) Major secondary bleeding endpoint: 0.41% vs. 1.54 %	1-month of DAPT f/b clopidogrel monotherapy had lower rate of cardiovascular and bleeding events as compared with 12 months of DAPT, meeting criteria of both noninferiority and superiority
GLOBAL LEADERS (2018) NCT01813435	Grp 1: 1-month DAPT f/b ticagrelor monotherapy Grp 2: 12 months DAPT f/b 12 months aspirin monotherapy	1) All-cause mortality, new Q wave MI: 3.81% vs. 4.37% (RR 0.87, 95% CI 0.75-1.01) 2) BARC type 3 or 5 bleeding: no significant difference in both groups	1-month DAPT f/b ticagrelor monotherapy for 23 months was not superior to 12 months DAPT f/b 12 months of aspirin monotherapy in preventing all-cause mortality or new Q-wave MI 2 years post PCI

DAPT: dual antiplatelet therapy, f/b: followed by, MACCE: major bleeding and adverse cardiac and cerebrovascular events, HR: hazard ratio, CI: confiden interval, BARC: Bleeding Academic Research Consortium, MI: myocardial infarction, TIMI: thrombolysis in myocardial infarction, PCI: percutaneous coronary intervention.

2) TWILIGHT trial (2019) involving 7119 patients showed that 3 months of DAPT followed by ticagrelor monotherapy had lower rate of bleeding as compared to continued DAPT for 12 months without increased risk of cardiovascular and ischemic events.[14]

3) SMART-CHOICE trial, 2019 (Smart Angioplasty Research Team: Comparison Between P2Y12 Antagonist Monotherapy versus Dual Antiplatelet Therapy in Patients Undergoing Implantation of Coronary Drug-Eluting Stents) involving 2993 patients showed that three months of DAPT followed by P2Y12 inhibitor monotherapy had noninferior rates of major adverse cardiac and cerebrovascular events as compared with 12 months of DAPT. Rate of Bleeding Academic Research Consortium (BARC) types 2 to 5 bleeding was less with P2Y12 inhibitor monotherapy.[15]

4) STOPDAPT-2 trial, 2019 (Short and Optimal Duration of Dual Antiplatelet Therapy After Everolimus-Eluting Cobalt-Chromium Stent) involving 3,045 patients showed that one month of DAPT followed by clopidogrel monotherapy resulted in significantly lower rate of cardiovascular and bleeding events as compared with 12 months of DAPT, which proved it to be both noninferior and superior.[16]

5) GLOBAL LEADERS (2018) involving 15,968 patients showed that one-month DAPT followed by ticagrelor monotherapy for 23 months was not superior to 12 months DAPT followed by 12 months of aspirin monotherapy in preventing all-cause mortality or new Q-wave myocardial infarction

C) Trials which compared DAPT versus aspirin monotherapy

1) ISAR SAFE trial (2015) involving around 4,000 patients with DES implantation showed that six months DAPT (aspirin 81- 200 mg/d plus clopidogrel 75 mg/d) followed by aspirin monotherapy had noninferior rates of death, MI, stent thrombosis, stroke, and major bleeding as compared to 12 months DAPT at nine months after randomization (1.5 percent vs. 1.6 percent, difference -0.1 percent, upper limit of one-sided 95 percent CI 0.5 percent, limit of non-inferiority 2 percent, P for noninferiority<0.00). The trial was stopped prematurely due to slow recruitment and low event rates.[18]

2) ITALIC trial (2015) involved 2031 patients undergoing implantation of everolimus-eluting stents with confirmed nonresistance to aspirin. It showed that there was no significant difference between 6 months DAPT (aspirin 75-365 mg/d depending on aspirin sensitivity/resistance plus clopidogrel 75 mg/d, or prasugrel 60 mg/day, or ticagrelor 90 mg twice per day) followed by aspirin monotherapy as compared to 24 months DAPT in composite rate of death, MI, urgent target vessel revascularization, stroke, and major bleeding at one year of stent placement. The trial was prematurely terminated due to recruitment problems.[19]

3) SECURITY trial (2014) involving 1,399 patients, six months DAPT (aspirin plus clopidogrel/prasugrel/

Table 4. Trials of DAPT versus aspirin monotherapy.

STUDY	Comparison (DAPT)	Results (Grp 1 vs. Grp 2)	Conclusion
ISAR SAFE (2015) NCT00661206	Grp 1: 6 months DAPT f/b aspirin monotherapy Grp 2: 12 months DAPT	Composite of death, MI, ST, stroke, major bleed: 1.5% vs. 1.6%	6 months DAPT was noninferior to 12 months DAPT
ITALIC (2015) NCT01476020	Grp 1: 6 months DAPT f/b aspirin monotherapy Grp 2: 24 months DAPT	Composite of death, MI, urgent TVR, stroke, or major bleeding: 1.6% vs. 1.5% (p = 0.85)	6 months DAPT was noninferior to 24 months DAPT
SECURITY (2014) NCT00944333	Grp 1: 6 months DAPT f/b aspirin monotherapy Grp 2: 12 months DAPT	Composite of Cardiac death, MI, ST, stroke, BARC type 3 or 5 bleeding:4.5% vs. 3.7% (risk difference 0.8%; 95% CI: -2.4 to 1.7; p = 0.469)	6 months DAPT was noninferior to 12 months DAPT
OPTIMIZE (2013) NCT01113372	Grp 1: 3 months DAPT f/b aspirin monotherapy Grp 2: 12 months DAPT	NACCE–death, MI, stroke, bleed: 6.0% vs. 5.8% (risk difference 0.17, 95% CI: -1.52 to 1.86; p = .002)	3 months DAPT was noninferior to 12 months DAPT
RESET (2012) NCT01145079	Grp 1: 3 months DAPT f/b aspirin monotherapy Grp 2: 12 months DAPT	Composite of death, MI, ST, revascularization, bleeding: 4.7% vs. 4.7%, (difference: 0.0%; 95% CI -2.5 to 2.5; p=0.84)	3 months DAPT was noninferior to 12 months DAPT
EXCELLENT (2012) NCT01145079	Grp 1: 6 months DAPT f/b aspirin monotherapy Grp 2: 12 months DAPT	Composite of cardiac death, MI, or ischemia driven TVR : 4.8% vs. 4.3%	6 months DAPT was noninferior to 12 months DAPT
PRODIGY (2012) NCT00698607	Grp 1: 6 months DAPT f/b aspirin monotherapy Grp 2: 24 months DAPT	Composite of death, MI, or stroke 16.7% vs. 7.3% (p = 0.034)	6 months DAPT was not superior to 24 months DAPT

DAPT: dual antiplatelet therapy, f/b: followed by, MI: myocardial infarction, ST: stent thrombosis, TVR: target vessel revascularization, BARC: Bleeding Academic Research Consortium, CI: confidence interval, NACCE: net adverse clinical and cerebral events

ticagrelor) was noninferior to 12 months DAPT for rates of cardiac death, MI, stroke, stent thrombosis and BARC type 3 or 5 bleeding at 12 months (4.5 percent vs. 3.7 percent ; risk difference 0.8 percent; 95 percent CI: -2.4 to 1.7; p = 0.469).[20]

4) OPTIMIZE trial (2013) included 3,119 patients with zotarolimus-eluting stents for a total follow up period of one year. It showed that three months DAPT (aspirin 100-200 mg/d plus clopidogrel 75 mg/d) followed by aspirin monotherapy (100-200 mg/d) was noninferior to 12 months DAPT for net adverse clinical and cerebral events (NACCE), (6.0 percent vs. 5.8 percent, risk difference, 0.17 [95 percent CI, -1.52 to 1.86]; P = .002 for noninferiority) with no significant increase in risk of stent thrombosis.[21]

5) RESET trial (2012) involving 2,117 patients showed that three months DAPT (aspirin 100 mg/d and clopidogrel 75 mg/d) followed by aspirin monotherapy in patients with zotarolimus eluting stent was noninferior to the 12 months DAPT at 1 year with respect to rates of cardiovascular death, MI, stent thrombosis, vessel revascularization, or bleeding (4.7 percent vs. 4.7 percent, difference: 0.0 percent; 95 percent CI -2.5 to 2.5; p=0.84).[22]

6) EXCELLENT trial (2012) involving 1443 patients undergoing implantation with drug-eluting stents showed that there was no significant difference in risk of target vessel failure which included composite of cardiac death, MI, or ischemia driven target vessel revascularization at 12 months between 6 months DAPT (aspirin 100-200 mg/d plus clopidogrel 75 mg/d) followed by aspirin monotherapy and 12 months DAPT (4.8 percent vs. 4.3 percent, the upper limit of one-sided 95 percent CI: 2.4 percent; P=0.001 for noninferiority).[23]

7) PRODIGY trial (2012) involved 224 patients undergoing PCI procedure for in stent restenosis (ISR). The cumulative incidence of death, MI, or cerebrovascular accident at 24 months was 16.7 percent in patients with 6 months DAPT (aspirin 80 to 160 mg/d plus clopidogrel 75 mg/d) followed by aspirin monotherapy as compared with 7.3 percent in patients with 24 months DAPT (p = 0.034). The trial showed that patients undergoing PCI for in stent restenosis (ISR) may benefit from long term DAPT without any significant increase in bleeding risk.[24]

The recent meta-analysis (2020) of 24 RCT (involving 79,073 patients) comparing short term (<6 months) DAPT followed by aspirin or P2Y12 inhibitor monotherapy, midterm (6-month) DAPT, 12-month DAPT and extended-term (>12 month) DAPT after PCI with DES showed that short term DAPT followed by P2Y12 monotherapy was noninferior for MI, MACE, and mortality, and superior for major bleeding and net adverse clinical events, in comparison with 12-month DAPT.[25]

Conclusion

The duration of DAPT following PCI with DES should have an individualized approach balancing the risk of ischemic events and bleeding risk. After reviewing results from several RCTs, high bleeding risk patients undergoing PCI with newer generation DES may be treated with short term DAPT of one to three months followed by aspirin (81-200 mg/d) or P2Y12 inhibitor monotherapy (clopidogrel 75 mg/d, or prasugrel 5-10 mg/day, or ticagrelor 90 mg twice per day) indefinitely rather than long term DAPT to be effective in preventing stent thrombosis and major adverse cardiac events along with decreasing the incidence of bleeding events.

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

About the Authors:

Jeffrey Wilson MD, Sanford Heart Hospital, Sioux Falls, South Dakota.

Mansi Oberoi MD, Department of Internal Medicine, University of South Dakota Sanford School of Medicine, Sioux Fall, South Dakota.

Tom Stys MD, Sanford Heart Hospital, Sioux Falls, South Dakota.

Adam Stys, MD, Sanford Heart Hospital, Sioux Falls, South Dakota.

Strategies for Optimizing Use of Medications Through Medication Adherence Services

Alex Middendorf, PharmD, MBA; and Jackie Thomas, PharmD

Pharmacological therapies are routinely used in the treatment and management of many chronic disease states. However, in order for pharmacological therapy to elicit its full benefit, patients must be adherent to the prescribed treatment regimen. The typical threshold to be considered adherent to medication therapy is 80 percent, though this does vary for certain conditions. Medication nonadherence is estimated to cost the United States $100-$300 billion healthcare dollars each year. In addition to the large sum in health care costs, nonadherence is associated with worse health outcomes, increased hospital admissions, and higher rates of morbidity and mortality.

Medication adherence can be impacted by a number of diverse factors both within the patient and provider's control as well as those outside of their control. While factors such as cost and provision of patient education may be more obvious, others such as medication regimen complexity and patient health beliefs about diseases or medication may be more difficult for one provider to ascertain.

Role of Pharmacists in Medication Adherence

Pharmacists represent an often underutilized health care provider who have specific training and expertise in intervening on issues related to medication adherence. As members of the health care team with specialized knowledge on appropriate use of medications, pharmacists can reduce or even eliminate many of the medication adherence barriers patients may experience.

In addition, utilizing pharmacists specifically to provide interventions on medication adherence represent a cost-effective way to reduce total cost of care for patients. A recent report from the Community Preventative Services Task Force (CPSTF) focused on cardiovascular disease prevention specifically identified a median estimate of $11,298 per quality adjusted life year saved. This is far below their quality adjusted life year threshold of $50,000. In the studies CPSTF reviewed in this report, a common theme was team-based care and communication with the patient, pharmacist, and primary care provider working together to provide tailored interventions in optimizing use of medications. Pharmacists assessed the medication use behaviors of patients to identify barriers then provided tailored guidance including but not limited to targeted educational counseling, use of adherence packaging and other tools, and services such as medication synchronization with routine follow-up.

Medication Adherence Services

Community pharmacists can improve medication adherence and optimize medication use through medication synchronization and medication adherence packaging services. Medication synchronization appeals to many patients as they are able to pick up all of their medications once every one to three months rather than making multiple trips to the pharmacy. Medication adherence packaging goes a step further in simplifying medication administration by organizing the patient's medications based on the appropriate days and times in simple, convenient packages as opposed to multiple individual vials.

Both services utilize regular contact with the patient, usually via phone, to confirm the patient's current medication list and medication use behaviors. Regular contact develops rapport with patients to deepen the patient-pharmacist relationship and facilitates the ability of pharmacists to assess both adherence and medication effectiveness from the patient's perspective. Collecting an accurate, in-depth medication list that includes all prescriptions, over-the-counter (OTC) medications, vitamins, supplements, and any other products allows the pharmacist to assess all of the patient's medications at once which enables the pharmacist to proactively identify any actual or potential medication-related problems. Additionally, these programs allow for pharmacist oversight into where and how patients acquire all of the medications they take, addressing issues that can arise from fragmented health care delivery and an incomplete medication list including ensuring therapy is as affordable as possible for patients.

From the pharmacist's standpoint, having patients enrolled in medication synchronization services facilitates a more predictable and manageable pharmacy dispensing workflow which allows for additional time during the day for providing direct patient care and other clinical services. The pharmacist takes the initiative in contacting providers ahead of time for prescription renewals as opposed to waiting for the patient to start this process when they are close to running out of medication. Pharmacists can also more easily control when various steps of the dispensing process are scheduled. Routine refills of chronic medications can be filled when extra pharmacy staff are available or during times in the week that are less busy as opposed to when multiple prescriptions for new acute medications are

Table 1. Examples of medication-related problems identified and resolved with medication synchronization and adherence packaging services.

Scenario	Potential medication-related problems	Resolution
The patient sees multiple providers at different facilities that do not seamlessly share electronic health record information. The patient has been taking simvastatin prescribed by his primary care provider and has a new prescription sent in for atorvastatin from a specialist.	The patient thinks he should be taking both and requests the new medication be added to his monthly medications.	The pharmacist educates the patient on both medications and contacts the providers to determine which statin the patient will take moving forward. The pharmacist discontinues the other prescription from patient's pharmacy dispensing system profile to prevent similar errors in the future.
The patient wants to include a new over-the-counter (OTC) product and herbal supplement in medication adherence packaging after having heard about the products from a friend. The patient has not discussed these products with their provider.	The patient is taking an anticoagulant that interacts with both the desired OTC product and herbal supplement to increase the risk of bleeding-related adverse events.	The pharmacist educates the patient on the interactions and the increased risk of bleeding. The patient decides not to take the supplement due to the interaction. The pharmacist identifies an alternative OTC without this interaction and contacts the provider's office to get a prescription so this OTC can be included in the next medication adherence packages.
The patient organizes medications into a weekly pill planner at home. She has some minor vision and memory problems but she "does not want to bother anyone" so does not actively seek out assistance.	The patient takes two medications that look alike (small, white, and round) and she thinks she has accidentally mixed them together when putting together the planner for the week.	The pharmacist is able to identify and correctly place the medications. The pharmacist offers medication adherence packaging services to save the patient time each week in organizing medications. The packaging shows a picture of each medication for the patient's reference.
The patient is out of his carvedilol before the next refill is calculated to be due. His atrial fibrillation has not been well-controlled recently and he is worried he will not be able to get the medication he needs in time.	The patient recently had an appointment where the carvedilol dose had been increased for better rate control. Based on his request to use his existing medication supply up to save money, he was given alternative instructions for his existing prescription to use it up prior to the new strength being filled. A new prescription had not yet been sent to the pharmacy.	The pharmacist contacts the provider's office to confirm the medication dose change and to get a new prescription with the updated strength and instructions. The prescription is filled correctly and realigned to the patient's other medications by short filling.
The patient is enrolled in the pharmacy's medication synchronization program. During the monthly call with the pharmacist to discuss the plan for filling medications, the patient requests to not fill metformin this month as he has many more tablets remaining than expected.	According to the patient's profile, the medication is due to be filled. The patient reports he has not been taking the medication due to experiencing side effects despite taking the medication with food.	The pharmacist and patient discuss the side effects that have been occurring. The pharmacist contacts the provider to explain the situation and recommends a new prescription for an extended-release formulation of metformin. The patient tolerates this formulation better with fewer side effects and is willing to take as prescribed.

expected. Medication synchronization programs also help with inventory management, allowing for high-cost items to be ordered immediately prior to the scheduled dispensing date when the patient will need them as opposed to needing to have those products in pharmacy inventory at all times. Another benefit of utilizing these medication synchronization services is that patient medication deliveries are able to be made less frequently since everything is aligned, which can make providing delivery more financially sustainable for the pharmacy to offer to more patients.

To initiate medication synchronization or medication adherence packaging processes, the pharmacy collects a detailed medication list from the patient including any OTC medications, vitamins, supplements, and any other products the patient takes on a scheduled basis. As needed medications are also discussed but generally filled separately from the synchronized medications depending on frequency of use. Along with the list, the pharmacy will acquire counts of how much of each medication the patient has on hand at home and may contact the prescriber's office to get prescription for shortened quantities to fill in vials to align the patient's medications for the same fill date through short fills. If the patient's medications are close to being aligned or are able to be filled for minimal cost to the patient, the pharmacy may have the patient keep a smaller supply of medication at home in the meantime while the synchronization process is completed in that time frame. While aspects of these services can be performed by skilled pharmacy technicians or pharmacy student interns, a pharmacist clinically reviews the patient's medications prior to dispensing in order to proactively identify and resolve any actual or potential medication-related problems (Table 1).

For adherence packaging services, if existing prescription instructions are not specific, the pharmacist will provide input on what time slot a medication should be placed to minimize safety issues and to maximize the medication's benefit. For example, some patients prescribed a diuretic product will see the prescription instructions state "take daily" with no specific time recommendations. These patients may be taking this at bedtime with their statin medication and thus will complain of frequent urination during the night disturbing their sleep. The pharmacist can provide education on this and recommend putting the diuretic medication in the morning time slot of adherence packaging to alleviate some of the issue. As another example, a patient on metformin may complain of stomach upset but not be taking the medication with food. The pharmacist can once again educate the patient and put the medication in time slots around the patient's biggest meals. The pharmacist can also help determine what day of the week to put a once weekly medication based on patient's weekly routine.

After the initial medication synchronization or medication adherence packaging is set up, the pharmacist will follow up with the patient monthly to assess medication use behaviors to assess for issues as well as identify any known changes or upcoming appointments the patient may have. If a medication change occurs, the pharmacy will work with the patient to get the medication change made as quickly as possible while not disturbing fills of the other medications. If a new medication is added between fill dates, a short fill in a medication vial may be used to align the medication to when the next synchronized fill will occur. This ensures the medication list and synchronized filling process is consistent in the future to facilitate optimal medication use behaviors by the patient.

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Pharmacology Focus is a feature sponsored by Department of Pharmacy Practice at South Dakota State University.
For more information, visit sdstate.edu/pharmacy-and-allied-health-professions/pharmacy-practice.

Member News

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

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SDSMA's legislative staff is your eyes, ears and voice in Pierre and Washington. We track hundreds of pieces of legislation that affect you, as well as coordinate opportunities for you to get involved in the process.

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There are more SDSMA benefits to tell you about, and you'll hear about them in the months to come. In the meantime, if you'd like more information about our legislative services and advocacy programs, give us a call at 605.336.1965 or visit www.sdsma.org.

Thank you for your membership in SDSMA.

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

Lucio N. Margallo II, MD, Sworn in as SDSMA President

Lucio N. Margallo, MD, of Mitchell, became president of the SDSMA during the SDSMA's Annual Leadership Conference on Friday, June 3 in Sioux Falls. Outgoing president Kara L. Dahl, MD, presented the presidential medallion to Dr. Margallo at the annual banquet at the Hilton Garden Inn Downtown.

Dr. Margallo has been an active member of the SDSMA since 1994 and is an internal medicine physician at Avera Medical Group Mitchell; clinical assistant professor, University of South Dakota Sanford School of Medicine; clinical professor, University of South Dakota PA Program; and professor, Athletic Training Program, Dakota Wesleyan University. He has been involved in the leadership of organized medicine for many years. Prior to becoming SDSMA president, he held offices on the SDSMA's Board of Directors. While serving on the SDSMA Policy Council, Dr. Margallo represented the District 6 Medical Society. He also served as president of the District 6 Medical Society. Dr. Margallo is past chairman of the SDSMA PAC, serves on the SDSMA Foundation Board of Directors and is a member of the American Medical Association.

During the state legislature, Dr. Margallo has volunteered for the SDSMA's advocacy efforts by participating in the Doctor of the Day program in Pierre. In addition to his work with the SDSMA, Dr. Margallo has been actively involved in the Mitchell community for many years in numerous volunteer capacities. He is a Dakota Wesleyan University Athletic Hall of Fame Award recipient, a recipient of the Children's Champion Award – Abbott House, and recipient of the SDSMA Distinguished Service Award. He is also a recipient of Mitchell High School's Athletic Booster Club Distinguished Service Award and was inducted into its Athletic Hall of Fame.

Dr. Margallo received his medical degree at the University of Santo Tomas, Manila, the Philippines, and completed his residency through the University of South Dakota (USD) Internal Medicine Residency Program.

Read more coverage of the 2022 SDSMA Annual Leadership Conference in next month's issue of *South Dakota Medicine*, online at sdsma.org, and in email updates.

Read coverage of the 2022 SDSMA Annual Leadership Conference in next month's issue of *South Dakota Medicine*, online at sdsma.org, and in email updates.

SDSMA Endorses Medicare Physician Payment Reform

The South Dakota State Medical Association, along with the American Medical Association and 119 other medical societies, has endorsed the *Characteristics of a Rational Medicare Physician Payment System*. The document calls for a rational payment system and an overhaul that would remedy financial instabilities impacting physician practices due to the pandemic, statutory payment cuts, lack of inflationary updates and significant administrative burdens.

Under the Medicare Access and CHIP Reauthorization Act (MACRA) of 2015, physicians are in the middle of a six-year payment freeze. Adjusted for inflation in practice costs, Medicare physician payment declined 20 percent from 2001 to 2021, and without an inflation-based update, the gap between frozen physician payment rates and rising inflation in medical practice costs will widen. The Medicare payment system is on an unsustainable path threatening patient access to physicians. The reform principles call on Congress to:

- Provide financial stability through a baseline positive annual update reflecting inflation in practice costs, and eliminate, replace or revise budget neutrality requirements to allow for appropriate changes in spending growth.
- Reward the value of care provided to patients and encourage innovation, so practices and systems can be redesigned and continuously refined to provide high-value care and include historically non-covered services that improve care for all or a specific subset of patients, as well as for higher risk and higher cost populations.
- Advance health equity and reduce disparities. Payment model innovations should be risk-adjusted and recognize physicians' contributions to reducing health disparities, addressing social drivers of care and tackling health inequities. Physicians need support as they care for historically marginalized, higher risk, hard to reach or sicker populations.

The SDSMA will continue to work toward solutions to the systematic problems with the Medicare physician payment system and preserve patient access to care, and will continue to advocate to strengthen the Medicare physician payment system.

Legal Brief Highlight: Medical Records Privacy – Disclosure with Patient Consent

For the release of protected health information, valid written authorization of the release of records is necessary. Protected health information may be released by a patient, and must include written authorization that contains certain provisions in order to be valid. Personal representatives and parents of minors may execute such an authorization as well. The authorization must be in writing and contain the following:

- A description of the information to be used or disclosed.
- The person, or class of persons, authorized to make the requested use or disclosure.
- The name or other specific identification of the person, or class of persons, to whom the covered entity may make the requested disclosure.
- A description of each purpose of the requested use or disclosure. The statement, "at the request of the individual" is a sufficient description when an individual initiates the authorization and does not provide a statement of the purpose.
- An expiration that relates to the individual or the purpose of the use or disclosure. The statement "end of the research study," "none," or similar language is sufficient if the authorization is for the use or disclosure of protected health information for research, including for the creation and maintenance of a research database or research repository. "End of case" or "end of lawsuit" is also acceptable.
- The signature of the individual and date. If the authorization is signed by a personal representative, a description of his or her authority to act for the individual must also be provided.

More information is available in the SDSMA legal brief *Medical Records Privacy – Disclosure with Patient Consent* at sdsma.org. The SDSMA provides legal briefs for member physicians on a variety of rules and regulations that apply to the medical profession. For nonmembers, legal briefs are available for purchase.

Member News

AMA at 175: Our National Partner Contributing to SDSMA's Success

The gains we constantly make in diagnosing and treating illness and injury are easy to take for granted – until we realize just how far organized medicine has advanced since the mid-1800s, when bloodletting and blistering helped place "bodily humors" back into balance. Today, next-generation mRNA vaccines and groundbreaking advancements in gene therapy are just two examples demonstrating our tremendous progress in restoring health and maintaining wellness for all, which also means dismantling the structural and social drivers of health inequities.

The American Medical Association, which last month marked the 175th anniversary of its founding, helps propel the science and research that drives organized medicine forward through advocacy and innovation built around the world's first-ever code of medical ethics. The AMA's work to both standardize and modernize medical education and physician training are key elements in meeting its mission to promote the art and science of medicine and the betterment of public health.

As not only an individual membership association, but the convening national body of medicine through its House of Delegates – comprised of more than 190 state and specialty medical societies and other critical stakeholders – the AMA is the nation's largest and most influential medical organization. The policies adopted by the House of Delegates underpin its advocacy and guide ethical medical practice for millions of physicians in the U.S. and around the world.

Delegates selected by the state medical associations, medical specialty societies, national medical organizations and other recognized constituent associations that comprise the AMA House of Delegates meet twice each year to shape AMA policy and prioritize initiatives in medical education, ethical and judicial affairs, public health, diversity and inclusion, and a host of other subjects.

The SDSMA has been proud to partner with the AMA on advocacy efforts for physicians, patient safety, and protecting the health of South Dakotans. The AMA has been instrumental in providing resources and support for the SDSMA as we face scope expansion by other health care professions that would impact patient safety. They also support the SDSMA staff by providing education and training opportunities and serve as a great resource for day to day association needs.

Since the earliest days of its founding, the AMA and its state and specialty medical association partners have put patients first – from our earliest efforts to protect the public from medical quackery and fraudulent "medicines" that were ineffective at best and life-threatening at worst. Over the years, we have spoken for physicians in a unified voice in championing vaccine safety and efficacy, confirming the harmful effects of tobacco use while helping ban smoking on airliners, and advocating for seat belts as standard equipment in vehicles, among other initiatives.

The AMA continues to fulfill its mission by working to remove obstacles to patient care, leading the charge to prevent chronic disease and confront public health crises, and driving the future of medicine through innovation and improved physician training and education.

While the AMA can be rightfully proud of its contributions to organized medicine, the organization has also owned up to the fact that some of its prior actions and policies helped create many of the disparities and inequities in health that persist today. The AMA has acknowledged these mistakes and is working collaboratively to eliminate inequities throughout health care in order to achieve optimal health for all.

As the AMA marks its 175th anniversary, its leadership is grateful for the contributions of time and volunteer service by millions of physician members who have advanced its mission over generations while working tirelessly to improve the health of their patients, communities, and our nation.

South Dakota Physician Well-Being Program

For South Dakota-licensed physicians or residents looking to use the confidential South Dakota Physician Well-Being Program, call **1-605-275-4711** or go to **www.mshms.com/pwbp**. PWBP provides individualized, confidential and professional support for physicians experiencing professional stress and burnout, substance use disorders, mental health disorders, and other conditions that may adversely affect a physician's well-being.

South Dakota Physician Well-Being Program

Take a Moment to Breathe

Andrew Ellsworth, MD

The act of breathing is essential to life and can be done with or without thinking about it. You can control your breath and vary it, but eventually air must come in, and air must go out.

The breath of life and breathing exercises are an important aspect of many religions. In the book of Genesis, when God created man, he formed man of the dust of the ground, and breathed into his nostrils the breath of life. Several Eastern religions use controlled breathing in meditation and prayer, helping in the processes of consciousness, mindfulness, and visualization.

In this time of increased stress and anxiety over money, wars, and numerous other matters, I encourage us all to take time to focus on our breathing.

One of the simplest ways to combat stress and anxiety is to breathe. It does not cost any money and does not have to take much time. However, deep breathing can decrease your stress, help you feel calmer, reduce pain, reduce your blood pressure, help you focus, and improve digestion. It can also increase your energy and improve your immunity.

How do you do it? Easy! Just do it. Make sure you are somewhere safe and close your eyes. Breathe in gently through your nose, take about four to five seconds, and fill your belly and chest. Perhaps hold it for another couple seconds. Then release it through your open mouth over five seconds or more, whatever is comfortable. Repeat this at least five times.

When I have patients that have anxiety or panic attacks, I often take a little time to practice this with them. Every time I feel calmer myself, and I hope they find it calming as well.

Last month, our television program, On Call with the Prairie Doc®, celebrated its 20th season of providing truthful, tested, and timely medical information. We are taking time to breathe in and reflect on our past, feeling grateful for our founders, the late Dr. Richard Holm and his wife Joanie, and celebrating the contributions of everyone on our team.

Thank you, our readers, for taking the time to read our columns through the years, and I hope there are many more to come. Now, please take a moment to do some deep breathing. First you breathe in, then breathe out.

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

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