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Letter to the Editor

This letter is in response to an article published in a previous issue, titled “Management of Brujeria, a Culture-Bound Syndrome.” (GHS Proc. 2016;1:140-2)

Dear Dr Bolton:

We have read with interest the paper published in the November 2016 issue by Mingoia and Sharma titled “Management of Brujeria, a Culture-Bound Syndrome.”1 We would like to highlight 2 main ideas that, in our opinion, merit additional mention. First, Brujeria, the culture-bound syndrome described by Mingoia and Sharma, is only one example of a diverse group of conditions presenting within the context of a specific culture. Second is the vital role of the interpreter, who brought the notion of culture to his or her job, broadening the understanding of the concepts of health and disease.

Since 1962, the term “culture-bound syndrome” has been commonly used,2 with the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) describing 25 culture-bound syndromes as of 2000.3 However, in 2013, the DSM was updated and the concept of culture-bound syndrome was revised to “cultural concepts of distress.”4 Of note, the DSM was primarily developed for its use in the United States, as some DSM “disorders” are unlikely to fit in other countries with different sociocultural, political, and economic environments.5

Culture-bound syndromes are considered to be illnesses limited to specific areas, societies, or cultures. In population health, health beliefs and culture are important determinants, often influencing outcomes in health care. For this reason, we agree with the authors regarding the need for clinicians to be aware of these conditions. We also suggest that this subject be included in medical school curriculums.

Several additional and frequently seen culture-bound syndromes in the United States include Amok, a disorder characterized by sudden homicidal rages and most often seen in Malaysian men;6 Brain Fag, which causes depression and demotivation among West Africans;7 anorexia nervosa, an eating disorder that causes people primarily in Western cultures to be obsessed with their weight and what they eat; Koro, an anxiety disorder where Asian men come to fear that their penis is disappearing;8 Devaki Syndrome, which causes depression and anxiety in Hindu women with previous fetal loss resulting from spontaneous abortions;9 and semen loss anxiety, an anxiety disorder reported in men in various parts of the world following loss of semen from nocturnal emissions or masturbation, affecting the idea of masculinity.10 Brujeria should be viewed in a similar light to these syndromes.

Brujeria and any associated symptoms depend on cultural beliefs. Since culture has an important influence on the expression of psychopathology, we believe that Brujeria is not a nosologic entity by itself. For example, in 2014, an unusual outbreak of neurologic symptoms was reported in the city of Carmen de Bolivar following the country-wide human papillomavirus immunization strategy implemented by the Colombian government. Approximately 300 young women in Carmen de Bolivar received the vaccine. From these women, 200 developed the unreported side effects of fainting spells and pseudocrisis. The local people believed this reaction to be a massive spell, and the Colombian government was forced to cancel the immunization program, even though this event was an isolated one. This situation is a classic example of mass psychogenic illness within a cultural context, despite Brujeria not being a particularly common cultural belief in Colombia.

Finally, one important aspect to be considered in clinical practice is a patient’s level of education. Depending on patients’ education, they may use different words to describe their symptoms, diseases, and even body parts, which could present a challenge for both the physician and interpreter. The same way clinicians should receive additional training in cultural awareness, interpreters may also benefit from similar instruction. The ability
to understand medical terminology and speak the patient’s language is important. However, being familiar with the patient’s culture and possible associated beliefs could provide the interpreter with unique insight and additional avenues of communication.

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References
Radiology Imaging

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Patient Description

A 28-year-old transgender woman presented to an emergency department at our institution (Greenville Health System) with a 2-day history of shortness of breath and chest tightness. The patient reported chills and diaphoresis the previous night and weakness that morning. She had arrived in town the day before following a 17-hour train ride from New Mexico. Her past medical history was significant for the human immunodeficiency virus, depression, and estrogen use. Computed tomography (CT) pulmonary angiography of the chest and pelvic CT were performed (Fig 1). Based on the images below, what is the most likely diagnosis for this patient? Answer on the following page.

Imaging

Figure 1

CT of the patient’s chest and pelvis.

Figure Legend: Axial chest CT (A), soft tissue window; axial chest CT (B), lung window; coronal chest CT (C), lung window; axial pelvic CT (D), soft tissue window.
Silicone-Related Pneumonitis

Before the Food and Drug Administration ban in 1992 for safety concerns and ineffectiveness, use of polydimethylsiloxane (also known as injectable silicone) was commonly used for breast augmentation.1 Despite warnings of untoward, long-term effects as early as 1967,2,3 use of silicone injections persists on the black market today.

In recent years, buttock augmentation via fat grafting has increased, with more than 18 000 procedures reported in 2016.4 Gluteal augmentation can cost up to $7000 when performed by a physician. On the black market, however, free silicone injections, among other substances such as paraffin, can be obtained for a few hundred dollars.

Health risks associated with use of free silicone injections include acute or latent pneumonitis, granulomatous hepatitis, mastitis, and death. One of the earliest reported deaths attributed to free silicone injection was in 1975. The patient was noted to have free silicone deposits in the lungs, liver, brain, spleen, kidneys, and pancreas.5 Multiple subsequent autopsy reports, as well as bronchoalveolar lavage specimens, have demonstrated large amounts of free silicone in the lungs.6 Further, patients presenting with fever, malaise, and elevated liver enzymes demonstrated foreign body granulomas and silicone on liver biopsy.5 It is hypothesized that mechanical injury may result in passage of injectable silicone into the venous circulation, leading to symptomatology.

Significance

Unfortunately, recognition of the clinical sequelae of injectable silicone remains relevant today. Evidence of silicone injection in the breasts, hips, and particularly the buttocks is commonly seen in our practice. Moreover, overall incidence is

Figure 2
Silicone-related pneumonitis.

Figure Legend: Axial chest CT (A), soft tissue window demonstrates nodular soft tissue densities (outlined) and fatty stranding related to silicone injection; axial chest CT (B), lung window demonstrates bilateral diffuse peripheral airspace disease (outlined); coronal chest CT (C), lung window demonstrates bilateral diffuse peripheral airspace disease (outlined); axial pelvic CT (D), soft tissue window demonstrates nodular soft tissue densities (outlined) and fatty stranding related to silicone injection.
likely under-reported given the illicit nature of the procedure.

Acute pneumonitis typically presents with fever, hypoxia, and hemoptysis, and can be identified using chest CT or chest X-ray as bilateral peripheral airspace disease. The small particle size rarely results in pulmonary artery filling defects, such as would be expected with thrombotic embolus. A nuclear medicine ventilation and perfusion (VQ) exam will normally show multiple small, peripheral, nonsegmental filling defects on the perfusion component of the exam.7 Acute pneumonitis can progress to acute respiratory distress syndrome and even death. Although treatment guidelines are not well-established for this entity, supportive oxygen therapy and steroids are often employed.

Latent pneumonitis can present similar to acute pneumonitis, but of diminished severity. It is most commonly seen as inflammation localized at the site of prior silicone injection. Direct trauma, such as motorized trauma or fisticuffs, to a previously injected area has been reported to result in latent pneumonitis.8 As silicone is inert, development of latent pneumonitis can be seen indefinitely, so patients should be counseled accordingly.

Silicone-induced mastitis, lymphadenopathy, fibroses, and granulomas can be seen in the chest. Granulomatous hepatitis can also present in an acute or delayed fashion.

The desire for inexpensive cosmetic procedures continues to drive the demand for silicone injection. Free silicone injection, however, is practiced solely on the black market and in foreign countries. Patients with untoward effects present to our medical community in a variety of ways and across many disciplines. Knowledge of the wide range of potential side effects will aid the clinician in further management.

References


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Choosing High-Value Care in the Evaluation and Treatment of Newborns at Risk for Early-Onset Sepsis

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Clinical Scenario

A 38-week gestational age (GA) male infant was born via spontaneous vaginal delivery, with rupture of membranes occurring 10 hours before delivery, to a gravida 1 para 1 (G1P1) mother found to be group B streptococcus (GBS) negative and with negative prenatal serologies. Prior to delivery, the mother of the infant was diagnosed with intra-amniotic infection (previously chorioamnionitis) resulting from maternal fever of 101.5°F, maternal tachycardia, and fetal tachycardia.

The infant’s Apgar score was 8 and 9 at 1 minute and 5 minutes, respectively. The infant was well-appearing and vigorous, and he was placed skin-to-skin with his mother. After a “golden hour,” the infant was transferred to the newborn nursery for further evaluation and care. During this evaluation, the on-call pediatric resident physician performed a physical exam and obtained relevant medical and social history from the mother.

Treatment Options

Option A: The infant is admitted and treated based on the American Academy of Pediatrics (AAP) and the Centers for Disease Control and Prevention (CDC) guidelines for infants born to mothers with intra-amniotic infection (IAI). An intravenous (IV) line is placed while in the nursery, and a complete blood count (CBC) with differential and a blood culture are collected. The infant is then started on empiric antibiotics to prevent early-onset neonatal sepsis, using IV ampicillin and gentamicin. The infant is assessed with vital sign measurements every 4 hours. After 48 hours, his blood culture is negative, and the infant is discharged home.

Option B: The infant is evaluated using the neonatal early-onset sepsis (EOS) calculator based on the Bayesian model for risk stratification of newborns ≥35 weeks GA at risk for EOS. According to the calculator, the risk per 1000 births for EOS in this well-appearing newborn is 0.84. The calculator’s clinical recommendation is to obtain vital signs every 4 hours for 24 hours with no empiric testing or antibiotics unless the infant’s clinical status changes. The infant is managed with routine newborn care and vitals every 4 hours. He is discharged home with his mother after his newborn screening bundle is completed, between 36 hours and 48 hours of life.

Discussion Questions

1. What is the current incidence of neonatal EOS and what are the current recommendations for evaluation and treatment according to 2010 AAP and CDC guidelines?

Answer: Neonatal EOS is defined as blood and/or cerebrospinal fluid culture-proven infection in a newborn less than 7 days old. Current incidence of EOS ranges between 0.5 and 1.2 cases per 1000 live births. Although this incidence represents a threefold to fivefold decrease over the past 20 years, the number of newborns evaluated and empirically treated has remained the same. Based on 2010 guidelines, the percentage of newborns treated with antibiotics is 200-fold higher than the incidence of EOS as all infants born to mothers with IAI are recommended to receive empiric antibiotics.

2. What is the evidence behind the new neonatal EOS calculator?

Answer: In 2013, Escobar et al published results from a 24-year, multi-center retrospective nested case control study (1993–2007). The study examined neonatal sepsis risk at birth based on objective maternal factors, demographics, specific clinical milestones, and vital signs during the first 24 hours of life. Using such data, a risk classification scheme for EOS was developed. The...
CHOOSING CARE FOR NEWBORNS AT RISK FOR SEPSIS

The neonatal EOS calculator takes into account the newborn’s clinical presentation, including vital signs, classifying him or her as well-appearing, equivocal, or clinical illness. Risk of EOS changes based on the clinical classification once initial data has been put into the calculator. As the risk of sepsis increases and the number needed to treat decreases, the calculator will recommend additional interventions such as laboratory work and/or empiric antibiotics.5

Costs*
Option A: $78 for 1 CBC, 1 blood culture, and antibiotics (4 doses of ampicillin and 2 doses of gentamicin for 48-hour sepsis rule-out)
Option B: $0 (no additional charge to routine newborn care)

*Costs were obtained from heathcarebluebook.com.6 These costs are estimates and represent the amount typically charged to the patient for these services.

Teaching Moment
Use of the EOS calculator for infants ≥35 weeks GA born at risk for EOS can help decrease unnecessary laboratory evaluation, invasive procedures (IV placement), and empiric antibiotic use during the neonatal period.

Interventions and Results
Between July 2016–September 2016, 62 infants were born at our institution (Greenville Health System, or GHS) to mothers with a diagnosis of IAI. From these 62 infants, 77 CBCs were collected. All 62 infants underwent blood cultures and received empiric antibiotics. Before any intervention, we performed a retrospective review and applied the EOS calculator to each newborn. The EOS calculator recommended routine care for 56 of the 62 babies (90%), lab work for 4 babies, and empiric antibiotics for 2 babies. Our review also showed all final blood cultures to be negative.

If the neonatal EOS calculator had been used to guide clinical decision making during these 3 months, a total patient savings of $5136 would have resulted. Extrapolating this figure out to a 1-year period, implementation of the EOS calculator has the potential to save over $20 544 a year. Other benefits of the EOS calculator include less pain from blood draws and IV placement, as well as improved antibiotic stewardship in the neonatal period.

On February 13, 2017, the neonatal EOS calculator was officially implemented at The Family Birthplace located at GHS’ Greenville Memorial Hospital. Newborns with risk factors for EOS are identified and include maternal fever (intrapartum temperature ≥100.4°F), prematurity (GA <37 weeks), prolonged rupture of membranes (≥18 hours), or maternal GBS colonization. Using vital signs and clinical status at 2 hours of age, the EOS calculator is used to determine whether empiric antibiotics and/or laboratory evaluation may be recommended. If indicated, the first dose of antibiotics is administered by 6 hours of life.

Data collection is ongoing. As of June 7, 2017, we have experienced a 93% reduction in the use of empiric antibiotics for healthy newborns and a 70% reduction in the amount of unnecessary lab work obtained in infants at risk for EOS. Of the newborns who received routine care, no readmissions for sepsis have occurred within the first 7 days of life. Since implementation of the EOS calculator, 18 babies were able to stay on their private pediatrician’s service rather than be transferred to the newborn hospitalist service.

We will continue to collect data. However, to date, we believe the EOS calculator to be a helpful tool that has enhanced our ability to provide patients with safe, evidence-based, and cost-conscious care.

References
The South Carolina State Board of Medical Examiners (SC Medical Board)—the regulatory agency for physicians in South Carolina (SC)—serves the public by promoting sound and responsible health care by the physicians of SC. Its initial focus was to establish licensing standards, ensure uniformity of medical licensing requirements, and develop disciplinary procedures for physicians practicing in the Palmetto State. Established in 1913, the SC Medical Board has a distinguished history as 1 of the original 22 charter member boards of the Federation of State Medical Boards (FSMB).

During the early part of the 20th century, the FSMB grew to include the medical boards of all 50 states with efforts primarily to improve and standardize medical licensing examinations as well as link medical licensing to medical education requirements. The SC Medical Board not only advanced these initiatives in SC, but also played a prominent role nationally, largely through the efforts of Harold Jervey, MD (Fig. 1). Dr Jervey served for 20 years on the SC Medical Board and as FSMB President in 1960–1961 and Executive Vice President/Secretary from 1978–1984. Throughout the history of the SC Medical Board, numerous other SC physicians have carefully weighed issues pertaining to healthcare delivery and maintained the leadership role of physicians in determining the best courses of action to promote high standards of health care in our state.

The SC Medical Board consists of 10 physician members: 7 from each congressional district and 3 additional members (1 of whom must be a doctor of osteopathic medicine, 1 appointed by the governor, and 1 elected at large). The governor and the General Assembly appoint 3 additional lay members. The SC Code of Laws mandates the board to maintain licensing requirements as well as establish education and practice standards for physicians and other healthcare providers, including respiratory therapists, acupuncturists, physician assistants, and anesthesiology assistants. SC Medical Board functions also include accurately defining healthcare issues to thoughtfully develop positions and guidelines that protect the public as well as ensure that a constructive practice environment for SC physicians is maintained.

This board has an important role in interacting with other regulatory boards in the SC Department of Labor, Licensing, and Regulation. For instance, the SC Medical Board Chairman serves as a liaison to the State Board of Nursing as an advisory, nonvoting member. The SC Medical Board has an important advisory role and publishes opinions and position statements at the request of the SC State Government as well as for

Spotlight on Dr Stephen Gardner and the South Carolina State Board of Medical Examiners

Timothy P. McHenry, MD

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Figure 1

Figure 2

Photo of Dr Harold Jervey. Reprinted with permission from the Federation of State Medical Boards.¹

Photo of Dr Stephen Gardner.
other organizations that employ healthcare practitioners with regard to healthcare procedures and policies based on current statutes.3

Stephen Gardner, MD

For 15 years, Dr Stephen Gardner (Fig. 2) has carried on the tradition of physician service in the community as the SC Medical Board representative for the Fourth Congressional District. For the last 4 years, he has been Chairman of the SC Medical Board while continuing a busy neurosurgical practice at Southeastern Neurosurgical & Spine Institute, part of Greenville Health System. He travels to the state capitol in Columbia regularly, usually monthly, to attend SC Medical Board meetings, and he performs SC Medical Board functions in the Upstate throughout the week.

Many of the overall accomplishments of the SC Medical Board during his tenure have been to improve the licensing and administrative processes of the board, develop policies and regulations to provide guidance to healthcare providers during the ever-changing medical practice environment, and integrate SC Medical Board efforts with the State Board of Nursing. He has also taken a keen interest in physician assistant affairs, serving as ex-officio on the Physician Assistant Committee and working extensively in developing and defining physician assistant scope of practice guidelines as well as advocating for physician assistants at SC Medical Board proceedings.

SC Medical Board accomplishments during Dr Gardner’s tenure have been to improve the medical practice environment through increasing accessibility to care for South Carolinians through both the Physician Assistants Practice Act and the Telemedicine Act, to combat the opioid epidemic by supporting the SC Department of Health and Environmental Control (SCDHEC) enforcement of a prescription drug monitoring program, and to implement Centers for Disease Control and Prevention (CDC) guidelines for controlled substance prescribing. The board has also promoted the availability and use of naloxone, enabling first responders (including family members) to save lives by the timely treatment of opioid overdoses. In addition to the integral role Dr Gardner has played in these initiatives, for many years he personally interviewed all newly licensed physicians in the fourth district, putting faces to names and educating SC physicians about board functions and processes. More recently, he was instrumental in transitioning the personal interview to a new physician informative process that includes both a written introduction from the SC Medical Board and the assignment of a physician mentor to ensure more comprehensive and consistent information as well as to provide an avenue for sustained personal guidance for new physicians.

Tort Reform

An early accomplishment during Dr Gardner’s tenure was medical tort reform that was initiated and championed by the SC Medical Association, with input from the SC Medical Board. The result was the South Carolina Noneconomic Damage Awards Act of 2005. This act limits civil liability for noneconomic damages for individual healthcare providers and for healthcare institutions to $350 000. It also removes physicians who provide care “in a genuine emergency situation involving an immediate threat of death or serious bodily injury to the patient receiving care in an emergency department or in an obstetrical or surgical suite”3 from civil liability except in cases of gross negligence.4 South Carolina was one of the first states to enact medical tort reform, and the stable medical legal environment that it created was a primary factor in the recognition of SC as one of the best states for physicians to practice in the United States (US)—18th overall in 2017.5 Another effect of tort reform was the shift of some of the responsibility for maintaining high standards of care and ensuring patient safety from the legal system to the regulatory and disciplinary functions of the SC Medical Board.

Physician Assistants Practice Act

Accessibility to health care continues to be a significant concern in SC; the SC Medical Board has been very active in addressing this issue through both the Physician Assistants Practice Act and the Telemedicine Act. The 2013 Amended Physician Assistants Practice Act created independent processes for physician assistant (PA) licensure and subsequent entrance into clinical practice, standardizing the process to include the requirements of a supervising physician with an active, unrestricted permanent SC medical license; a specific practice site; SC Medical Board approval of a proposed scope of practice; and adherence to prescribing standards. If additional scope of practice requirements are needed to “meet the needs of the physician’s practice,” the act also provided for the supervising physician to request board approval for an education and training plan to expand the physician assistant’s scope of practice.6

The process for expanding the PA’s scope of practice can start at any time, including during the initial period of limited licensure. The amended act maintains the requirement of the supervis-
ing physician being physically present on the
premises during the period of limited licensure. However, once the PA is fully licensed, this act
no longer requires the supervising physician
or alternate supervising physician to be present
75% of the time each month with no more than
7 consecutive days each month in the absence
of the supervising physician or alternate supervi-
sing physician. The amended act also increases
the number of PAs that a physician can supervise
from 2 to 3 full-time equivalents.

The Physician Assistants Practice Act encour-
ages healthcare providers to function at the top
of their licensure, increasing the level of health
care administered by a team of physician-led
providers. It also separates licensure from a spe-
cific practice environment, thereby increasing PA
portability and, in conjunction with telemedicine
and mobile outreach programs, encouraging the
expansion of healthcare services into previously
underserved areas.

**Telemedicine Act**

The South Carolina Telemedicine Act defines
*telemedicine* as the “establishment of a physician-
patient relationship via electronic communication
or information technology between a physician
licensed to practice medicine in SC and a patient at
another location.” The act stipulates that standard
care is the same as for traditional in-person
medical care specific to the physician’s specialty
area. It also includes generating and maintaining
appropriate medical records along with comply-
ing with applicable laws and regulations, such as
the Health Insurance Portability and Account-
ability Act and the Health Information Technol-
ogy for Economic and Clinical Health Act.

The Telemedicine Act allows remote prescribing
except when an in-person physician examination
is necessary to establish a diagnosis. It prohibits
the prescription of Schedule II, Schedule III, and
lifestyle medications such as erectile dysfunction
drugs unless specifically authorized by the SC
Medical Board. The remote prescription of abor-
tion-inducing drugs for terminating pregnancy is
prohibited as well.

This act promotes complete and comprehensive
medical care by specifying the requirements of
physicians to obtain and document appropriate
history and physical findings, establish diagnoses,
and discuss the risks and benefits of treatment
options. It also requires establishing an appro-
riate follow-up care plan to include discussing the
value of having a primary care medical home. A
goal of the Telemedicine Act was to establish vir-
tual practice medical standards allowing off-site,
in-home, and school-based medical consultation
to treat a spectrum of care, including prevent-
ive, nonemergent episodic care, and to manage
chronic illnesses in patients with an established
patient-physician relationship in a medical system.
It also promotes the delivery of care for non-emer-
gent conditions in settings other than emergency
departments, especially for low-income patients
and patients without transportation.

**Prescription Opioid Misuse**

Narcotic abuse is increasingly recognized as
a significant public health problem in SC and
throughout the US, with President Trump
recently declaring such abuse a “national emer-
gency.” In addition to the health risks to the
individual—including hepatitis, human immu-
nodeficiency virus, and liver failure—societal
consequences of narcotic abuse are profound
and include family dysfunction, loss of work produc-
tivity, and strains on the criminal justice and
healthcare systems.

Prescription opioid misuse is an important
aspect of narcotic abuse with the initial misuse
of prescription opioids being a precursor to sub-
sequent illicit narcotic abuse. Prescription opi-
oid misuse is particularly evident in the Upstate
of South Carolina. Six of the 10 SC counties with
the highest rate of drug overdose deaths are in
the Upstate, including Greenville County with
a 2016 drug overdose mortality rate of 16 per
100 000 people compared with the state average
of 13 per 100 000 people. In absolute numbers,
Greenville County had the third-highest number
of opioid-related overdose deaths in 2016 (Fig. 3).

Over 50% of all prescription drug misuse involves
the diversion of medications that are given,
bought, or stolen from friends or family, indicat-
ing the significant role that healthcare providers
can play in addressing the problem by responsi-
bly prescribing narcotic pain medications, iden-
tifying opioid misuse, and promoting treatment
strategies that address abuse when it does exist.

In 2009, the SC Medical Board—recognizing the
need for greater consistency and safety in the
prescription of controlled substances—published
“South Carolina Pain Management Guidelines.”
In November 2014, these guidelines were revised
and issued, in conjunction with the Dental Board
and Nursing Board, as the “South Carolina Joint
Revised Pain Management Guidelines.” These
detailed guidelines address the treatment of both
chronic and acute pain, including the consider-
ation of alternative treatments to opioid therapy,
initiation of opioid treatment, and discontinuation of opioid treatment.

Routine use of the prescription drug monitoring program developed by SCDHEC, the South Carolina Reporting and Identification Prescription Tracking System (SCRIPTS), was also endorsed by the guidelines.13 The development of SCRIPTS has had a significant impact on the state's healthcare providers and, starting in 2016, several health insurance providers (including South Carolina Medicaid insurers and the SC Public Employee Benefit Authority, the state employee health insurance plan) began requiring healthcare providers to review a patient's controlled substance prescription history before prescribing Schedule II controlled substances.

In 2017, the SC General Assembly passed legislation (H.3824) broadening the mandate for more responsible opioid prescribing, requiring that healthcare providers assess and document their review of SCRIPTS before issuing a prescription for Schedule II controlled substances. Exceptions include the following:

- A prescription that does not exceed 5 days;
- A prescription to treat a hospice-certified patient;
- A prescription for a patient with whom the provider has an established relationship for a chronic condition with the requirement that SCRIPTS is reviewed at least every 3 months;
- Approval of the administration of a controlled substance by a provider licensed in SC;
- A prescription for an inpatient at a skilled nursing facility, nursing home, community residential care facility, or assisted living facility that has controlled substances stored and dispensed at the facility;
- A practitioner is temporarily unable to access SCRIPTS because of “exigent” circumstances and documents the circumstances as well as the potential adverse impact to the patient if the prescription is not dispensed.14

SCRIPTS is currently linked to 24 states with expansion planned, likely nationwide, in the future. While it is too early to determine the full impact of the SCRIPTS program on the rate of prescription drug misuse in SC, other states with

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**Figure 3**

South Carolina opioid-related deaths by county. Reprinted with permission from the South Carolina Department of Health and Environment Control.17

**Number of deaths due to opioid overdose by county of occurrence, 2016**

- **0-1**
- **2-4**
- **5-20**
- **21-101**

**Bold number:** Number of deaths due to opioid overdose by county of occurrence, 2016

**Notes**

Breaks on map are by quartile.

Source: Division of Biostatistics, PHS, DHEC

Created 08/22/17
longer duration prescription drug monitoring programs have reported modest decreases in opioid prescribing and use.\textsuperscript{15}

\textbf{Naloxone Training for Law Enforcement Officers}

Another initiative that the SC Medical Board played a significant role in enacting is the Law Enforcement Officers Naloxone (LEON) Program, which provides comprehensive training to SC law enforcement agencies in identifying, treating, and reporting opioid overdoses. The “South Carolina Joint Revised Pain Management Guidelines” recognized the role of naloxone in preventing overdose deaths in patients who are prescribed high-dose opioids (greater than 80 mg morphine equivalent dose) or are at increased risk because of other factors.

In 2015, following the release of the guidelines, the SC General Assembly passed the SC Overdose Prevention Act, which enacted the LEON Program and empowered first responders to administer naloxone. Subsequently, the SC Medical Board, in a joint effort with the Board of Pharmacy, developed a protocol that was the basis for a 2016 amendment to the Overdose Prevention Act. The amendment allows pharmacists to dispense naloxone without a prescription. The combination of these efforts has resulted in the availability and administration of life-saving naloxone throughout SC (Fig. 4).\textsuperscript{16}

\textbf{Future Directions}

The SC Medical Board remains committed to addressing the problem of opioid abuse through multiple initiatives. Promoting physician awareness of safe prescribing habits will be essential for turning the tide against opioid abuse in SC, and there is a significant role for implementing additional prescription guidelines, according to CDC guidelines for best practices, as they are determined in the future.

Another resource to improve safe prescribing is SCRIPTS report cards, which make available updated performance feedback directly to providers. The adoption of e-prescribing to eliminate the use of paper prescriptions, an initiative that will likely be mandated by the Drug Enforcement Agency, promotes prescription authenticity and decreases the risk of prescription diversion. Cur-
References


Acknowledgments

The author thanks Dr Stephen Gardner and Mr Sheridon Spoon, Administrator, State Board of Medical Examiners of South Carolina, for their guidance and assistance in providing pertinent information and direction for this article.

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Burnout as a pervasive problem among healthcare providers has been well documented and described in myriad sources. As such, the primary objective of this article is to share a framework I use to organize various interventions shown to prevent burnout and build resilience for the individual healthcare provider.

The potential value of a framework is to organize pieces of information into a coherent package, allowing the various pieces to be more readily understood, remembered, and applied. In working with individuals and groups around burnout remediation and prevention, that is precisely how I have used the framework myself—as a means to organize the various strategies and practices from numerous sources in a way that facilitates remembering and communicating them. As a context for using the framework, it is important to first clarify the primary terms.

What Are Burnout and Resilience?

**Burnout** is typically used to refer to a defined constellation of signs and symptoms of a state of personal and professional impairment believed to result from prolonged periods of stress. The first important distinction is between job stress and burnout, the former being a necessary but not sufficient ingredient for the latter. That is, discrete episodes of stress are, well, stressful, but as long as those episodes are the exception rather than the norm—and we have the environmental and internal resources to cope with the stress—burnout is unlikely. It is when the stressful episodes are subjectively experienced as the norm, and we lack the support and resources to effectively cope, that the cumulative effect may be burnout.

The most widely used measure of healthcare provider burnout is the Maslach Burnout Inventory, a self-report scale by which the respondent rates how often he or she experiences problems in 3 areas: emotional exhaustion, depersonalization, and personal achievement. Emotional exhaustion includes feeling overwhelmed, drained, and frustrated. Depersonalization refers to a relatively uncaring or calloused attitude toward patients or those served. The personal achievement dimension to burnout reflects feeling relatively effective and relaxed in providing care. Burnout is characterized by relatively high levels of exhaustion and depersonalization and a relatively low level of achievement.

The description of burnout may sound similar to depression; indeed, the overlap may make distinguishing between them difficult, especially at the more extreme levels of burnout. At that point, labeling the experience one or the other may not matter, as treatment is a priority over diagnostic terminology. Shy of that more extreme point, however, a distinguishing factor may be the extent to which the negative feelings, attitudes, and perceptions are associated specifically with work. Although burnout can negatively impact aspects of life away from work, to the extent that work is experienced as “the problem,” it is more likely the individual is experiencing burnout rather than more generalized depression.

Whereas burnout is used to encapsulate the cumulative effects of chronic stress at work, the term resilience refers to the ability to effectively cope with stress, “bounce back” from adversity, and ward off the accumulation of toxic residue from frustrating experiences. In working with individuals and groups of healthcare providers, I tend to use the pair of terms to refer to ends of a single continuum, as the goal is to build resilience as a means of avoiding the opposite end of the continuum.

Fortunately, in support of the continuum metaphor, the strategies and practices shown to address burnout are the same or very similar to those shown to bolster resilience. Accordingly, consider the words “battling burnout” and “building resilience” as interchangeable throughout the rest of this article.
A Framework for Organizing Strategies and Practices for Battling Burnout and Building Resilience

Those who research and write about the prevention and remediation of burnout frequently emphasize that the phenomenon is multifactorial. That is, there is no sole cause or remedy. Instead, a set of conditions seems to make burnout more likely, and those conditions involve both environmental factors and individual or personal factors. Effectively addressing burnout, then, involves a multi-pronged approach in both domains (the setting and the individual).

Much of the published literature has focused on strategies and practices for the individual healthcare provider. Although this focus was undoubtedly meant to be helpful, especially because the individual reader has the most control over his or her own behavior and daily practices, a risk is the implication that burnout results from the failure of the individual to be able to “cut it” at work.

More recently, leaders in the domain of healthcare provider burnout have emphasized that, if we are collectively serious about addressing the burnout crisis, environmental factors must be a focus. These factors involve healthcare burdens at the national and systems levels, including incentive structures, governmental and other regulations, as well as burdens at the institutional level, such as amount of administrative support, scheduling, and workplace wellness initiatives.

The remainder of this article is focused on the strategies and practices for individual healthcare providers that have supporting evidence for their efficacy in battling burnout and building resilience. In gathering these strategies and practices from the published literature on burnout and resilience, as well as standard practices in clinical and counseling psychology, they seemed to fall into 5 general domains: Mindfulness Practices, Self-Awareness, Self-Management and Lifestyle, Purpose and Perspective, and Interpersonal Relationship Management.

Mindfulness Practices

A classic definition of mindfulness is “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experiences moment by moment.” Each component of this definition is important for a full understanding of mindfulness as a practice. For example, note an 1) intentional focus of one’s attention on the present experience and 2) awareness that is open to the experience rather than allowing it to be the stimulus for a runaway train of thoughts that distances us from the immediate experience.

Sometimes, the basic components of mindfulness are referred to as intention, attention, and attitude. Here, the intention applies not only to one’s focus of attention but also to one’s attitude. Rather than running each moment of experience through a cognitive filter to assign a label such as “good/bad,” “right/wrong,” or even “plant/animal,” the intentional attitude is acceptance. That’s not to say that all experiences are equally desirable or that we should be passive, yielding to what happens and not trying diligently to change it. Instead, it’s an acceptance of the reality of the experience, without layering on unnecessary meaning or distraction. It’s a full appreciation for what is happening, seeing it clearly for what it is and is not.

The intentional practice of mindfulness is a skill; like any skill, it is difficult at first but becomes easier as we continue to practice and become more skillful. Why would anyone decide to invest the effort to become more skilled at mindfulness? The most obvious answer is because the benefits are numerous, including decreased stress, improved concentration and memory, and more satisfying interpersonal relationships.

The connection between mindfulness and stress may not be obvious. Consider the sources of stress: Many assume that they are environmental; things happen to us that are inherently stressful. If that is the entire story, how is it that people can have virtually identical experiences with regard to the objective conditions they face, yet experience markedly different degrees of stress? Similarly, why is it that we may experience very similar “happenings” at 2 points in time rather differently with regard to the levels of stress they seem to induce?

Most often, the stress we experience results from the meaning(s) we ascribe to the situation, including the things we say to ourselves, consciously or barely so. For example, if I have a difficult task to complete under a challenging deadline, a way to heighten my stress would be to focus on all the consequences of failing. I could blend in thoughts about how unfair the situation is and mix in a bit of focus on times in the past that I have been similarly stressed and/or failed. Those additional thoughts and their meanings do not objectively alter the current circumstances, but they likely induce more stress and distract from productively focusing on the task at hand (which
Mindfulness means focusing on unfolding reality, rather than thoughts about the past, present, or future.

How do we practice mindfulness? A useful analogy is to building muscle. There is no one way, but the myriad ways share the requirement that the muscle is used and even challenged to work a bit harder than the norm. With mindfulness, the possible moments for practice begin upon awakening and end upon falling asleep. The trick is to select some of those moments for intentionally working the muscle that is mindfulness.

Some people designate particular moments to engage in a formal meditation practice, and many possibilities exist as described in numerous written sources, instructional videos, and audio-guided activities. Another set of options involves selecting particular recurring activities as ones in which you will simultaneously practice mindfulness. For example, brushing your teeth, commuting, and walking between rooms or buildings can all be set times for focusing only on your immediate experience. Within seconds, a thought will pop up. Practice letting it go and returning to simply observing your sensory experience. You might focus on what you see, or your bodily sensations, or even switch back and forth, but simply observe without thought.

Note that living more mindfully is not synonymous with having no thoughts and passively observing life. The point is to become stronger in our control over our own focus, thereby turning off the intrusive thoughts that distract us from the task or experience at hand that can cause stress. Remember, situations are not stressful; they just “are.” Stress results from what the situation means to us—what we tell ourselves about it and while experiencing it.

Self-Awareness

The heart of resilience is self-awareness. Why? Knowledge of our own strengths and weaknesses, habitual tendencies, and psychological sore spots better enables us to adapt accordingly. Unfortunately, such self-awareness is not an inevitable fruit of experience, but requires examination and reflection. Self-awareness may seem more natural, or at least more likely, for some people compared to others, but as with any skill, it can be cultivated.

There is no single or best method for growing in self-awareness, but being intentional seems important. Taking the necessary time to examine and reflect on our own behavior, reactions, and possible causes of both is a likely prerequisite for growth. Being intentional can be performed alone—inside one’s own head or through writing—or with someone else, such as a friend, loved one, counselor, or coach. Friends and loved ones offer the benefit of a perspective from perhaps seeing aspects of you that may be unknown to yourself, whereas counselors and coaches offer the benefit of professional training and more objectivity.

One means for promoting self-awareness is to explore personality types as they apply to your sense of self. Of course, personality types are simply constructs—artificial labels and corresponding descriptions. The purpose of considering personality types is not to discover some previously unseen “truth,” but rather for use as a structured prompt to engage in self-examination. Through a set of personality types or styles you can ask, “To what extent do I think each describes me? Why? How do my personality traits affect my experiences at work (therefore, my stress and risk for burnout)?”

Self-Management and Lifestyle

A traditional, common-sense approach to battling burnout is to promote self-care, such as healthy diet, adequate sleep, regular physical activity, and recreation. We all know these things to be important, if not vital, for our resilience to stress, so why don’t we live accordingly? One part of the answer is less-than-ideal self-management. These healthy lifestyle behaviors are not ones we are forced to perform, nor do they happen naturally or easily with busy schedules, so it is left up to us individually to carry them out.

Our caretakers had control over our rewards and punishments when we were children, so they influenced our behavior greatly. As adults, it is up to us to control our own rewards and punishments. Technically, we already do—we decide whether to allow or deprive ourselves of things we want or make ourselves do things we do not want to do. The point here, however, is to wield the control we have over administering our own rewards and punishments to produce the outcomes we desire.

What does this process mean for managing your own health behaviors? You know best what is reinforcing (rewarding) and punishing for you, so an honest assessment provides a menu of possible levers prompting you to engage in health behaviors you would not perform otherwise. Of course, rewards and punishments only work when applied consistently; because adults are charged with self-administration, that’s where the process typically breaks down.
The first step is to select a specific, measurable behavior to reinforce, being realistic and realizing that the desired behavior can/should be shaped over time toward the ultimate goals. For example, if you currently do not engage in intentional exercise, making an agreement with yourself to engage in vigorous exercise at a gym for at least 1 hour 3 times weekly seems unrealistic. That goal may be an ultimate desire, but perhaps at first the behavior to perform to earn the specified reward is to walk for at least 20 minutes a week. After this behavior is well established, the criterion for reward may be bumped up to the next realistic level.

Note that the behaviors mentioned above are fairly concrete (although they could be specified further). It’s not good practice to set goals such as “exercise” or “exercise more,” as both of these are too ambiguous to indicate whether the reward has been earned. Similarly, “eating healthy” or “losing weight” are not appropriately specified (the first being too ambiguous, the second an outcome rather than a behavior).

With regard to rewards and punishments, it is important to ensure that each is realistic, sufficiently strong to motivate your behavior, and upheld rigorously. When people first think of rewards and punishments for a new behavior plan, they frequently imagine options that are new or “extra” to their current lives (eg, “get to buy new clothes” or “have to donate cash to a despised organization”). These options may work fine, but we already have numerous alternatives for rewards built into our everyday routines. Think of those things you experience on a regular basis that you enjoy or look forward to: a favorite television program, reading or being on the internet, dining out, an evening snack. These options are all viable, as long as you only allow yourself the reward when you completed that day’s desirable behavior.

In addition to explicit rewards and punishments for specific behaviors, you can frequently alter the environment to make particular behaviors more likely. For example, having workout clothes present on the front seat of your vehicle makes it more difficult to “forget” that the daily goal was a session at the gym. Not having unhealthy foods in the house makes it more likely that you’ll eat a healthier diet.

When it comes to sleep, special considerations come to mind. First, the importance of quality sleep for mental health cannot be overstated. Indeed, one scientific review of the research literature was titled “Overnight Therapy? The Role of Sleep in Emotional Brain Processing” because of the conclusion that adequate sleep is necessary for brain functioning required to modulate emotions. There is much easy-to-find information regarding good “sleep hygiene” to ensure healthy sleep quality (rather than simply quantity).

Purpose and Perspective
As a whole, humans have the need for purpose and meaning in our lives and our work. That is, inherent in the experience of satisfying and sustainable work is a sense that what we do is purposeful, necessary, and efficacious. To the extent that we perceive our work as entailing lots of unnecessary “busy work” (typically administrative procedures or paperwork), we are more vulnerable to burnout. Similarly, the degree to which we feel ineffective or thwarted in our work means the paycheck alone cannot insulate us from burnout.

Beyond a need for purpose and meaning, human nature offers a wonderfully adaptive tendency that has the unfortunate side effect of facilitating burnout when we experience periods of stress. This adaptive tendency is habituation, or the tendency to grow accustomed to conditions that become the status quo. Habituation allows us to not be distracted by minor nuisances such as constant sounds, sights, or sensations, such as the stimulation of our clothing touching our skin. Without habituation, we would be constantly distracted by sensory experiences that would be more productive to ignore. That’s all good, but habituation applies to pleasant experiences as well, so the little pleasantries of life that are fairly consistent tend to fade into the background of our daily existence.

Returning to the example of our clothing, when do we notice the sensation against our skin? When something is annoying, such as a tight binding or a pricking from a tag. Our perceptual systems are primed to be sensitive to negative changes in our experience, while neutral and pleasant aspects pale in their ability to capture our attention. What does this point have to do with burnout and resilience? Under periods of stress, when there are numerous negative aspects of our experience, and new ones of various degrees sprouting up, it feels as though the ratio of negative to positive aspects of life is even worse than it is.

Intellectual knowledge of habituation and its potential role in burnout does little to prevent the problem. Instead, we need to consciously drag our attention toward positive facets of life, consistently and repeatedly, and especially during periods of stress. Because doing so does not come
naturally, no matter how appreciative we consider ourselves to be in general, it is important to develop some sort of regular gratitude or appreciation practice as part of our normal routine.

**Interpersonal Relationship Management**

It is the extremely rare job that does not involve working with and/or for people. So, the people with and for whom we work can be a tremendous source of stress as well as a great source of support. Given our human nature, we likely view the effect of other people on our stress level and job satisfaction as something determined by other peoples’ behavior (and whether they are “nice” people). This pillar of resilience, however, is predicated on the assumption that the ability to manage interpersonal relationships is a skill that can be developed, and doing so results in numerous benefits.

Of course, numerous aspects of interpersonal relationships are implicated in our experience of burnout versus resilience, such as the ability to establish and sustain supportive connections with others, request and receive assistance, and minimize interpersonal conflict (or at least unproductive effects of conflict). Each of these more general abilities consists of sets of more specific skills, including the ability to empathize, express appreciation and disappointment, provide and receive feedback, and address sensitive issues in healthy and productive ways.

As with each of the other domains, there is no single or best way to develop skills in this arena. However, a synergistic nature exists between them. That is, becoming more skillful at mindfulness, self-awareness, and so forth, facilitates development of skills in managing relationships with others.

**Conclusion**

Both burnout and resilience are multi-factorial phenomena, with numerous strategies to address them. The purpose of this article was to provide a 5-domain model for considering what individual healthcare providers might consider for personal practices to battle burnout and build resilience. Each domain is broad and entails numerous possible skills that can be developed along the continua from relatively “less” to “more.”

**References**

The benefits of exercise include several physical and psychological health effects. Physically active individuals live longer and have a lower incidence of heart disease, stroke, diabetes, depression, and several cancers. Despite widespread knowledge of these benefits, many people in the United States (US) are not physically active. The rates of physical inactivity also follow regional, racial, and socioeconomic status. For example, people living in Southern states are less likely to be physically active compared to other regions of the country; Caucasians are more likely to be physically active compared to African Americans or Hispanics; and adults with more education are more likely to be physically active compared to those with less education.
In addition to physical inactivity, unhealthy eating habits play a vital role in the obesity epidemic. According to the Centers for Disease Control and Prevention (CDC), approximately 38% of US adults consume less than 1 serving of fruit per day and 22% consume less than 1 vegetable per day. Often, this consumption is tied to low socioeconomic status. The combination of physical inactivity and unhealthy eating contributes to the alarming statistic that more than 1 out of 3 Americans are classified as obese.

The disturbing rates of physical inactivity and unhealthy nutritional intake are occurring at a time when the US is attempting to make the transition from fee-for-service to value-based health care that emphasizes quality, cost effectiveness, and preventive services. Population initiatives aimed at increasing levels of physical activity and improving dietary habits have the potential to drastically enhance public health by reducing the burden of chronic disease.

Measuring, monitoring, and starting conversations regarding physical activity and diet can be challenging in the clinical setting. Cumbersome and detailed objective assessments have become more prevalent and can be inaccurate. However, limitations exist regarding cost and feasibility on a large scale and in widespread use in the clinical setting.

Use of an exercise vital sign has been proposed in the healthcare setting with 2 questions aimed at understanding frequency (days per week) and duration (minutes per day) of exercise. Only 2 studies have assessed the use of a physical activity vital sign in clinical practice. Nevertheless, the use of this type of vital sign has been recommended by groups such as the American Heart Association in consensus documents. A shortcoming of this vital sign is the inability to assess diet, which is a major risk factor for chronic conditions such as cardiometabolic disease. The purpose of this investigation was to determine whether 2 questions—one aimed at physical activity and another directed toward diet—could be used to detect patients at higher risk of cardiometabolic disease based on associations with clinical biomarkers.

Methods
Greenville Health System (GHS) is a private not-for-profit academic healthcare delivery system in Greenville, South Carolina, with approximately 15 000 employees. From October 1, 2014–September 30, 2015, employees (physicians, administrators, janitors, restaurant workers, researchers, faculty, nurses, front desk workers, social workers, pharmacists, therapists, etc.) and spouses within GHS were offered a clinical health risk assessment for cardiometabolic disease. This health risk assessment included body mass index (BMI), blood pressure (systolic and diastolic), low-density lipoprotein (LDL), and hemoglobin A1c (A1c).

Before the assessment, individuals electronically completed single-question items about their levels of physical activity (Do you exercise for a minimum of 30 minutes at a moderate intensity at least 3 days a week? Yes/No) and nutritional intake (Do you eat at least 5 servings of fruit and vegetables every day? Yes/No). Studies have demonstrated clinical benefits may be greatest when individuals increase physical activity levels from 0 to 90 minutes per week, which is the reason this threshold was chosen. Five servings of fruits and vegetables were chosen based on studies demonstrating cardiovascular benefits at this threshold. Participants who did not have complete data during the 1-year study period were excluded.

Differences in the proportions of the population who met levels of physical activity and nutritional intake thresholds were analyzed across demographic variables (ethnicity, gender, age, ZIP code, job title) using Chi-square tests with Holm-Bonferroni post-hoc pairwise comparisons. Differences in continuous clinical variables, A1c, LDL, BMI, and blood pressure between those who met thresholds for physical activity and nutritional intake versus those who did not were analyzed using student’s t-tests. Multiple linear regressions were run to analyze associations among demographic variables as well as reported exercise and fruit/vegetable intake on each biomarker. A P value < .05 was considered statistically significant. All analyses were carried out using R statistical software (R Development Core Team 2008. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria).

Geomaps were created using Environmental Systems Research Institute software (ESRI 2016. ArcGIS Desktop: Version 10.4.1. Redlands, CA: Environmental Systems Research Institute) to depict a visual representation of the proportions of the population meeting physical activity and nutritional intake thresholds.

The study was approved by the Human Subjects Division of the Institutional Review Board within GHS.
Results

Data from 9708 individuals (78.3% employees, 62.1% women, 67.9% Caucasian, 8.0% physicians, average age 45.8 years ± 12.0) were recorded with the average BMI being borderline obese (29.6 kg/m²); the average systolic blood pressure was recorded within the range for prehypertension (121.8 mmHg). Approximately 55.0% of participants stated that they exercised at least 3 times per week for 30 minutes; 59.6% reported daily intake of at least 5 servings of fruits and vegetables. More data regarding demographics, cardiometabolic disease biomarkers, physical activity, and diet are presented in Table 1.

Analyses of exercise and diet as a function of demographic factors are presented in Table 2. Physicians were significantly more likely to report regular exercise than employees from other occupational categories, except administrative/executive employees where there was no difference. Physicians were also more likely to eat at least 5 serving of fruits and vegetables daily than were other occupations. Those younger than 35 years old were more likely to report regular exercise compared to subjects older than 35 years. Compared to women, men were more likely to report meeting minimum exercise standards (58.8% vs. 53.4%, \( P < .05 \)) and fruit and vegetable consumption (62.2% vs. 59.6%, \( P < .05 \)). Caucasians were more likely to exercise regularly (56.1% vs. 51.2%, \( P < .05 \)) and eat fruits and vegetables (61.4% vs. 52.3%, \( P < .05 \)) compared to African Americans. No significant difference existed in reported rates of physical activity and dietary intake between employees and spouses.

Geomaps using ZIP codes in South Carolina were created to examine levels of physical activity (Fig. 1) and reported daily consumption of fruits and vegetables (Fig. 2) by socioeconomic and geographic factors. Greenville represents one of the more affluent residential areas with over 75% of respondents from this ZIP code meeting exercise and dietary thresholds. The majority of ZIP codes demonstrated that less than 50% of the people living in that ZIP code did not exercise 3 times per week for at least 30 minutes or eat at least 5 servings of fruits and vegetables daily. ZIP codes that commonly reported not meeting the physical activity threshold were largely the same ones reporting an inability to eat 5 servings of fruits and vegetables daily. These ZIP codes represented regions with lower socioeconomic status.

Relationships between the cardiometabolic disease biomarkers and exercise and diet are pre-

### Table 1

<table>
<thead>
<tr>
<th>Number of Participants</th>
<th>9708</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity, %</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>67.9</td>
</tr>
<tr>
<td>African American</td>
<td>9.8</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.1</td>
</tr>
<tr>
<td>Asian</td>
<td>1.6</td>
</tr>
<tr>
<td>Other</td>
<td>0.3</td>
</tr>
<tr>
<td>Missing</td>
<td>18.2</td>
</tr>
<tr>
<td>Gender, %</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>26.3</td>
</tr>
<tr>
<td>Females</td>
<td>62.1</td>
</tr>
<tr>
<td>Missing</td>
<td>11.6</td>
</tr>
<tr>
<td>Age (years), mean ± SD</td>
<td>45.8 ± 12.0</td>
</tr>
<tr>
<td>Health system status, %</td>
<td></td>
</tr>
<tr>
<td>Employee</td>
<td>78.3</td>
</tr>
<tr>
<td>Spouse</td>
<td>21.7</td>
</tr>
<tr>
<td>Occupation (employees only), %</td>
<td></td>
</tr>
<tr>
<td>Physician</td>
<td>8.0</td>
</tr>
<tr>
<td>Nurse</td>
<td>21.1</td>
</tr>
<tr>
<td>Other clinical</td>
<td>20.5</td>
</tr>
<tr>
<td>Other nonclinical</td>
<td>21.3</td>
</tr>
<tr>
<td>Administrative/Executive</td>
<td>3.3</td>
</tr>
<tr>
<td>A1c, mean ± SD</td>
<td>5.5 ± 0.8</td>
</tr>
<tr>
<td>LDL, mean ± SD</td>
<td>112.2 ± 31.7</td>
</tr>
<tr>
<td>BMI, mean ± SD</td>
<td>29.6 ± 7.1</td>
</tr>
<tr>
<td>Systolic pressure (mmHg), mean ± SD</td>
<td>121.8 ± 13.7</td>
</tr>
<tr>
<td>Diastolic pressure (mmHg), mean ± SD</td>
<td>76.1 ± 9.2</td>
</tr>
<tr>
<td>Exercise regularly (≥90mins a week), %</td>
<td>55.0</td>
</tr>
<tr>
<td>Daily intake of fruits and vegetables, %</td>
<td>59.6</td>
</tr>
<tr>
<td>SD, standard deviation; A1c, hemoglobin A1c; LDL, low-density lipoprotein; BMI, body mass index</td>
<td></td>
</tr>
</tbody>
</table>
employees and spouses who reported exercising at least 3 times per week for 30 minutes were found to have significantly lower BMI, systolic and diastolic blood pressures, and hemoglobin A1c levels. Similarly, those who reported eating at least 5 servings of fruits/vegetables daily had statistically significant lower BMI and systolic and diastolic blood pressures. Increased levels of physical activity and healthier diets were not associated with significant differences in LDL levels. Participants who did not meet minimum standards for exercise or a healthy diet were more likely to be categorized as obese.

To examine the independent relationships between the variables (demographics, exercise, and diet) on each of the cardiometabolic disease biomarkers, a series of multiple regression analyses were performed (Table 4). This analysis contained only those cases for which data existed on all included variables; as a result, spouses were excluded. The values in each column of Table 4 represent the degree of change in the cardiometabolic disease biomarker associated with that variable while simultaneously controlling for the effects of other variables within the analysis. For ethnicity, the variables African American and Other are each in comparison to Caucasians, Non-Hispanic. For each of the occupational variables, the comparison is to physicians. For example, with regard to BMI, African Americans had values more than 3 points higher than Caucasians, Non-Hispanics. In contrast, exercise was associated with a reduction of nearly 3 points in BMI from the reference value, even after statistically controlling for age, race, sex, occupation, and diet. Across analyses, exercise demonstrated statistically significant relationships with BMI, A1c, and systolic and diastolic pressure, whereas diet demonstrated statistically significant relationships with BMI and systolic and diastolic blood pressure. In all such instances, the independent effects of exercise exceeded those of diet.

**Discussion**

Cardiometabolic disease is the leading cause of death worldwide. Classic risk factors include hyperglycemia, hyperlipidemia, hypertension, and obesity, which can ultimately lead to insulin resistance. Clinical tools that can delineate who may be at increased risk for developing these disorders can be powerful, especially if they are inexpensive, easy to administer, and can be added to an electronic medical record without difficulty. Most clinical practices do not ask patients about levels of physical activity or explicit details about

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**Table 2**

Exercise and diet as a function of demographic factors.

<table>
<thead>
<tr>
<th>Gender, (%)</th>
<th>Exercise at Least 3 Times a Week for 30 Minutes</th>
<th>At Least 5 Servings of Fruits/Vegetables Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>58.8a</td>
<td>62.2a</td>
</tr>
<tr>
<td>Females</td>
<td>53.4a</td>
<td>59.6a</td>
</tr>
<tr>
<td>Age, (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;35 years</td>
<td>58.1a</td>
<td>57.7</td>
</tr>
<tr>
<td>36–50 years</td>
<td>53.9a</td>
<td>58.0</td>
</tr>
<tr>
<td>&gt;51 years</td>
<td>54.4a</td>
<td>58.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employee vs. spouse, (%)</th>
<th>Exercise at Least 3 Times a Week for 30 Minutes</th>
<th>At Least 5 Servings of Fruits/Vegetables Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee</td>
<td>55.2</td>
<td>59.7</td>
</tr>
<tr>
<td>Spouse</td>
<td>54.6</td>
<td>59.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation (employees only), (%)</th>
<th>Exercise at Least 3 Times a Week for 30 Minutes</th>
<th>At Least 5 Servings of Fruits/Vegetables Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician</td>
<td>67.3abc</td>
<td>74.1bcd</td>
</tr>
<tr>
<td>Nurse</td>
<td>60.3ad</td>
<td>65.0aa</td>
</tr>
<tr>
<td>Other clinical</td>
<td>57.0a</td>
<td>64.0ab</td>
</tr>
<tr>
<td>Other nonclinical</td>
<td>54.8abc</td>
<td>58.9ab</td>
</tr>
<tr>
<td>Administrative/Executive</td>
<td>67.4a</td>
<td>65.7bc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ethnicity, (%)</th>
<th>Exercise at Least 3 Times a Week for 30 Minutes</th>
<th>At Least 5 Servings of Fruits/Vegetables Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>56.1a</td>
<td>61.4ae</td>
</tr>
<tr>
<td>African American</td>
<td>51.2a</td>
<td>52.3ae</td>
</tr>
<tr>
<td>Other</td>
<td>64.8ad</td>
<td>69.2ae</td>
</tr>
</tbody>
</table>

Note: Within each column, each set of demographic categories was compared. Values sharing the same superscript signify statistical difference between those groups (P < .05). Values with no superscript signify no statistical difference between groups (P > .05).

**Table 3**

The association of exercise and dietary habits with cardiometabolic disease biomarkers.

<table>
<thead>
<tr>
<th>Daily intake of fruits and vegetables, mean (95% confidence interval)</th>
<th>Yes</th>
<th>No</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1c</td>
<td>5.5 (5.47, 5.53)</td>
<td>5.4 (5.36, 5.44)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>LDL</td>
<td>112.4 (111.19, 113.61)</td>
<td>112.0 (110.51, 113.49)</td>
<td>.581</td>
</tr>
<tr>
<td>BMI</td>
<td>28.9 (28.64, 29.16)</td>
<td>30.9 (30.54, 31.26)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Systolic pressure</td>
<td>121.3 (121.04, 121.56)</td>
<td>122.5 (121.87, 123.13)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Diastolic pressure</td>
<td>75.7 (75.35, 76.05)</td>
<td>76.8 (76.38, 77.22)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exercise regularly (≥90mins a week), mean (95% confidence interval)</th>
<th>Yes</th>
<th>No</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1c</td>
<td>5.3 (5.27, 5.33)</td>
<td>5.4 (5.37, 5.44)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>LDL</td>
<td>110.0 (108.75, 111.25)</td>
<td>110.5 (109.07, 111.93)</td>
<td>.506</td>
</tr>
<tr>
<td>BMI</td>
<td>27.0 (26.75, 27.75)</td>
<td>30.5 (30.16, 30.87)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Systolic pressure</td>
<td>120.8 (120.27, 121.33)</td>
<td>123.1 (122.5, 123.70)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Diastolic pressure</td>
<td>75.4 (75.00, 75.80)</td>
<td>77.1 (76.69, 77.51)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

A1c, hemoglobin A1c; LDL, low-density lipoprotein; BMI, body mass index
PHYSICAL ACTIVITY AND NUTRITION VITAL SIGNS

**Figure 1**
Percent of populations within ZIP codes that reported physical activity levels of at least 3 times per week for 30 minutes.

**Figure 2**
Percent of populations within ZIP codes that reported dietary consumption of at least 5 servings of fruits and vegetables daily.

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
dietary habits, both representing an opportunity for expanded services.

While an exercise vital sign has previously been developed, those tools currently use 2 questions to address physical activity and are devoid of assessing nutritional habits. Our investigation similarly asked 2 questions, but focused 1 on physical activity and the other on nutrition. By demonstrating potential associations, we hoped these tools could be used to start conversations about both lifestyle habits during a clinical encounter, rather than the singular focus on exercise.

Data from our investigation provide 3 major findings: 1) healthcare workers can improve their health, with the mean BMI for this population being borderline obese (BMI = 29.6 kg/m²) and systolic BP within the prehypertensive range (121.8 mmHg); 2) rates of physical inactivity, poor diet, and cardiometabolic disease markers follow socioeconomic, racial, and regional lines; and 3) those who reported exercising 3 times per week for at least 30 minutes had the lowest risk for cardiometabolic disease based on the biomarkers tested, even when controlling for other variables in a multivariate linear regression analysis.

Only 1 study has assessed the use of an exercise vital sign to determine the association between physical activity and cardiometabolic disease.4 Similar to that investigation, our physical activity assessment was able to discriminate risk between different populations such that increasing age, female gender, lower socioeconomic status, and being African American were all associated with lower levels of physical activity. Unique to this study, the nutrition vital sign was also able to discriminate risk between populations, with female gender, lower socioeconomic status, and being African American associated with less healthy diets.

<table>
<thead>
<tr>
<th>Table 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results from multiple linear regression analyses on each variable.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>(Intercept)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>African American</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Other ethnicity</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Nurse</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Other clinical</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Other nonclinical</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Administrative/ Executive</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Exercise (yes)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Vegetables (yes)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*Linear regressions coefficients (95% confidence interval) are values that represent the degree of change (and 95% confidence interval) in the cardiometabolic disease biomarker associated with that variable while controlling for the effects of the other variables within the analysis.
A1c, hemoglobin A1c; LDL, low-density lipoprotein; BMI, body mass index
*Indicates statistical significance (P < .05)
Physical inactivity and poor diet are major risk factors for cardiometabolic disease and likely contributed to the obesity found within our institution.

According to the CDC Division of Nutrition, Physical Activity, and Obesity, 28.9% of US adults 18 years of age and older are classified as obese and 35.2% as overweight. Results from our investigation suggest that our population is much worse, with 40.2% being obese and 31.3% being overweight—likely related to physical inactivity and poor diet. It is unclear why our population has a large proportion of individuals who are physically inactive and do not eat a healthy diet. It is, however, apparent that working in a healthcare institution does not automatically translate to a healthier lifestyle, and a more conscious effort is needed in this setting to ensure that employees benefit from long-term health. Both the results and design of this study, including the 2-question physical activity and dietary screen and the demographic and socioeconomic analysis through the use of geomaps, may assist other institutions or organizations in designing physical activity and nutritional programs to identify high-risk populations to encourage healthy lifestyles and initiate more intensive educational or medical interventions.

Future directions for our institution include identifying reasons for the underlying obesity, designing programs to increase physical activity and healthy dietary intake, and engaging with key community stakeholders to encourage healthier lifestyles. Local Young Men’s Christian Association (YMCA) partnerships, as well as 12-week intensive classes on lifestyle modifications for employees, have recently begun, and our institution has committed resources to assist in improving the cardiometabolic risk profile of our employees.

Our investigation has several limitations. First, the accuracy of the self-reported measures for exercise and nutrition are likely inexact. However, the overall goal of the study was not to study the accuracy of the self-report tools, but rather to see if a relationship existed between these self-reported measures and cardiometabolic disease risk. Given the associations found in this investigation, the self-reported measures can serve as a surrogate to identify risk.

Second, the self-reported measure used in our investigation for physical activity asked whether individuals exercised for 30 minutes at least 3 times per week, which is lower than the recommended 150 minutes/week of physical activity. It is possible that the goal of 150 minutes/week of moderate exercise sets a standard that is not achievable by many people. Given 90 minutes per week has been shown to have clinical benefits, this lower threshold may be more appropriate when screening large populations, especially where obesity is more prevalent. Future investigations can determine the association between cardiometabolic risk and minutes of physical activity a week to understand whether there are any further associations in health improvement and whether this link may occur in a linear or exponential fashion.

Lastly, our study population had a predominance of female participants (62.1%) and Caucasians (67.9%), reflective of the demographics of our institution. Such percentages should be taken into consideration when applying our results to other populations with different demographics.

Conclusion

Cardiometabolic disease is the leading cause of death worldwide. Physical activity and diet are recognized as important markers of cardiovascular health; however, these major risk factors are the very ones not routinely assessed in clinical practice. Results from this study provide preliminary evidence that physical activity and nutrition vital signs can be effective in discriminating populations at high risk for cardiometabolic disease. Physical activity and nutrition vital signs offer health professionals a targeted screen and unique opportunity to identify patients for whom lifestyle-based strategies to improve cardiometabolic profiles may be most valuable.
References


Clinical Learning in an Urban Emergency Department: An Examination of Residents’ Abilities for Reflective Practice

Matthew Bitner, MD, MEd; Sarah Farris, MD; and Lee Benjamin, MD

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Abstract

Background: The emergency department (ED) provides a fertile ground for learning. However, harnessing a chaotic learning environment to develop resident physicians into reflective medical practitioners can prove difficult. This study used structured teaching rounds as an intervention to attempt to increase reflective practice by decreasing rates of “unrecognized learning” (new information encountered by potential learners that goes unrecognized) and improving learner perceptions of teaching, instruction, and satisfaction.

Methods: During the study period, structured teaching rounds were used in an urban, academic ED. Rounds were audio recorded and transcribed into individual items or concepts (“learned items”). These items were then coded to the Accreditation Council for Graduate Medical Education (ACGME) core competencies and the concept of “unrecognized learning.” Additionally, pre- and post-study period surveys were administered to students and residents in the ED regarding learner perception of teaching, instruction, and satisfaction.

Results: A total of 266 learned items were captured, which were coded 673 times to the ACGME core competencies. All competencies were represented, but off-service rotators and students failed to identify any Interpersonal and Communications Skills or any Professionalism items. A 2.3% rate of decline occurred in “unrecognized learning” over the study (R^2 = .67). Overall, learner perception of teaching and instruction increased (16.8% increase), along with improved satisfaction scores, particularly regarding off-service rotators (77.8% increase).

Conclusions: Use of structured teaching rounds in the ED can increase reflective practice and may increase learner perception of teaching and instruction, as well as instructional satisfaction in the ED.

The primary goal of all emergency medicine (EM) residency programs is to produce competent physicians capable of the independent practice of EM. The emergency department (ED) should expose learners to sufficient opportunities to achieve the cognitive, affective, and psychomotor skills necessary for the independent practice of EM according to the Model of the Clinical Practice in EM. EM residency programs are also charged with educating learners who include medical students and non-EM residents. The Accreditation Council for Graduate Medical Education (ACGME) requires that all residency programs, except pathology, include either a formal rotation or at least a clinical experience in EM. The ACGME also specifies that resident learning should encompass teaching and oversight of other learners at varied levels (eg, students, residents, and prehospital personnel).

The ED provides a unique, fertile ground for learning. The management of undifferentiated
As part of an ongoing educational continuous quality improvement effort to determine what residents were learning during their clinical shifts, the initial phase of the study focused on examining rounds during change of shift. The oncoming/off-going attending would pose a single question to each learner: “What did you learn today?” Each response was coded to an area of desired ACGME core competency.

This study revealed that, when asked, nearly two thirds of the learners could not recall a “learned item” and required either prompting by an attending for recall of a case or time to recount patients (while other learners presented, and they were subsequently called on again). This experience signaled a need for re-examination of the delivery of clinical instruction in the ED.

The initial phase of this study identified 2 additional areas that required further investigation. First, it became clear that new information encountered by potential learners often goes unrecognized. “Unrecognized learning” is a representation of reflective practice as described through transformative learning theory. For example, the normal course of events for graduate medical education is that learners progress through their years of graduate medical education with an accompanying maturation in the cognitive, affective, and psychomotor abilities needed to competently practice within their specialty. This aspect of graduate medical education is recognized without a clear understanding of how it happens. Which aspects of the educational program are vital to this maturation process?

The second question is whether the concept of introducing the “What did you learn today?” structured teaching rounds construct as an educational intervention is a valid instructional strategy for producing physicians who are reflective in their practice and meet minimum competency standards for ACGME.

The initial phase of the study showed us that learners were often unable to recall what they learned during a clinical shift. This follow-up study asked the same question of the trainees, but the intent was to examine the impact of formalizing the process of recall and critical reflection on learning in the ED environment. We focused on “unrecognized learning” as a surrogate for reflective practice and the acquisition of ACGME core competencies in the clinical environment.

The hypothesis was that the introduction of the “What did you learn today?” teaching rounds...
LEARNING IN THE ED

construct would decrease the amount of unrecognized learning in the ED and provide a mechanism by which learners can become reflective practitioners of medicine. In addition, the study sought to identify which ACGME core competencies are learned during clinical education in the ED (and stratify them according to level of training and primary specialty), increase learner perception of learning/instruction in the ED, and improve learner satisfaction with clinical instruction in the ED.

Methods

Setting
This preintervention study was performed throughout July at an urban tertiary care, university-based adult ED with over 70,000 visits annually. This facility serves as a community ED; a major transplant, medical, and surgical referral center; and one of the region’s only level 1 trauma centers. There are 2 major teaching areas, each staffed with 1 EM faculty physician, 1 senior EM resident, a cohort of 1–3 other EM residents (postgrad year [PGY] 1 or 2), residents from non-emergency medicine disciplines, and 1–2 students (medical students, physician assistant students, and/or visiting students). Nineteen times per week, the off-going faculty physician and learners provide a form of patient report known as rounding. Rounding serves as the mechanism to transition care for patients who remain in the ED to the oncoming faculty physician and learners. The study period of 31 days, with 2 teaching pods, meant a maximum of 166 observations was possible.

Participants
All faculty physicians were asked to participate as part of the academic mission of the institution. All learners in the ED who were present at teaching rounds during the study period were eligible to participate. A verbal consent study information sheet was posted in the ED and distributed to each learner during the rotation orientation. Those learners who consented were asked to take part in structured teaching rounds. Those who declined were asked to simply observe the structured teaching rounds.

Data Collection
Following local Institutional Review Board approval, a brief electronic survey was distributed to all learners who rotated in the department during the 30 days (June) immediately preceding the study period. Study personnel initially developed this survey by modeling it after validated workplace satisfaction surveys, and residency leadership then reviewed it for approval. This survey used a standardized psychometric instrument utilizing 7-point Likert scale items for survey questions. It focused on learner perceptions of instruction and satisfaction of clinical education in the ED, asking about teaching that was “routinely” received as well as perceptions of “ideal” states for learning.

The survey was constructed and distributed through a web-based survey solution (SurveyMonkey.com, LLC). Learners were asked to electronically complete the survey during the last 7 days of their assigned clinical rotation in EM.

Each of the 2 teaching pods was assigned a digital voice recorder (Zoom Portable Digital Recorders, Model#H1). If there were a participating faculty physician, that person distributed study information sheets, as necessary, and reaffirmed verbal consent from all learners present. The faculty physician started recording by identifying the date, time, and location of the teaching rounds being recorded. All learners were asked to verbally identify their year in training and specialty before their response(s). The faculty physician then asked each learner, “What did you learn today?” The study assumed that a learner in the ED would have at least 1 “learned item” per shift. If a learner could not recall a “learned item,” the faculty member prompted the learner as a means to activate recall of what transpired that shift.

While it was difficult to differentiate between activation of prior knowledge and new knowledge, the question that was posed (“What did you learn TODAY?”) attempted to focus the learner on that day’s newly gained knowledge as opposed to previous knowledge. However, if the learners had never activated prior knowledge and incorporated it into practice, then the study assumed that it represented relearning; as such, it was counted as a “learned item.”

The primary investigator downloaded the digital voice recorder and transcribed all the audio from teaching rounds for data analysis. The recordings were subsequently destroyed using Department of Defense 5220.22-M standards for erasing digital data. At the conclusion of the study period, an electronic survey was distributed to all learners who rotated in the department during July. It mirrored the survey given during the pre-study phase.

Study Analysis
Transcripts of all teaching rounds were used by the primary investigator to identify 1) the learned
item; 2) the level of training; 3) the primary specialty of the learner; 4) the date, time, and location of the teaching rounds; and 5) if the learner either first failed to identify a learned item or required a prompt to recall a learned item. If the learner initially failed to identify a learned item or required a prompt, “failed item” was coded. This code was subsequently used as the rate of occurrence of “unrecognized learning.” This information was placed into a standard Microsoft Excel spreadsheet that was provided to 2 study personnel (“coders”).

For training purposes, coders were given examples of learned items from the pilot project and the corresponding ACGME core competencies that they were coded to. They could also use these examples when coding the learned items from the study period. These personnel then independently coded learned items to ACGME core clinical competencies. Coders mapped an individual learned item to as many core competencies as they deemed appropriate.

Learned items in all ACGME core competencies were considered, not just those that fall into the Medical Knowledge competency. The coder’s individual responses were compiled into a composite Microsoft Excel Spreadsheet. The principal investigator served as a third coder, settling any discrepancies between the 2 primary coders. The composite spreadsheet (not audio recordings or transcripts) was provided to coders to ensure anonymity for participants. Concordance as well as intercoder reliability (Cohen’s Kappa) was calculated for the coders.

Once coding was completed, standard statistical methods were used to derive descriptive and inferential statistics. Items were stratified by ACGME core competencies, level of training, and primary specialty to attempt to identify trends. However, because of the small sample size of non-EM resident learners, the primary specialties were subsequently grouped into EM and rotating learners. The frequency of learners failing to identify learned items or requiring a prompt to recall a learned item was mapped across the study period to determine if a decline in “unrecognized learning” existed using the least squares method of linear regression.

For the survey instrument, responses were collated. Mean Likert scores as well 95% confidence intervals using the student’s t-test were calculated by question, by year of postgraduate training, and by primary specialty (again grouped by EM vs. Rotator) for both the pre- and post-study period surveys. A direct comparison of means was then used to examine learner satisfaction with clinical instruction and learning in the ED over the study period.

**Results**

During the 1-month study, 97 of the possible 166 observations were captured (58.4%). These observations were fairly equally split between the 2 teaching pods, with 1 area having 45 observations (46.4%) and the other having 52 observations (53.6%). The 3pm weekday and 7pm weekend rounds both represented the end-of-day shift, so these two were combined. At the 7am, 3pm/7pm, and 11pm rounds, 32 (33.3%), 42 (43.8%), and 23 (24.0%) observations were made, respectively (Table 1).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Survey overview.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total observations, recorded/possible, (%)</strong></td>
<td>97/166 (58.4)</td>
</tr>
<tr>
<td><strong>Location, no. (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Pod 1</td>
<td>45 (46.4)</td>
</tr>
<tr>
<td>Pod 2</td>
<td>52 (53.6)</td>
</tr>
<tr>
<td><strong>Time of day for rounds, no. (%)</strong></td>
<td></td>
</tr>
<tr>
<td>7am</td>
<td>32 (33.3)</td>
</tr>
<tr>
<td>3pm/7pm</td>
<td>42 (43.8)</td>
</tr>
<tr>
<td>11pm</td>
<td>23 (24.0)</td>
</tr>
<tr>
<td><strong>Survey respondents, total/possible, (%)</strong></td>
<td>Pre-Study</td>
</tr>
<tr>
<td>17/19 (89.5)</td>
<td>21/28 (75.0)</td>
</tr>
<tr>
<td><strong>Training level, no. (%)</strong></td>
<td></td>
</tr>
<tr>
<td>PGY1</td>
<td>7 (41.2)</td>
</tr>
<tr>
<td>PGY2</td>
<td>8 (47.1)</td>
</tr>
<tr>
<td>PGY3</td>
<td>2 (11.8)</td>
</tr>
<tr>
<td>Student</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td><strong>Primary specialty, no. (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Emergency medicine</td>
<td>12 (70.6)</td>
</tr>
<tr>
<td>Anesthesiology</td>
<td>1 (5.9)</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>3 (17.6)</td>
</tr>
<tr>
<td>Orthopaedic surgery</td>
<td>1 (5.9)</td>
</tr>
<tr>
<td>Obstetrics and gynecology</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Students</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td><strong>PGY, postgraduate year</strong></td>
<td></td>
</tr>
</tbody>
</table>
LEARNING IN THE ED

From these observations, 266 learned items were recorded. Of these items, 92 (34.6%) were coded “failed items” or “unrecognized learning” and 174 (65.4%) were coded “recognized learning.” When these items were mapped across the study period, using linear regression by least squares method, a 2.3% decline was noted in the rate of “unrecognized” items ($R^2 = .67$) (Fig. 1).

PGY2 residents reported the most learned items [95 (35.7%)], while students reported the least [15 (5.6%)]. EM residents accounted for 220 (82.7%) learned items, while the other specialties were in significantly smaller proportions (Fig. 2). The majority of learned items were recorded at the 3pm/7pm rounds [118 (44.4%)], while the remainder split equally between the 7am and 11pm rounds.

Learned items were coded to the ACGME core competencies 684 times. The coders had a concordance rate of 86.8% (with a Cohen’s Kappa value of 0.71). Disagreements occurred between the coders in each of the ACGME core competencies except Medical Knowledge. The most frequently disagreed-on core competency was Professionalism. Patient Care was coded the most frequently with 257 instances (37.6%).

Learned items were then sorted both by year in training and by primary specialty (Table 2). Students were excluded from the primary specialty analysis, and 10 items could not be coded by specialty as they were not available/audible in the transcripts. Neither students nor off-service rotators had any learned items coded to Interpersonal and Communication Skills or to Professionalism.

The pre-study period survey had 17 of a possible 19 respondents (89.5% response rate). The post-study period survey had 21 of a possible 28 respondents (75.0% response rate) (Table 1). While the off-service rotators differed in the pre- and post-study period, 8 EM residents were in both pre- and post-study survey groups (representing 47.1% of pre-study respondents and 38.1% of post-study respondents).

A comparison of the pre- and post-study period learner surveys showed that when taking all respondents into account, there were increases in mean Likert scores for routine perceptions of learning/instruction in the ED by 0.46 (12.3%) for each of the learner stimuli, except the one negatively phrased stimulus that decreased (a net positive effect) by 0.56 (20.5%) (Table 3).

Figure 1
Unrecognized learning over time
($R^2 = .67$).
* Error bars represent 95% CI.
Figure 2
Learned items by specialty.

EM, emergency medicine; IM, internal medicine; Peds, pediatrics; Surg, surgery; Psych, psychiatry

Table 2
Learned items by ACGME core competencies by level of training and primary specialty.

<table>
<thead>
<tr>
<th>Core Competency</th>
<th>Patient Care</th>
<th>Medical Knowledge</th>
<th>Practice-Based Learning</th>
<th>Interpersonal &amp; Communication Skills</th>
<th>Professionalism</th>
<th>Systems-Based Practice</th>
<th>Total Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total overall, no. (%)</td>
<td>257 (37.6)</td>
<td>247 (36.1)</td>
<td>92 (13.5)</td>
<td>12 (1.8)</td>
<td>18 (2.6)</td>
<td>58 (8.5)</td>
<td>684</td>
</tr>
<tr>
<td>PGY1</td>
<td>92 (37.1)</td>
<td>87 (35.1)</td>
<td>32 (12.9)</td>
<td>7 (2.8)</td>
<td>8 (3.2)</td>
<td>22 (8.9)</td>
<td>248</td>
</tr>
<tr>
<td>PGY2</td>
<td>92 (36.1)</td>
<td>89 (34.9)</td>
<td>37 (14.5)</td>
<td>2 (0.8)</td>
<td>8 (3.1)</td>
<td>27 (10.6)</td>
<td>255</td>
</tr>
<tr>
<td>PGY3</td>
<td>57 (42.2)</td>
<td>54 (40.0)</td>
<td>15 (11.1)</td>
<td>3 (2.2)</td>
<td>2 (1.5)</td>
<td>4 (3.0)</td>
<td>135</td>
</tr>
<tr>
<td>Medical students</td>
<td>14 (40.0)</td>
<td>13 (37.1)</td>
<td>6 (17.1)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (5.7)</td>
<td>35</td>
</tr>
<tr>
<td>Physician assistant students</td>
<td>2 (18.0)</td>
<td>4 (36.4)</td>
<td>2 (18.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>3 (27.3)</td>
<td>11</td>
</tr>
<tr>
<td>Emergency medicine</td>
<td>213 (37.7)</td>
<td>201 (35.6)</td>
<td>73 (12.9)</td>
<td>12 (2.1)</td>
<td>18 (3.2)</td>
<td>47 (8.3)</td>
<td>565</td>
</tr>
<tr>
<td>Off-service</td>
<td>26 (41.3)</td>
<td>25 (39.7)</td>
<td>9 (14.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>3 (4.8)</td>
<td>63</td>
</tr>
</tbody>
</table>
# Table 3
Mean Likert scores* for routine and ideal learning perceptions.

<table>
<thead>
<tr>
<th></th>
<th>All Respondents</th>
<th>Emergency Medicine Respondents</th>
<th>Off-Service Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
<td>Before</td>
</tr>
<tr>
<td>&quot;Routine&quot;</td>
<td>Mean 95% CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I receive teaching with every patient encounter</td>
<td>3.88 0.79</td>
<td>4.82 0.80</td>
<td>5.05 0.54</td>
</tr>
<tr>
<td>&quot;Ideal&quot;</td>
<td>Mean 95% CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I receive teaching on rounds at the beginning of my shift</td>
<td>3.18 0.84</td>
<td>5.06 0.71</td>
<td>4.15 0.72</td>
</tr>
<tr>
<td>I receive teaching on rounds at the end of my shift</td>
<td>3.65 0.89</td>
<td>4.76 0.95</td>
<td>4.25 0.68</td>
</tr>
<tr>
<td>I receive teaching on topics chosen by the attending</td>
<td>4.41 0.79</td>
<td>5.38 0.75</td>
<td>4.65 0.75</td>
</tr>
<tr>
<td>I receive teaching on topics chosen by me</td>
<td>4.82 0.86</td>
<td>5.59 0.48</td>
<td>5.15 0.59</td>
</tr>
<tr>
<td>I receive teaching in a 1-on-1 setting</td>
<td>5.35 0.36</td>
<td>5.76 0.53</td>
<td>5.55 0.44</td>
</tr>
<tr>
<td>I receive teaching in a group setting</td>
<td>4.82 0.69</td>
<td>5.65 0.63</td>
<td>5.20 0.54</td>
</tr>
<tr>
<td>I am asked a series of questions (“pimping”) as a teaching method</td>
<td>4.59 0.68</td>
<td>4.29 1.02</td>
<td>4.80 0.62</td>
</tr>
<tr>
<td>I perform a real-time literature search regarding patient care questions</td>
<td>4.06 0.84</td>
<td>4.71 0.89</td>
<td>4.20 0.80</td>
</tr>
<tr>
<td>I read about a patient after my shift is over</td>
<td>4.88 0.75</td>
<td>5.76 0.62</td>
<td>5.35 0.68</td>
</tr>
</tbody>
</table>

* Likert Scale 1-7 (Strongly Disagree, Disagree, Slightly Disagree, Neutral, Slightly Agree, Agree, and Strongly Agree, respectively) • CI, confidence interval
Additionally, taking all respondents into account, there were increases in the mean Likert scores of learner satisfaction in all stimuli except “Instruction is valuable to my professional development,” which decreased 0.02 (0.3%). The greatest increase in mean Likert scores was seen with “I frequently witness formal teaching rounds in the ED,” which increased by 1.01 (31.2%) (Table 4).

EM respondents showed pre- and post-survey increases in the mean Likert scores of routine teaching perceptions for all learner satisfaction in all stimuli by 0.87 (22.4%). The biggest gains were seen with “I routinely receive teaching on rounds at the beginning of my shift,” which increased by 1.86 (57.3%). The smallest increase was seen with “I routinely receive teaching in a 1-on-1 setting,” which increased only 0.22 (4.2%) (Table 3). For off-service rotators, increases were seen in the mean Likert scores of routine teaching perceptions for 7 of the 11 learner stimuli, with a mean increase of 0.61 (16.5%) (Table 3).

When pre- and post-study survey satisfaction scores are sorted by specialty, the mean Likert scores of EM learner satisfaction increases in all stimuli, with a mean increase of 0.78 (17.0%). The greatest increase in mean Likert scores was seen with “I frequently witness formal teaching rounds in the ED,” which increased by 1.86 (51.9%) (Table 4). For off-service rotators, there were increases in the mean Likert scores of learner satisfaction in all stimuli, with a mean increase of 1.35 (40.8%). The greatest proportional increase in mean Likert scores was seen with “Overall satisfaction with teaching/instruction in the ED,” which increased by 2.33 (77.8%) (Table 4).

**Discussion**

Few studies have looked at the use of educational interventions in the ED, and none have examined “unrecognized learning.” Furthermore, in EM graduate medical education, a movement is underway to design educational experiences appropriate for adult learners that will equip them with the necessary tools to be competent, independent practitioners of EM. 1,10

This study showed that the use of a simple construct (the “What did you learn today?” structured teaching rounds) decreased rates of “unrecognized learning” during the study period and that structured teaching rounds are an effective means by which one can engage the learner in

---

**Table 4**

Mean Likert scores* for learner satisfaction scores.

<table>
<thead>
<tr>
<th>Satisfaction stimulus</th>
<th>All Respondents</th>
<th>Emergency Medicine</th>
<th>Off-Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
<td>Before</td>
</tr>
<tr>
<td>Instruction occurs frequently</td>
<td>5.24 (0.67)</td>
<td>5.60 (0.38)</td>
<td>5.75 (0.29)</td>
</tr>
<tr>
<td>Instruction is valuable to professional development</td>
<td>6.12 (0.40)</td>
<td>6.10 (0.43)</td>
<td>6.42 (0.33)</td>
</tr>
<tr>
<td>ED faculty are committed to providing structured educational sessions</td>
<td>4.53 (0.82)</td>
<td>5.10 (0.59)</td>
<td>5.00 (0.81)</td>
</tr>
<tr>
<td>Frequently witness formal teaching rounds in the ED</td>
<td>3.24 (0.84)</td>
<td>4.25 (0.74)</td>
<td>3.58 (0.99)</td>
</tr>
<tr>
<td>Formal teaching rounds in the ED are useful</td>
<td>5.06 (0.74)</td>
<td>5.60 (0.60)</td>
<td>5.17 (0.81)</td>
</tr>
<tr>
<td>I learn something new on every clinical shift</td>
<td>5.71 (0.57)</td>
<td>6.20 (0.39)</td>
<td>6.08 (0.33)</td>
</tr>
<tr>
<td>The ED is a great place to learn clinical medicine</td>
<td>5.65 (0.87)</td>
<td>6.45 (0.32)</td>
<td>6.42 (0.57)</td>
</tr>
<tr>
<td>Satisfaction with instruction in the ED</td>
<td>4.29 (0.81)</td>
<td>5.53 (0.50)</td>
<td>4.75 (0.72)</td>
</tr>
<tr>
<td>Satisfaction with formal teaching rounds</td>
<td>3.53 (0.68)</td>
<td>4.40 (0.58)</td>
<td>3.92 (0.57)</td>
</tr>
<tr>
<td>Satisfaction with faculty commitment to my learning</td>
<td>4.29 (0.70)</td>
<td>5.55 (0.60)</td>
<td>4.75 (0.67)</td>
</tr>
<tr>
<td>I learn well from other learners</td>
<td>5.41 (0.52)</td>
<td>5.95 (0.39)</td>
<td>5.42 (0.63)</td>
</tr>
<tr>
<td>Overall satisfaction with teaching/instruction</td>
<td>4.41 (0.87)</td>
<td>5.50 (0.44)</td>
<td>5.00 (0.90)</td>
</tr>
</tbody>
</table>

* Likert Scale 1-7 (Strongly Disagree, Disagree, Slightly Disagree, Neutral, Slightly Agree, Agree, and Strongly Agree, respectively) • CI, confidence interval • ED, emergency dept.
critical reflection. Furthermore, the process of doing so in a group setting provides additional educational moments for other learners in the ED. Finally, it was publicized that structured teaching rounds were going to occur. This foreknowledge gave the learners an opportunity to prepare for participation in critical reflection and reflective discourse, which is central to enabling them to evaluate their experiences and move toward being reflective practitioners of medicine.11-13

While at first pass each of the ACGME core competencies was represented, when sorted by specialty and examined, it was interesting to note that students and off-service rotating residents found no Interpersonal and Communication Skills or Professionalism competencies in their training in the ED. Although this study has a small sample size, this learning gap clearly needs to be addressed in faculty-learner interactions as well as through the EM rotation curriculum.

Additionally, while an increase emerged in EM learner perceptions of learning and instruction in the ED as well as learner scores of satisfaction, it was the off-service rotator group that experienced the greatest gains in learner satisfaction. This finding may be, in part, because off-service rotators are not acclimated to the somewhat chaotic ED environment, and the use of structured teaching rounds may reproduce a learning environment with which they are more accustomed.

Limitations
First and foremost, this study was conducted at a single hospital site, in 1 academic training program with a relatively small sample size. The study occurred in July, which is often a time of renewed energy in the educational process as resident physicians are actively engaged in new roles due to their promotion. This study lacks a mechanism to determine if the reflective practice will fatigue over time.

Next, only 58% of possible observations were captured, with the resultant number of learned items being relatively low (2.74 learned items/observation). Hence, the study might not entirely represent the learning environment in the ED. Also, Hawthorne and Rosenthal effects may have contributed to the rate of decline of unrecognized learning, given no option was available for blinding subjects in the study. Residents may have become accustomed to having to prepare for rounds as well. Therefore, while it appears that a net positive educational effect was gained, it remains uncertain if this new learning will be incorporated into future practice or whether the practice of identifying learned items was added to residents’ shift routine without incorporating it into their learning schemas.

The surveys had excellent response rates and were modeled after workplace satisfaction survey instruments.22 However, a validated instrument for evaluating perceptions of learning/instruction and satisfaction in resident education in the ED does not exist. Therefore, the instrument itself could have introduced bias. Further, the pre- and post-survey respondents were different groups of learners (except the 8 EM residents who completed both surveys). While both pre- and post-study groups were exposed to the same clinical learning environment and the same faculty pool, the nature of faculty scheduling means some variation existed in which faculty were participating in instructing the 2 groups. This variance could have produced a significant impact on a learner’s perception of instruction as faculty mentorship has been shown to be pivotal to learning in the clinical environment.23,24 Finally, student participation in structured teaching rounds was so low that the inferences regarding students must be interpreted cautiously.

Recommendations for Future Research
While this was a 1-month study period, given the appropriate amount of resources, this research could be repeated over a longer time. It should include more residents, particularly from other specialties, to further identify any specialty-specific trends. Additionally, this study took place during July: While there may be value in maintaining the 1-month study period, one might consider repeating it 6 months into the year to look for seasonal variation and at a time with more stability in academic health centers. Furthermore, if the survey were repeated at various time intervals, additional unannounced observations and learner surveys should be conducted during both study periods as well as staggered by a quarter (ie, alternate study periods with surveys and surveys without study periods every 3 months). This practice, coupled with unannounced observations, would allow for evaluation of learner fatigue with respect to reflective practice both during and outside of the study periods. While intercoder reliability was fairly good in this study, one might consider involving more than 2 baseline coders. Finally, before expanding the scope of the project, there may be value in performing focus groups with learners who participated in this study to capture learner discussion on structured teaching rounds and its individual impact on them.
Conclusion

This study demonstrated that the introduction of formal structured teaching rounds is a valid instructional strategy for producing reflective physicians. For learned items coded during the study, each ACGME core competency was represented during clinical instruction in the ED, but not in all learner groups. Additionally, formal structured teaching rounds decreased the rate of “unrecognized learning” for all learners and increased resident perception of learning, instruction, and overall satisfaction scores. The increase in satisfaction scores was most pronounced when examining off-service rotators. While it was difficult to attain statistical significance with this study’s sample size, if these trends are correct, the findings should impact the manner in which EM residency programs design their teaching rounds.

References

Intrauterine insemination (IUI) has been a first-line treatment for many infertile couples since the early 1980s.1 In theory, IUI is successful in establishing pregnancy because the procedure increases the number of motile sperm arriving at the ampullary region of the oviducts, thus improving the chance of fertilization. IUI can be the solution for various forms of infertility including unexplained infertility, mild to moderate forms of male factors, and female factor infertility.2 IUI improves the chances for a couple to conceive if the male factor infertility includes substandard semen parameters including count, morphology, and motility. Immunologic infertility in men or women, cervical mucus hostility, and mild endometriosis can also be overcome with IUI. IUI cannot, however, be used to address infertility resulting from tubal obstruction or anovulation despite ovulation-inducing drugs.

Published pregnancy rates following IUI reveal wide variation. A review article of 18 IUI studies revealed a pregnancy rate that ranged from 5% to 62%. This wide variation suggests that many factors can affect IUI pregnancy rates. More often than not, infertility is the result of several factors. In addition, semen preparation and insemination techniques vary among providers, giving rise to further variation in reported pregnancy rates.3

Other factors also may reduce the chance for a couple to conceive. For example, female fertility decreases after age 35 with the IUI success rate being negatively affected by maternal ages over 39 years.7 In addition, stimulation protocol,5,6 body mass index (BMI),6 and ethnicity7-9 have been shown to affect pregnancy success.

Semen parameters, including morphology, motility, and concentration, have been of interest for

Sperm Motility Index and Intrauterine Insemination Pregnancy Outcomes

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Abstract

Background: This study determined if sperm motility index affects pregnancy outcome following intrauterine insemination between various ovulation induction protocols.

Methods: Calculated sperm motility (determined via computer-assisted semen analyzer) indices were correlated with pregnancy outcomes following intrauterine insemination.

Results: Pregnancy rates for different ranges of sperm motility index values showed a trend of increasing pregnancy success across increasing ranges of grouped sperm motility index values, but none of these differences between groups was statistically significant. Within the clomid/letrozole cycles, male age differed significantly (P = .022) between the pregnant and non-pregnant groups. The difference in sperm motility index between pregnant and non-pregnant groups approached significance (P = .066).

Conclusions: A trend exists for an increased pregnancy rate as the sperm motility index approaches 200. Furthermore, our research suggests that as the male partner becomes advanced in age, the chance for getting his partner pregnant declines significantly.
predicting pregnancy success with IUI. No single parameter has been found to be highly diagnostic of male subfertility. Although a positive linear correlation between sperm concentration and pregnancy is evident, a threshold value for IUI success has not been determined.

Percent normal morphology is arguably one of the most important parameters for predicting pregnancy success with IUI. The World Health Organization (WHO) criteria for morphologic evaluation before 2010 led to wide variation in threshold values and made this standard impractical for comparing pregnancy success rates among different studies. However, with the use of the Tyberg strict criteria that treated 4% normal morphology as the threshold value, morphology was found to be one of the most powerful predictors of outcome after IUI.

Sperm motility has also been strongly linked to pregnancy outcome. Sperm motility of 50% or greater has been reported to have a positive association with pregnancy outcomes, while less than 50% motility was associated with a decreased pregnancy outcome. When sperm concentration and percent motility were combined, pregnancy rates were significantly reduced when the total number of motile sperm decreased below 0.5 x 10^6 cells.

When morphology is considered in conjunction with sperm concentration and percent motility, at least 2.75 million total normal motile forms are needed for IUI to be considered as a treatment option. All parameters described above have significant interplay in determining a couple’s fertility. In fact, an increased linearity in sperm movement enhances the predictive value of sperm morphology on pregnancy success.

A more recently developed parameter, called sperm motility index, attempts to describe sperm motility more specifically than simply motile or nonmotile. Traditional motility percentages and total motile counts simply measure the amount of moving sperm. They do not account for velocity or linearity of sperm motion. It is reasonable to imagine that a spermatozoon with moderate to high velocity and high linearity would have a better chance of fertilizing the oocyte than a spermatozoon moving slowly in circles. However, this scenario has not been previously investigated.

The computer-assisted semen analyzer (CASA) has the ability to quantitatively assess the motility of a semen specimen. The CASA system objectively measures a number of semen parameters, but uses curvilinear velocity to calculate sperm motility index. CASA assigns patterns of sperm movement into 1 of 4 categories based on velocity. Category 4 is the rapid velocity category, while category 3 is considered medium velocity. Category 2 consists of sperm moving at slow velocity, while category 0–1 contains static sperm or sperm not moving quickly enough to be considered slow.

The objective of this project was to determine, with the use of CASA, the relationship between sperm motility index and pregnancy outcomes following IUI with various ovulation induction protocol groups.

**Methods**

**CASA Information**

The CASA used for this study was the Sperm Class Analyzer® (SCA; Version 5.1, microptic s.l., Barcelona, Spain). A minimum of 2 samples, 3 fields per sample, and at least 200 sperm were analyzed per concentration per day. The standard parameter settings used with the SCA were as follows: frames acquired: 25; frame rate: 25; minimum contrast: not used in SCA, as it automatically selects the best value; minimum size: 2; maximum size: 60; LO/HI size gates: not used in SCA; LO/HI intensity: not used in SCA; nonmotile head size: 2; and nonmotile brightness head intensity: not used in SCA. The following settings are preset in the SCA program: medium path velocity: 35; low VCL value: 15; slow cells motile: 10; threshold straightness: 80; number of points to calculate the average path velocity: 5; and minimum number of points: 10.

**Patient Selection**

A total of 517 couples who presented to our practice were selected for the study. Patient inclusion criteria were all couples presenting to the clinic for IUI therapy using 1 of 4 ovulation induction protocols (natural cycle; clomid/letrozole; exogenous gonadotropins; combination of clomid/letrozole and exogenous gonadotropins) during the period of July 2008–May 2013. During this study period, 1124 cycles were initially included in this study. Cycles were excluded if the couple was lost to follow-up (n = 22), if the IUI was cancelled (n = 7), if the procedure used donor semen (n = 3), or if outcomes were unable to be verified (n = 3). The final number of included cycles was 1089.

**Calculating Sperm Motility Index**

With the use of SCA, we evaluated at least 200 spermatozoa per patient. The instrument placed the velocity of the sperm into 1 of 4 categories.
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of sperm velocity and calculated the percent of spermatozoa that appeared in each of the categories. Category 4, rapid, contained sperm moving at >35 µ/sec. Category 3, medium, was defined by velocities 15–35 µ/sec. Category 2, slow, consisted of sperm moving at 10–14 µ/sec. Lastly, category 0–1 was the static category, which has a qualifying velocity of 10–14 µ/sec. We multiplied the percent of sperm in each category by the respective category number and then summed the values to obtain a sperm motility index (Table 1). Note that the static category percent value is multiplied by 0 and thus does not contribute to the sperm motility index value.

Statistical Analysis

This retrospective chart analysis used Chi-square test for categorical variables, while student’s t-test and 1-way ANOVA were used for continuous variables. We used the Statistical Package for the Social Sciences (version 12.0; SPSS, Chicago, IL) for these analyses. A P value < .05 was considered indicative of statistical significance.

Results

Patient characteristics are reported in Table 2. Note that the 1089 sample size represents the number of cycles included in this study, not the number of unique patients (517). The mean male age was 34.9 years, while the mean female age was 33.1 years. The mean female BMI was 26.5, which fell within the overweight range. The average number of cycles per patient was 2.4.

The semen analysis revealed that the mean (±SD) count in million sperm/mL was 63.5 (63.4), the total motile count in millions of sperm was 80 (83.4), and the morphology was 5.1% (3.9%). In addition, the percent motility was 49.1 (16.1), while the sperm motility index was 172 (60.9). As depicted by the standard deviation, wide variation exists in the semen parameter values.

Table 3 shows patient characteristics specific to stimulation protocol groups. The gonadotropin cycle group had the highest mean female and male age among all the protocol groups. The lowest mean BMI was in the natural cycle group, while the highest BMI was in the gonadotropin group. The lowest mean cycle number was in the

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Example of the calculation for the sperm motility index in a single patient.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category Number</td>
<td>Percent</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>0-1</td>
<td>52</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Characteristics of patient population who underwent intrauterine insemination.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>Total IUI cycles, N</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural</td>
<td>1089</td>
</tr>
<tr>
<td>Clomid/Letrozole</td>
<td>57 (5.2)</td>
</tr>
<tr>
<td>C/L + G</td>
<td>95 (8.7)</td>
</tr>
<tr>
<td>Gonadotropin</td>
<td>153.5 ± 58.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Characteristics of intrauterine insemination patients by stimulation protocol group.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulation Protocol</td>
<td>Male Age ± SD</td>
</tr>
<tr>
<td>Natural</td>
<td>36.0 ± 5.9</td>
</tr>
<tr>
<td>Clomid/Letrozole</td>
<td>34.2 ± 5.6</td>
</tr>
<tr>
<td>C/L + G</td>
<td>34.9 ± 5.5</td>
</tr>
<tr>
<td>Gonadotropin</td>
<td>37.3 ± 5.7</td>
</tr>
<tr>
<td>P Value</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

SD, standard deviation; C/L + G, clomid/letrozole plus gonadotropin
had the highest pregnancy rate (15.5%), while gonadotropins had the lowest (9.3%). The difference among pregnancy rates among the stimulation protocol groups approached significance ($P = .07$).

We examined mean values for several variables within each stimulation protocol group. Variables included female age, male age, female BMI, cycle number, and sperm motility index. In the natural cycle category, none of these variables differed significantly between the pregnant and non-pregnant group. Male age differed significantly between the pregnant and non-pregnant groups within the clomid/letrozole cycle group ($P = .022$).

In the clomid/letrozole + gonadotropin group, female age was the only variable to differ significantly between the pregnant and non-pregnant groups. Within the gonadotropin group, male age and cycle number differed significantly with $P$ values of .025 and .037, respectively. Female age also had a $P$ value that approached significance (.067).

Table 4 reveals the pregnancy rate for each protocol group. The clomid/letrozole + gonadotropin had the highest pregnancy rate (15.5%), while gonadotropins had the lowest (9.3%). The difference among pregnancy rates among the stimulation protocol groups approached significance ($P = .07$).

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**Discussion**

The overarching question of this study was “Is there a relationship between sperm motility index and a successful pregnancy outcome?” No significant difference in the motility indices of the 2 outcome groups (pregnant and non-pregnant) was found. When cycles were categorized according to protocol type, no significant difference was found in the motility indices of the outcome groups within any protocol.

However, the clomid/letrozole group did have a difference in sperm motility index between outcome groups that was of clinical significance. This finding was of interest because the clomid/letrozole group was also the protocol group where other variables were similar between outcome groups. In this case, sperm motility index was a better predictor of pregnancy success than motility percentage alone. Although no statistically significant differences were found with the use of sperm motility index, these pieces of evidence suggest further investigation is warranted.

Our study has several strengths. We had a large and complete data set that allows us to further investigate subgroups of the study population. Having multiple ovulation induction protocol types is an advantage because it allowed investigation of an additional variable. Using SCA for semen analyses also adds strength as the system reduces subjectivity present in manual semen analyses.
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The purpose of this study was to generate information that will aid physicians and patients in making more informed treatment decisions with regard to infertility. Sperm motility index has the potential to help guide a couple to IUI or in vitro fertilization. Figure 2 is a theoretical decision tree that represents the type of guidance that sperm motility index may help provide, eventually. If a threshold sperm motility index could be identified, a couple could start down the appropriate treatment path.

Future studies would include a revision to the current sperm motility index. Current sperm motility index is calculated using percentages of sperm in 4 categories (rapid, medium, slow, and static/nonmoving). These 4 categories are based on average velocity of a sperm head along its actual curvilinear trajectory. Sperm motility index could be calculated another way as to yield an even more informative measurement. Sperm motility index could instead represent a calculation, similarly based on 4 categories, but in this case, the 4 categories could be based on measurements of curvilinear velocity and straightness. Straightness is calculated by dividing straight line velocity by average path velocity.

The fifth WHO manual presently has 4 categories based on velocity and straightness. A future study should use percentages based on WHO criteria to calculate another sperm motility index. This “new” sperm motility index could be more informative and more predictive of pregnancy success with IUI because it incorporates straightness of movement.

Conclusion

In conclusion, our study indicates that sperm motility index demonstrates a trend for an increased pregnancy rate as the sperm motility index approaches 200. Furthermore, our research suggests that as the male partner advances in age, the chance for the female partner becoming pregnant declines significantly.

Abbreviations and Acronyms

IUI = intrauterine insemination; BMI = body mass index; WHO = World Health Organization; CASA = computer-assisted semen analyzer; SCA = Sperm Class Analyzer

Figure 2

Potential decision tree for deciding which patients should undergo intrauterine insemination (IUI) and which patients should undergo in vitro fertilization (IVF). This decision tree is based on sperm motility index values from the male partner’s semen specimen.

- Motility Index
  - ≤100
  - 101-150
  - >150
    - IVF
    - Motility Stimulant + IUI
    - IUI
    - Conventional
    - Intracytoplasmic Sperm Injection

References
Patients’ Perceptions of Clinical Scribe Use in Outpatient Physician Practices

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Abstract

Background: Implementation of electronic medical records has led to providers using computers for their documentation during office visits, while trying to examine and communicate with patients. Use of electronic medical records can impact the physician-patient interaction and patient office flow. Use of clinical scribes to document for the physician has become popular in many specialties; however, not much is known about outpatient visit satisfaction when a scribe is used.

Methods: An anonymous patient survey assessed patient satisfaction with having a scribe present during the physician visit at 2 different outpatient medical specialty offices. Statistical analysis included generating frequency tables and using Chi-square tests for independence to test for association between survey responses and medical practice type.

Results: 377 patient surveys were completed at 2 different practices during a consecutive 6-week period in 2016. Most survey respondents (85%) were not concerned about their privacy when having a scribe present. Most also said that they would like for their other doctors to have scribes to type the exam notes (74%) and felt that having a scribe to type notes for the doctor improved the overall quality of their visit (85%).

Conclusions: In this particular sample, scribes increased patient satisfaction during a patient’s outpatient office visit with a physician—and with no reported concern about loss of privacy. There is potential for the results to increase awareness of the benefits of using scribes, particularly the effect on patient satisfaction. Further studies regarding patient satisfaction with scribe use in the outpatient office setting should be considered in all specialties.

Electronic medical records have introduced new challenges, one of which is the impact on patient-provider communication. Concurrently, patient satisfaction and patient-centered care are receiving increasing attention and becoming regarded as essential to a positive patient experience. In the near future, physician and hospital reimbursement will include metrics that assess patient satisfaction with care.¹

The need to electronically document the patient visit has resulted in a computer becoming an integral part of every patient encounter. Such technology has led to mixed results in terms of cost, efficiency, workflow, and patient-provider interaction.² A survey of primary care physicians using the Epic electronic health record system found that the majority felt it adversely affected eye contact with their patients,² largely because physicians want to finish charting during clinical time rather than after hours.³ In some outpatient physician practices, the work of documentation has been reassigned to free the
physician from this clerical task. Trained staff known as “scribes” have taken on the duty of transcribing notes and conversations between the physician and patient. Scribes are documented in the literature as early as the mid-1970s working in emergency rooms. According to The Joint Commission, the goal of using scribes is to allow the physician or licensed practitioner to spend more time with the patient, while maintaining accurate documentation. Making physicians more efficient with scribes could improve patient satisfaction.

Using scribes has many benefits, including positive effects on teamwork, potential improved patient satisfaction, and expanding the role of the doctor’s assistant beyond preparing patients and collecting data. Economic incentives for using scribes have been documented, which include enhancing physician productivity, gaining revenue, potentially impacting the length of stay in acute care settings, potentially improving documentation, and eliciting change in case mix index.

The patient experience is a key focus for patient-centered care. Based on our review of the literature, this study appears to be the first to evaluate scribe use that is solely focused on patient satisfaction.

Methods

A paper form survey of 5 brief questions was developed to ask patients about their perceptions of how the use of the scribe affected their physician visit (Fig. 1). The survey was developed by the authors following a literature review of scribe use; items were selected to reflect the concept of patient satisfaction. The survey tool has face validity, a subtype of content validity of a research instrument. To our knowledge, no validated, reliable survey tool in the literature focuses on patients’ perceptions of scribe use. Press Ganey and other published patient satisfaction surveys did not have questions that address scribe use. The surveys were anonymous, and no patient identifiers were collected.

A convenience sample of outpatient physician practices using scribes was recruited. Practices allowed patients to voluntarily take part in providing feedback on the use of scribes. Participating physician practices distributed the paper survey to their patients at the end of each office visit. Patients were given the option to complete the survey and return it to a specific receptacle before exiting the office.

Patients were only offered the survey when the scribe was present with the physician for the entire office visit. The scribe typed what the physician said about findings on the exam and documented the physician’s full discussion with the patient, all in front of the patient with the physician in the room. Patients were informed of the purpose of the survey, and implied consent was considered to be obtained if the survey was completed and returned. Surveys were collected by a member of the research team on a weekly basis. This study was reviewed and approved by our organization’s Institutional Review Board.

The anonymous patient survey was implemented in 2 participating physician practices during a consecutive 6-week period in 2016. An ophthalmology practice participated for 6 weeks, and a neurosurgery practice participated for 4 weeks.

The survey defined the scribe as “the person who was typing notes in the computer during [the patient’s] interaction and examination with the doctor.” With the exception of 1 question asking about previous experience with scribes, patients

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**Figure 1**

Patient experience survey.

### PATIENT EXPERIENCE SURVEY

The person who was typing notes in the computer during your interaction and examination with the doctor is called a “Scribe.” Below are questions that ask you about your experience with having a scribe to assist the doctor during your visit.

You can voluntarily (your choice) take this survey, answering these questions does not affect the care you will receive, you will not be identified, and you will not receive any compensation for taking this survey. By taking this survey you are providing implied consent. Your responses are part of a study to better understand how you feel about having a scribe involved in your doctor visit. Thank you for your time!

1. Have you visited a doctor in the past year who had a scribe to type his or her exam notes?
   - **Yes**
   - **No**
   - **Don’t Know**

2. I felt like I was able to participate more in my care since I heard what the doctor told the scribe to type.
   - **Strongly Agree**
   - **Agree**
   - **Uncertain**
   - **Disagree**
   - **Strongly Disagree**

3. I felt like my doctor was able to better listen & communicate with me because there was a scribe to type.
   - **Strongly Agree**
   - **Agree**
   - **Uncertain**
   - **Disagree**
   - **Strongly Disagree**

4. I am concerned about my privacy with having a scribe present.
   - **Strongly Agree**
   - **Agree**
   - **Uncertain**
   - **Disagree**
   - **Strongly Disagree**

5. I would like my other doctors to have scribes to type the exam notes.
   - **Strongly Agree**
   - **Agree**
   - **Uncertain**
   - **Disagree**
   - **Strongly Disagree**

6. Having a scribe to type note for the doctor improved the overall quality of my visit.
   - **Strongly Agree**
   - **Agree**
   - **Uncertain**
   - **Disagree**
   - **Strongly Disagree**

**THANK YOU FOR TAKING TIME TO COMPLETE THIS SURVEY!**

Please give your survey to a member of the office staff or put it in the box to collect the surveys before you leave the office.
responded to the remaining 5 questions using Likert items on a scale of 1 (strongly disagree) to 5 (strongly agree). Descriptive statistics (frequency, percent) were generated aggregately and for subgroups based on medical specialty and patients’ experience with scribes in the past year using Stata 14 (StataCorp, College Station, TX).

Chi-square tests for independence gauged any association between survey response and medical practice type as well as whether patients had a visit in the past year to a doctor with a scribe. A web-based Chi-square calculator was used for the analysis. Post-hoc Chi-square tests for independence made pairwise comparisons using a Bonferroni correction factor of 0.5/3.

**Results**

A total of 377 patient surveys were completed: 177 from ophthalmology and 200 from neurosurgery. There were 3425 office visits for these 14 physicians over the study period; thus, 11% (377/3425) of patients seen at these practices were surveyed during the study period. The percentage of ophthalmology patients completing the survey was 12.1% (177/1458), followed by neurosurgery at 10.2% (200/1967).

Overall, 82% of survey respondents agreed or strongly agreed that they were able to participate more in their care since they heard what the doctor told the scribe to type. Approximately 86% of survey respondents agreed or strongly agreed that the doctor was able to better listen and communicate with the patient because there was a scribe to type. The majority (85%) of survey respondents disagreed or strongly disagreed that they were concerned about their privacy with having a scribe present. Most survey respondents (74%) agreed or strongly agreed that they would like for their other doctors to have scribes to type exam notes, and 85% agreed or strongly agreed that having a scribe to type notes for the doctor improved the overall quality of their visit (Fig. 2).

Results were stratified by medical practice type and whether patients had a visit in the past year to a doctor with a scribe (Table 1). Data met the assumptions for the Chi-square test of independence. There was a significant association ($\chi^2 = 7.90; P = .02$) in survey response category across...
medical practice type with regard to whether patients felt they were able to participate more in their care because they heard what the doctor told the scribe to type. Survey responses were not significantly associated with medical practice type for any of the other survey questions.

A significant association was found between survey response categories and whether the patient has visited a doctor in the past year where a scribe typed exam notes for every survey question. Post-hoc tests revealed a significant difference for all 5 survey items in the responses of those who answered “yes” versus “I don’t know” when asked, “Have you visited a doctor in the past year who had a scribe to type his or her exam notes?” A significant difference also emerged in the responses for 3 survey items for those who answered “no” versus “I don’t know” when asked, “Have you visited a doctor in the past year who had a scribe to type his or her exam notes?” No significant difference existed for any question between those who responded “yes” versus “no” (Table 2).

**Discussion**

Heaton and Schultz conducted systematic reviews of the literature, but found only a limited number of published, peer-reviewed research articles on scribe use, with none of the studies in these reviews taking into account patient satisfaction alone. Other researchers have examined patient satisfaction as a secondary outcome with scribe use across various medical practice types. One study by Sondi et al raised concerns about whether using a dictation system or live scribe in front of the patient may seem rude to the patient. In 2014, Bastani et al examined patient satisfaction as a secondary outcome of emergency department visits after implementing a com-

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**Table 1**

<table>
<thead>
<tr>
<th>Question</th>
<th>Ophthalmology</th>
<th>Neurosurgery</th>
<th>Has the patient visited a doctor in the past year who had a scribe to type his or her exam notes?</th>
<th>N*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I felt like I was able to participate more in my care since I heard what the doctor told the scribe to type.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D/SD</td>
<td>22 (6.0)</td>
<td>4 (2.3)</td>
<td>18 (9.1)</td>
<td>72 (19.0)</td>
</tr>
<tr>
<td>Uncertain</td>
<td>49 (13.0)</td>
<td>24 (13.5)</td>
<td>25 (12.6)</td>
<td>255 (68.1)</td>
</tr>
<tr>
<td>A/SA</td>
<td>304 (81.0)</td>
<td>149 (84.2)</td>
<td>155 (78.3)</td>
<td>439 (114.5)</td>
</tr>
<tr>
<td>I felt like my doctor was able to better listen and communicate with me because there was a scribe to type.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D/SD</td>
<td>20 (5.3)</td>
<td>5 (2.8)</td>
<td>15 (7.6)</td>
<td>135 (36.0)</td>
</tr>
<tr>
<td>Uncertain</td>
<td>34 (9.1)</td>
<td>16 (9.0)</td>
<td>18 (9.1)</td>
<td>106 (28.0)</td>
</tr>
<tr>
<td>A/SA</td>
<td>321 (85.6)</td>
<td>156 (88.1)</td>
<td>165 (83.3)</td>
<td>534 (140.0)</td>
</tr>
<tr>
<td>I am concerned about my privacy with having a scribe present.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D/SD</td>
<td>317 (84.8)</td>
<td>155 (88.1)</td>
<td>162 (81.8)</td>
<td>398 (105.0)</td>
</tr>
<tr>
<td>Uncertain</td>
<td>23 (6.1)</td>
<td>7 (4.0)</td>
<td>16 (8.1)</td>
<td>40 (10.5)</td>
</tr>
<tr>
<td>A/SA</td>
<td>34 (9.1)</td>
<td>14 (7.9)</td>
<td>20 (10.1)</td>
<td>36 (9.5)</td>
</tr>
<tr>
<td>I would like my other doctors to have scribes to type the exam notes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D/SD</td>
<td>23 (6.2)</td>
<td>6 (3.4)</td>
<td>15 (7.7)</td>
<td>124 (32.5)</td>
</tr>
<tr>
<td>Uncertain</td>
<td>74 (19.9)</td>
<td>34 (19.4)</td>
<td>40 (20.5)</td>
<td>194 (51.0)</td>
</tr>
<tr>
<td>A/SA</td>
<td>275 (73.9)</td>
<td>135 (77.2)</td>
<td>140 (71.8)</td>
<td>384 (101.0)</td>
</tr>
<tr>
<td>Having a scribe to type notes for the doctor improved the overall quality of my visit.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D/SD</td>
<td>22 (5.9)</td>
<td>8 (4.5)</td>
<td>14 (7.1)</td>
<td>13 (3.4)</td>
</tr>
<tr>
<td>Uncertain</td>
<td>34 (9.1)</td>
<td>12 (6.8)</td>
<td>22 (11.2)</td>
<td>13 (3.4)</td>
</tr>
<tr>
<td>A/SA</td>
<td>318 (85.0)</td>
<td>157 (88.7)</td>
<td>161 (81.7)</td>
<td>357 (91.2)</td>
</tr>
</tbody>
</table>

Only the items with survey responses from the 377 returned surveys are included in the data; some items were not answered, thus the slight variation in the numbers and percentages seen in the table.

D/SD, disagree/strongly disagree; A/SA, agree/strongly agree

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puterized physician order entry. With use of Press Ganey surveys, they showed that scribe use brought patient satisfaction back to its level before initiation of the physician order entry system. However, no improvement was gained in patient satisfaction from the initial baseline.\textsuperscript{17}

Koshy et al studied patient and physician satisfaction with scribe use in a urology practice. Results showed patients were not concerned about privacy with the use of a scribe, and patient satisfaction was unaffected by scribe use.\textsuperscript{18}

Our study collected data on patient perceptions of medical scribe use for medical record documentation during an outpatient visit as measured by a brief, anonymous, self-reported survey taken at the conclusion of the office visit. Results showed overwhelming patient satisfaction.

Eleven percent of patients seen at participating offices during the study time completed surveys. A limitation of this study is whether the true survey response rate is higher than 11%. It is unknown, since the researchers are unable to determine how many of the total office visits were eligible for the study due to the type of visit or whether the scribe were present for the entire visit. In all offices, staff members were aware that the patient surveys were not intended to grade scribes, but only to understand patient perception of the use of scribes.

Future studies should consider cost effectiveness and other outcomes of scribe use. Differences in training or professional designation of staff used as scribes may also prove significant.

Conclusion

Our study showed that the patients in this sample expressed satisfaction with having a scribe present during the outpatient office visit. Privacy issues were not reported as a concern with this sample. A majority of respondents (74%) indicated they would like to have scribes present to type physicians’ notes for their other outpatient visits. There is potential for the results to increase awareness of the benefits of using scribes, particularly the effect on patient satisfaction. The presence of the scribe may improve the overall patient experience, as our results showed patients felt that their doctors had more time to listen and communicate.

This study can be considered a first step in attempting to analyze the impact of medical scribes on outpatient office visits in a large health system. Because patient satisfaction is a major factor in future reimbursement, use of scribes in all medical specialty outpatient practices should be studied.

### Table 2

<table>
<thead>
<tr>
<th>Perception</th>
<th>( \chi^2 )</th>
<th>( P ) Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I felt like I was able to participate more in my care since I heard what the doctor told the scribe to type.</td>
<td>20.20</td>
<td>.004</td>
</tr>
<tr>
<td>Yes vs. No (prior experience with scribes)</td>
<td>0.96</td>
<td>.62</td>
</tr>
<tr>
<td>Yes vs. Uncertain</td>
<td>19.01</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>No vs. Uncertain</td>
<td>11.69</td>
<td>.003</td>
</tr>
<tr>
<td>I felt like my doctor was able to better listen and communicate with me because there was a scribe to type.</td>
<td>12.74</td>
<td>.01</td>
</tr>
<tr>
<td>Yes vs. No</td>
<td>1.58</td>
<td>.45</td>
</tr>
<tr>
<td>Yes vs. Uncertain</td>
<td>11.18</td>
<td>.004</td>
</tr>
<tr>
<td>No vs. Uncertain</td>
<td>6.73</td>
<td>.04</td>
</tr>
<tr>
<td>I am concerned about my privacy with having a scribe present.</td>
<td>11.68</td>
<td>.02</td>
</tr>
<tr>
<td>Yes vs. No</td>
<td>4.14</td>
<td>.13</td>
</tr>
<tr>
<td>Yes vs. Uncertain</td>
<td>8.39</td>
<td>.02</td>
</tr>
<tr>
<td>No vs. Uncertain</td>
<td>4.13</td>
<td>.13</td>
</tr>
<tr>
<td>I would like my other doctors to have scribes to type the exam notes.</td>
<td>14.72</td>
<td>.005</td>
</tr>
<tr>
<td>Yes vs. No</td>
<td>1.41</td>
<td>.49</td>
</tr>
<tr>
<td>Yes vs. Uncertain</td>
<td>12.03</td>
<td>.002</td>
</tr>
<tr>
<td>No vs. Uncertain</td>
<td>12.21</td>
<td>.002</td>
</tr>
<tr>
<td>Having a scribe to type notes for the doctor improved the overall quality of my visit.</td>
<td>13.34</td>
<td>.01</td>
</tr>
<tr>
<td>Yes vs. No</td>
<td>2.89</td>
<td>.24</td>
</tr>
<tr>
<td>Yes vs. Uncertain</td>
<td>12.86</td>
<td>.002</td>
</tr>
<tr>
<td>No vs. Uncertain</td>
<td>4.39</td>
<td>.11</td>
</tr>
</tbody>
</table>

*\( P < .05 \) indicates statistical significance
References


Implementation of a Clinical Management Pathway to Shorten Time to Antibiotic Delivery in Febrile Patients With Sickle Cell Disease in a Pediatric Emergency Department

Jeremy Loberger, MD; Julia Sharp, PhD; and Kevin Polley, MD

From the Pediatric Critical Care Fellowship Program, Department of Pediatrics, University of Alabama Birmingham, Birmingham, Ala (J.L.); Department of Statistics, Colorado State University, Fort Collins, Colo (J.S.); and Department of Emergency Medicine, Greenville Health System, Greenville, SC (K.P.)

Abstract

Background: Children with sickle cell disease are at increased risk for serious bacterial infections due to functional asplenia. When these children present for evaluation for fever, early administration of empiric antibiotics reduces morbidity and mortality. The American Academy of Pediatrics recommends that antibiotics be administered within 60 minutes of presentation to the hospital. Our primary objective was to shorten the time to delivery of the first dose of antibiotics for patients with sickle cell disease and fever in our pediatric emergency department by creating and implementing a clinical management pathway.

Methods: We developed a clinical management pathway for treatment of febrile children with sickle cell disease. Data for pre- and post-intervention cohorts were obtained using a retrospective chart review of pediatric emergency room encounters where a history of both fever and sickle cell disease were documented. The primary outcome measured was time to first dose of antibiotics, which was compared between pre- and post-intervention using a two-sample t-test. Secondary outcomes included the percentage of patients who received appropriate laboratory work-up and appropriate antibiotics.

Results: After implementation of the pathway, time to first dose of antibiotics decreased significantly from 2.22 hours (SD = 1.36; n = 46 visits) to 1.56 hours (SD = 1.13; n = 69 visits) (\( P = .006 \)). The percentage of patients who received appropriate laboratory work-up and appropriate antibiotics also demonstrated a statistically significant improvement following intervention.

Conclusions: Implementing a standardized, evidence-based clinical management pathway for administering antibiotics quickly to febrile children with sickle cell disease can be an effective strategy for improving care in the pediatric emergency department.

Patients with sickle cell disease (SCD) are at increased risk for severe bacterial infections as a result of functional asplenia secondary to auto-infarction. Only 12% of infants with SCD have intact splenic function by 12 months of age. Encapsulated organisms such as Streptococcus pneumoniae and Haemophilus influenzae are of particular concern. However, patients with SCD are also at risk for infections with other organisms such as Escherichia coli, Salmonella sp., and Staphylococcus aureus.

Introduction of the 23-valent polysaccharide Streptococcus pneumoniae vaccine (PPSV23) in 1990 and the 7-valent pneumococcal protein-conjugate vaccine (PCV7) in 2000 has greatly reduced, but not eliminated, the risk of invasive pneumococcal disease. Furthermore,
non-vaccine preventable strains of pneumococcus still cause invasive disease.\textsuperscript{7,9} More recently, the 13-valent pneumococcal protein-conjugate vaccine (PCV13) was introduced. Its impact on the incidence of serious bacterial infection in patients with SCD, however, remains to be seen. Therefore, despite improvements in vaccine prevention, this patient population remains vulnerable to serious morbidity and mortality resulting from serious bacterial infection.

Fever can be the first sign of serious illness in the patient with SCD and should be treated as a medical emergency, triggering aggressive laboratory evaluation as well as empiric antibiotic therapy. Typical antibiotic selection for treating the stable SCD patient with fever is a third-generation cephalosporin such as ceftriaxone, thanks to its effective coverage of most strains of pneumococcus and its broad spectrum of activity.\textsuperscript{10} In the unstable patient, high doses of ceftriaxone are used in conjunction with an anti-staphylococcal antibiotic such as vancomycin. This combination therapy should be considered strongly in communities where resistant pneumococcal bacteria strains are prevalent.

There is significant interest in identifying SCD patients with fever who are at the greatest risk of invasive bacterial infections to help guide disposition. Unfortunately, not a single set of universally accepted risk criteria exists, as most studies were performed in the pre-PCV7 vaccine era.\textsuperscript{11-13}

In addition to any risk criteria used, it is important to obtain patient care information and advice from the patient’s primary pediatric hematologist to help guide disposition and discharge planning. The hematologist is likely aware of the patient’s baseline hematologic values, past medical history, and current risk status.

The American Academy of Pediatrics (AAP) has published best practice recommendations for children with SCD, including recommendations for managing these patients in the setting of fever. The AAP recommends administering parenteral, broad-spectrum antibiotics to patients within 60 minutes of triage. Additionally, the minimum recommended laboratory evaluation should include a complete blood count (CBC), reticulocyte count, and blood culture.\textsuperscript{14} These recommendations are consistent with many published guidelines.\textsuperscript{15-17} Specifically, the 60-minute threshold aligns with the American College of Critical Care Medicine recommendations for managing pediatric and neonatal septic shock.\textsuperscript{18}

Febrile patients with SCD frequently present to the emergency department (ED) for evaluation. As a result, demand is increasing for rapid patient transit through the ED, as prolonged length of stay has been linked to reduced quality of care and a rise in adverse events.\textsuperscript{19}

It is also critical that the ED provider be allowed sufficient time to consider situations necessitating a greater degree of complex clinical decision making while still providing efficient, high-quality care to a high volume of patients.\textsuperscript{20,21} One way to help facilitate this goal is to implement clinical management pathways for commonly occurring patient complaints where best practice guidelines exist.\textsuperscript{22-24} The goal of these pathways is not to supplant clinical decision making, but rather to provide a framework that increases efficiency and quality of care through compliance with best practice guidelines.\textsuperscript{22}

Preliminary analyses demonstrated that the recommended 60-minute threshold for administering antibiotics was not met in the majority of encounters in our pediatric ED. Therefore, as a quality improvement measure to shorten the average delivery time of the first dose of antibiotics to less than 60 minutes as recommended by the AAP, we created and implemented a clinical management pathway for patients with SCD and fever. Secondary aims included improving antibiotic selection and ensuring that patients receive the minimum recommended laboratory evaluation.

Methods
A clinical management pathway for patients presenting to our pediatric ED with both SCD and fever was developed in collaboration with a pediatric ED physician and a pediatric hematologist/oncologist. Recommendations for laboratory work-up, antibiotic choice, and risk stratification criteria were determined by evidence-based literature review and AAP best practice recommendations. Once created and approved by both departments, the pathway was presented to all ED physicians and nursing staff 1 week before implementation (April 1, 2014) (Fig. 1). The pathway was again presented approximately halfway through the intervention period at a department-wide morbidity and mortality conference that highlighted a case of pneumococcal septic shock in a young child with SCD. The pathway was also posted prominently at physician and nursing staff work stations inside the ED.

A retrospective chart review was completed for 1 year before intervention (March 2013–March
IMPROVING TIME TO ANTIBIOTICS IN A PEDIATRIC ED

2014) and after intervention (April 2014–April 2015). Chart review was conducted by a single physician reviewer (J.L.). Pre-intervention reviews were completed in 6-month intervals. Post-intervention reviews were completed in 3-month intervals.

Inclusion criteria for a patient encounter were 1) a documented International Statistical Classification of Disease-9 code for SCD in any ED visit, 2) patient age 2 months to 18 years, and 3) a documented objective or subjective history of fever. Although a numerical threshold for fever was used in the pathway, none was used in the chart review since this threshold was not reliably documented in the patient’s medical record. For inclusion in the study, a history of fever needed only to be noted in the medical record by physician or nursing triage documentation. All patient encounters occurring within the specified date ranges, and meeting all inclusion criteria, were included in the study.

Data collection included triage time, antibiotic administration time, name of antibiotic administered, laboratory studies obtained, blood culture result (if obtained), and length of stay (if applicable).

Triage time was considered to be time zero. End time was the time of antibiotic administration as documented by nursing staff. Antibiotic selection was considered appropriate when it included 1 of those recommended in the management pathway.

Figure 1
Clinical management pathway for febrile patients with sickle cell disease who present to the pediatric ED.

**Clinical Low-Risk Criteria**
- >12 months
- Well-appearing
- No concerns for VOC, sequestration, ACS
- Tolerating PO
- No new hypoxia
- Oxygen saturation ≥92% if unknown baseline
- Room air saturation <3% below baseline

**Laboratory Low-Risk Criteria**
- Hgb >5
- Retic >1% (unless Hgb >10)
- No drop >2 grams in Hgb
- WBC >5K & <30K
- CXR without infiltrate
- UA (if indicated)

**Social/PMHx Low-Risk Criteria**
- No hx of Rocephin in last 8 weeks
- Bacteremia, sepsis, sequestration
- Multiple visits for same febrile illness
- No hx of PCN noncompliance, delayed immunizations
- Likelihood of good follow-up (relatable phone/car, no hx of missed appts, not in shelter)

**Empiric Antibiotics**
- Within 60 minutes of triage*

**Sickle Cell Disease w/Fever**
- 2 months to 18 years old

**Current Temp OR History of Temp**
- ≥101.5 F

**Vancomycin & Rocephin**
- 15 mg/kg/dose
- 75-100 mg/kg/dose
- If unstable/septic

**Clindamycin**
- 10-15 mg/kg/dose
- Hx of cephalosporin allergy (max 1.6 grams)**

**Rocephin**
- 50-75 mg/kg/dose
- Max dose 2 grams

**All Patients**
- Contact hematologist on call to discuss disposition/follow-up

* Abx should not be delayed for lab studies.
** PCN allergies are not a contraindication to Rocephin.
or when an equivalent drug was given based on its spectrum of activity, patient allergy, or a documented contraindication.

An independent two-sample t-test assuming similar variances for individuals presenting before and after intervention was conducted to compare the average time to first antibiotic for the pre- and post-intervention cohorts. An independent two-sample test of proportions (Z) was conducted for each percentage that received ceftriaxone or another appropriate antibiotic, had a blood culture obtained, had a CBC obtained, and had a reticulocyte count obtained. All analyses were conducted in SAS (version 9.3, SAS Institute). A statistical threshold of .05 was used for all tests as a measure of statistical significance.

Results

A total of 121 unique patient encounters were reviewed and included in the data analysis.

The pre-intervention cohort included 52 patients; the post-intervention cohort included 69 unique patient encounters. All encounters occurred in the same pediatric ED. When determining mean time to first dose of antibiotics in the pre-intervention cohort, 6 patients were not included because they did not receive any antibiotics in the ED. However, these excluded patient encounters were considered in other analyses because the patients received a laboratory work-up.

Overall, mean time to antibiotic administration was significantly shorter in the post-implementation cohort (pre-implementation: 2.2 hours vs. post-implementation: 1.56 hours; \( P = .006 \)) (Table 1) (Fig. 2). Moreover, the proportion of patients who received antibiotics within 60 minutes of triage increased significantly following pathway implementation (17.4% vs. 37.9%; \( P = .010 \)) (Table 2). The proportion of patients who received antibiotics between 1 and 2 hours of triage also increased post-implementation. This increase, however, was not statistically significant (30.4% vs. 39.1%; \( P = .170 \)) (Table 2). The proportion of patients who received antibiotics more than 2 hours from triage was significantly lower following pathway implementation (52.2% vs. 23.2%; \( P < .001 \)) (Table 2).

A significantly higher proportion of patients received appropriate antibiotics following pathway implementation (pre-intervention: 86.5% vs. post-implementation: 98.6%; \( P = .004 \)) (Table 3). The rate of recommended laboratory work-up performed was also significantly improved: blood

### Table 1
Average time (hours) to first dose of antibiotics pre- versus post-intervention.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention Cohort</th>
<th>Post-Intervention Cohort</th>
<th>Test Statistic (df), ( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>46</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>Time to first dose (hours), mean ±SD</td>
<td>2.22 (±1.36)</td>
<td>1.56 (±1.13)</td>
<td>( t(113) = -2.83, P = .006 )</td>
</tr>
<tr>
<td>SD, standard deviation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2
Breakdown by time for first dose of antibiotics pre- versus post-intervention.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention Cohort</th>
<th>Post-Intervention Cohort</th>
<th>Test Statistic (df), ( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>52</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>Time to first dose, no. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤60 mins</td>
<td>9 (17.3)</td>
<td>26 (37.7)</td>
<td>( Z = 2.34, P = .010 )</td>
</tr>
<tr>
<td>&gt; 60 mins and &lt;120 mins</td>
<td>16 (30.8)</td>
<td>27 (39.1)</td>
<td>( Z = 0.95, P = .170 )</td>
</tr>
<tr>
<td>≥120 mins</td>
<td>27 (51.9)</td>
<td>16 (23.2)</td>
<td>( Z = 3.20, P &lt; .001 )</td>
</tr>
<tr>
<td>SD, standard deviation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
From the 112 blood cultures reviewed in the 2-year study period, 5 had positive results (4.4%). Of these 5 cultures, 3 were classified as contaminants and 2 as clinically significant. One of the positive cultures was Streptococcus pneumoniae with the patient developing septic shock (0.89% of all collected blood cultures). Approximately 41.3% of all study patients were admitted to the hospital. Mean length of stay was 3.7 days.

Discussion

These data showed implementation of a clinical management pathway in our pediatric ED to have a significant impact on the timeliness and quality of care provided to pediatric patients with SCD and fever. While the overall mean time to first dose of antibiotics was still higher than 60 minutes post-pathway implementation, we did experience a significant increase in the proportion of patients treated within 60 minutes ($P = .010$) and a significant decrease in patients waiting more than 2 hours ($P < .001$).

Appropriate antibiotics were administered in 98.6% of encounters in the post-intervention group. This figure was significantly higher than the pre-intervention group, demonstrating the priority placed on timely administration of appropriate antibiotics in the clinical management pathway ($P = .004$). Significant improvements were also seen in the proportion of patients who received the recommended laboratory tests outlined in the pathway, including blood cultures, CBC, reticulocyte count, and BMP or CMP.

The incidence of bacteremia in febrile patients with SCD varies in the literature, with reports ranging from 0.8% to 4.0%. The specific incidence of pneumococcal bacteremia in one study was 0.4%. Our rate of bacteremia was consistent with the findings reported in the literature. The blood culture positivity rate was 4.4%, including pathogenic and suspected skin contaminant bacteria. The incidence of true pathogenic bacteremia, however, was 1.8%. We had 1 case of pneumococcal bacteremia, correlating with a 0.9% incidence rate.

Similar published quality improvement initiatives for pediatric patients with SCD and fever were not identified in our literature review. One study by Rutman et al reported on a clinical management pathway targeted toward increasing evidence-based care delivered to patients with asthma in a pediatric ED. Similar to our findings, they demonstrated statistically significant improvements in care following pathway implementation.

Two other studies sought to decrease the time to less than 60 minutes in providing antibiotics for neutropenic patients in the pediatric ED. Neutropenic patients represent a high-risk population, similar to those with SCD. Both studies yielded statistically significant decreases in the time to first dose of antibiotics and were able to achieve an average time of less than 60 minutes.

These studies’ findings, as well as ours, support implementation of a standardized treatment approach, such as a clinical pathway, for improving patient care within a pediatric ED. Given the success of these other studies, we are hopeful that our pathway will continue to yield further sustainable improvements.

The strength of our project centered on a multi-disciplinary approach to solve a substantial clinical problem and improve quality of care. Tremendous clinician and staff support existed for the project among both the Emergency Medicine and Hematology/Oncology units.

This study has all the inherent limitations associated with a single-center, retrospective study. Retrospective chart review studies are only as...
strong as the documentation contained within the records reviewed. It is possible that important medical decision making was not documented. This fact would be especially important in cases where antibiotics were never administered to a patient.

Future Directions
Future directions for this project include the integration into our electronic medical record of a “Best Practice Advisory” with built-in “hard stops.” This innovation will require triage personnel to acknowledge the patient’s history of SCD and chief complaint of fever at the time of triage.

References

Conclusion
Clinical management pathways provide an opportunity to improve the quality of patient care, especially in patients at risk for significant morbidity or mortality if specific standards of care are not met. Our clinical management pathway for febrile pediatric patients with SCD presenting to the ED resulted in significant improvements in all primary and secondary outcomes assessed. It is our hope that these improvements will continue with the ultimate goal of meeting all best practice recommendations for this patient population.

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Abbreviations and Acronyms
SCD = sickle cell disease; AAP = American Academy of Pediatrics; CBC = complete blood count; ED = emergency department; BMP = basic metabolic panel; CMP = complete metabolic panel


A mucocele is a rare but often serious condition that affects the appendix. It is found in approximately 0.3% of appendectomy specimens. A mucocele refers to distention of the appendiceal lumen by mucin. This distension can be secondary to several causes, including retention cyst, mucosal hyperplasia, or neoplasia secondary to cystadenoma or cystadenocarcinoma. Mucoceles often cause signs and symptoms that mimic appendicitis, leading to an eventual diagnosis during imaging work-up or postoperatively by pathology. Current standard of care for mucoceles is surgical excision with clear margins. However, the particular modality used for appendectomy to treat a mucocele remains controversial. Many surgeons argue that the risk of spillage of mucin and subsequent pseudomyxoma peritonei mandates an open approach. Conversely, several case reports or small case series describing successful results using a laparoscopic approach have been conducted. To further add to the data, we present our experience and short-term outcomes of laparoscopic appendectomy for 15 patients with suspected appendiceal mucoceles.

Methods

Following approval from our Institutional Review Board, a prospective database was used to identify all patients with suspected appendiceal mucocele who underwent a laparoscopic appendectomy between January 2006–October 2015. All patients with suspicious CT (computed tomography) findings for mucocele or suspicious...
LAPAROSCOPIC MANAGEMENT OF MUCOCELES

findings intraoperatively were included in this study (N = 15). Patient charts were then retrospectively reviewed for additional data.

Data collection included patient demographics and comorbidities, lesion characteristics, diagnostic method, intraoperative data, final pathology, and follow-up data. The primary endpoint was complications. Although all patients underwent a laparoscopic appendectomy, the specific steps of the procedure, method of transection of the appendix and mesoappendix, and removal of the appendix were left to surgeon discretion. Descriptive analysis of patient demographics is reported as frequency and percentage; additional analysis on mucocele sizes and follow-up times is reported as means and standard deviations (SD).

Results
During our study period, 15 consecutive cases met inclusion criteria. Patient characteristics are described in Table 1. The average patient was Caucasian (66.7%), female (60%), and had a mean age of 57.7 ± 16.3 years. Average lesion size on CT imaging was 2.29 cm ± 2.25 cm, and all were suspicious on imaging for mucocele. Most lesions (80%) were identified preoperatively with CT. Only 1 patient had a CT performed emergently for right lower quadrant pain. The majority of the patients who underwent preoperative CT imaging had imaging performed for other reasons, most commonly for follow-up of renal calculi, hematuria, and diverticulitis. The remaining 20% (n = 3) of lesions were identified intraoperatively. From those mucoceles not identified preoperatively, all 3 lesions appeared suspicious on visual inspection by the operating surgeon.

All procedures included appendectomy. However, a small number of patients also underwent endometriosis ablation (n = 2), cholecystectomy (n = 1), or small bowel resection (n = 1). Mean estimated blood loss was 10 cc ± 0 cc. A majority of the surgical procedures (n = 12, 80%) were performed by general surgeons; however, a small number were performed by the colorectal service (n = 2) and surgical oncology service (n = 1).

With regard to final pathology, 1 specimen showed evidence of early appendicitis. Final pathologies reported included simple mucocele (n = 5), mucinous cystadenoma (n = 3), mucinous cystadenoma with low-grade dysplasia (n = 6), and mucinous cystic neoplasm with high-grade dysplasia (n = 1). Only 1 lesion had evidence of a positive margin; none had evidence of rupture; and 5 lesions (33%) had evidence of dissecting mucin. The patient with evidence of positive margins did undergo additional surgery for small bowel resection to achieve clear margins. The mean size of the resected lesions upon pathologic review was 2.1 cm ± 1.8 cm.

Follow-up was documented in 13 of the 15 patients, with a mean time of 3.5 ± 2.8 years. There was 1 long-term mortality secondary to breast cancer. Upon review, 33% (n = 5) of patients had undergone colonoscopy postoperatively. No postoperative complications were reported on follow-up visits, and no documentation of symptoms of recurrence or radiographic evidence of recurrence or pseudomyxoma peritonei was found.

Table 1
Patient and lesion characteristics.

<table>
<thead>
<tr>
<th>N</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean ± SD</td>
<td>57.7 ± 16.3</td>
</tr>
<tr>
<td>Female gender</td>
<td>9 (60.0)</td>
</tr>
<tr>
<td>Race, no. (%)</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>10 (66.7)</td>
</tr>
<tr>
<td>African American</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Asian</td>
<td>1 (6.7)</td>
</tr>
<tr>
<td>Latino</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Diabetes mellitus, no. (%)</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Hypertension, no. (%)</td>
<td>8 (53.3)</td>
</tr>
<tr>
<td>Coronary artery disease, no. (%)</td>
<td>1 (6.7)</td>
</tr>
<tr>
<td>Smoking status, no. (%)</td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>1 (6.7)</td>
</tr>
<tr>
<td>Former smoker</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Follow-up time, mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td>1282 ± 1011</td>
</tr>
<tr>
<td>Years</td>
<td>3.5 ± 2.8</td>
</tr>
<tr>
<td>Positive margins, no. (%)</td>
<td>1 (6.7)</td>
</tr>
<tr>
<td>Dissecting mucin, no. (%)</td>
<td>5 (33.3)</td>
</tr>
<tr>
<td>Lesion size (cm), mean ± SD</td>
<td></td>
</tr>
<tr>
<td>On imaging</td>
<td>2.3 ± 2.3</td>
</tr>
<tr>
<td>Pathology</td>
<td>2.1 ± 1.8</td>
</tr>
<tr>
<td>SD, standard deviation</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

While rare, a mucocele of the appendix can be a serious condition. Causes include retention cyst, mucosal hyperplasia, or neoplasia secondary to cystadenoma (benign) or cystadenocarcinoma (malignant). Some appendiceal mucocele will have symptoms that mimic appendicitis, but most are discovered incidentally on imaging. A small number are also discovered incidentally during laparoscopic procedures for other indications. Our experience supports the literature, as 2 mucoceles were discovered during endometriosis ablation and 1 during a small bowel resection.

The likelihood of malignancy can be predicted preoperatively using imaging based on appearance and size. Mucoceles found to be less than 2 cm are more likely to be benign, while those greater than 2 cm are more likely to be malignant, such as that of cystadenocarcinoma. The presence of internal soft tissue attenuation and nodularity of the wall can also be predictive of malignancy.

Optimal management of appendiceal mucocele is first based on preoperative and intraoperative evaluation of the extent of the lesion. Appendectomy is safe and curative if the appendiceal mucocele is unruptured. However, a mucocele that protrudes into the cecal lumen may require partial cecectomy. A more extensive ileocecal resection, or even a right hemicolectomy, may be required to maintain adequate surgical margins if invasion into the ileum or cecal wall is evident. All of the patients in our series underwent appendectomy. None of our patients required a more extensive resection.

Intraoperative management of mucoceles remains controversial. A significant number of authors in the literature continue to support an open procedure for maximum patient safety. Reasons are multi-factorial. First and foremost, many believe the chance of rupture—thus, potential for peritoneal spread—to be lower in open versus laparoscopic appendectomy. Additionally, it is important during the case to survey the abdomen for evidence of pseudomyxoma peritonei. Some authors have stated this goal is best accomplished through an open approach to better explore the abdomen.

We (and other authors) argue these same goals can be accomplished laparoscopically. With the rapid advancement in laparoscopes and high-definition imaging, survey of the abdominal cavity for pseudomyxoma peritonei should now be more precise using the laparoscopic approach. Authors of a case series recently published on the laparoscopic approach have also outlined several steps to ensure reduced risk of rupture; these steps include strictly avoiding the following: grasping the tumor with instruments, using the mesoappendix for retraction, using laparoscopic retrieval bags to remove the specimen, and being willing to convert to an open procedure if the possibility of mucin spillage emerged.

We believe the results of our case series support those of other authors advocating safe removal of appendiceal mucoceles using the laparoscopic approach. Here, we presented 15 cases using the laparoscopic approach with no early postoperative complications or signs of recurrence on follow-up. It is our opinion that using the safe techniques aforementioned can provide for a procedure with less recovery time and less morbidity for the patient.

An algorithm has also been published by Dhage-Ivatury and Sugarbaker to further guide safe management and appropriate operative intervention. This algorithm consists of several factors, including evidence of the following: perforation, involvement at the base of the appendix, and evidence of positive lymph nodes. None of the patients in this case series had involvement of the base or positive lymph nodes on preoperative evaluation.

Limitations of this case series and conclusions drawn merit discussion. We presented a relatively small sample of patients, which was retrospective in nature. Although the mean follow-up was greater than 3 years, longer term follow-up is necessary. Also, these patients were not actively screened for evidence of pseudomyxoma peritonei. Instead, follow-up visits of patients in this series were screened for signs or symptoms of recurrence, including abdominal pain, bloating, distension, and weight changes. While none of the patients in this series developed these complications in the postoperative period, we are unable to provide objective proof that pseudomyxoma is not present.

Conclusion

This case series provides further support that the laparoscopic approach to treating appendiceal mucoceles is both safe and effective. Long-term follow-up, however, is needed to provide more conclusive evidence.
References


Lower Extremity Reconstruction: Revisiting the Cross-Leg Flap

Andrew Bonett, MD; S. Hannah Shirley, BS; and Wesley J. Culpepper, MD

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Abstract

Management of complex lower extremity injuries with large soft tissue defects can be challenging, especially in the setting of peripheral vascular compromise that limits treatment options. Before the 1970s, the cross-leg flap technique was widely used for lower extremity wound reconstruction. This technique, however, declined with the introduction of microvascular surgery and the free flap. Here we describe a case in which free flap reconstruction had to be aborted and the cross-leg flap was successfully used. Although seemingly an archaic technique, the cross-leg fasciocutaneous flap remains a viable option for lower extremity reconstruction in the setting of poor or limited vasculature at the recipient site. In these scenarios, in which a free flap is not possible, the cross-leg flap provides adequate soft tissue coverage with favorable cosmetic and functional results.

Management of traumatic injuries to the lower extremity with resulting soft tissue defects can be complex because of vascular insufficiency, whether pre-existing or post-traumatic. Vascular insufficiency not only compromises healing potential but also limits treatment options. In 1854, Frank H. Hamilton introduced the cross-leg flap, a technique that provides coverage for large tissue defects while limiting operative time. This technique involves a pedicled tissue transfer from the contralateral leg and is not dependent on the vasculature of the injured extremity. The cross-leg flap became widely popular during World War II as a limb salvage technique to treat injuries sustained in battle. However, with the advent of microvascular surgery and the introduction of the free flap in 1970, use of the cross-leg flap and other distant flaps declined.1,2

The free flap is currently the preferred method for treating traumatic injuries to the lower extremity.3 However, for the free flap to be successful, adequate recipient-site vasculature for microsurgical anastomosis is required.4 Consequently, when injuries present with no such recipient artery and/or vein, it is necessary to consider older techniques like the cross-leg flap. Unlike the free flap, distant flap techniques initially carry their own blood supply, allowing neovascularization to take place in the recipient wound bed.4-6 In this report, we describe successful management of an open, complex fracture of the left tibia-fibula using the cross-leg flap technique.

Case Description

A 41-year-old man presented to an outside hospital after sustaining a multi-system trauma from a motorcycle collision. On arrival, he had an obvious left lower extremity deformity without distal pulses. He was taken emergently to the operating room (OR) for external fixation of a tibia-fibula fracture. Angiography showed loss of flow in the anterior tibial artery but preserved flow of the posterior tibial and peroneal arteries. Negative-pressure wound therapy was placed over the large soft tissue defect, and the patient was transferred to our hospital for higher level care resulting from concomitant injuries.

The patient required multiple trips to the OR for further debridement before definitive fixation of the fracture. After extensive debridement and irrigation, the cross-leg flap provided adequate coverage of the large soft tissue defect. The patient was discharged from the hospital after a successful outcome and follow-up visits.
the fracture. He was left with a soft tissue defect measuring approximately 15 cm x 15 cm and a wound bed primarily consisting of bone and tendon (Fig. 1).

Because of the size of the soft tissue defect and the inability to close primarily, plastic surgery was consulted. Based on the wound bed composition and its inability to granulate secondary to the avascular structures, it was determined that split-thickness skin grafting would not be a viable option. The decision was then made to proceed with a rectus abdominis free flap to cover the left ankle defect as the dorsalis pedis and posterior tibial pulses were intact on Doppler and clinical exam.

The patient was taken to the OR and the posterior tibial artery was exposed by vascular surgery in preparation for the free flap. At that time it was discovered that when the posterior tibial artery was occluded manually, the Doppler signals to the dorsalis pedis, posterior tibial, and digital artery of the great toe were lost. Concerned that the leg had single-vessel runoff, the procedure was aborted. A repeat angiogram obtained the following day confirmed the single-vessel runoff (Fig. 2) and showed that the posterior tibial artery was supplying the dorsalis pedis artery via retrograde filling.

With the posterior tibial artery being the predominant inflow to the leg, a free flap was no longer possible because of the high risk of amputation should the flap fail. The patient was subsequently scheduled for a cross-leg flap, which he underwent 2 days later. The flap was raised as a fasciocutaneous flap from the contralateral leg. A split-thickness skin graft was harvested from the thigh of the donor leg and used to cover the flap donor site (Fig. 3).

As with any flap or graft, undue tension or shear forces deter healing. To minimize this risk, orthopaedic surgery placed both legs in external fixation with 4 kickstands to prevent pressure on the posterior calves and heels (Fig. 4). This fixation was performed in the OR immediately after the flap had been inset.

Within 3 weeks, new vascular networks had formed between the flap and the recipient site. These networks allowed the flap to be divided from its native blood supply on the donor leg and completely inset to the recipient leg on postoperative day 19. A drain was left in place to help prevent seroma and hematoma formation, and the legs were taken out of external fixation (Fig. 5).

Two months out from the initial flap, great healing had occurred, with the cross-leg flap providing a favorable skin color match (Fig. 6).
Discussion
The free flap has largely replaced the cross-leg flap in lower extremity repairs. However, our case demonstrates that certain circumstances arise for which the free flap may not be the best or safest option. The cross-leg flap is a safer, less complicated technique that allows for better matching of skin color, texture, and thickness, reduced operative time, and less donor site morbidity than distal free flaps. Moreover, a cross-leg flap does not require microsurgical capabilities and can be performed with basic equipment. Although it is not the first-line treatment for distal lower extremity reconstruction, several case reports and series have been published within the last decade demonstrating favorable outcomes as presented in this case.1,3,7,8

Clockwise from top left:

Figure 3
Cross-leg flap. The left lower extremity soft tissue defect is completely covered using a pedicled fasciocutaneous flap from the contralateral leg. A split-thickness skin graft from the right thigh covers the donor site.

Figure 4
External fixators placed at conclusion of tissue transfer.

Figure 5
Flap was divided and inset on postoperative day 19 and a drain left in place.

Figure 6
Well-healed flap 2 months after initial procedure.
The cross-leg flap was elevated at the level of the superficial muscle fascia and was perfused by fasciocutaneous perforators. One advantage of using a fasciocutaneous flap as performed here is the anatomical consistency of these perforators. With an understanding of the vascular networks, these flaps can be raised at a length:width ratio of 3:1, allowing coverage of larger defects with less concern for flap loss. The soft tissue defect in this case was approximately 15 cm x 15 cm and was comfortably covered by the fasciocutaneous flap.

Unfortunately, this procedure may not have been possible for a significantly larger defect. Those injuries often require more complicated limb salvage techniques such as the cross-leg free flap, which has been well-documented and typically involves distant muscle or myocutaneous flaps. Orthopaedic surgery also played an integral role in helping prevent against infection. A cement spacer impregnated with vancomycin was prepared and incorporated within the repair. Serial debridement of the wound before tissue transfer and placement of a wound VAC (vacuum-assisted closure) during this time were also necessary to keep the wound bed clean. Preoperative antibiotics were given before each case according to our hospital protocol.

**Conclusion**

The cross-leg fasciocutaneous flap remains a viable option for lower extremity reconstruction in the setting of poor or limited vasculature at the recipient site. In these scenarios, in which a free flap is not possible, the cross-leg flap provides adequate soft tissue coverage with favorable cosmetic and functional results. This technique should not be considered obsolete and continues to play a significant role in reconstructive surgery today.
Pregnancy is a setting that is high risk for thrombotic microangiopathies (TMA) such as thrombotic thrombocytopenic purpura (TTP) and hemolytic uremic syndrome (HUS). 1,2 Pregnancy-associated atypical hemolytic uremic syndrome (P-aHUS) occurs in about 1 in 25 000 pregnancies. The women affected by P-aHUS are typically those who are genetically susceptible. 1,3 Common TMA disorders of pregnancy that present similarly to TTP and HUS are HELLP (hemolysis, elevated liver enzymes, low platelets), preeclampsia, and eclampsia.1 Because TMAs can be life-threatening, their timely diagnosis and prompt treatment are paramount to a patient’s successful recovery.

Case Description
A 29-year-old gravida 1 woman at 41 weeks’ gestation presented for late-term induction. She had no past medical history and the pregnancy had been uncomplicated. Early in her induction, she had elevated blood pressures (BPs) between 140/90 and 160/110, which improved with oral labetalol. The initial HELLP labs were normal with the exception of low platelets (aspartate transaminase (AST) 30 U/L, alanine transaminase (ALT) 28 U/L, creatinine 0.72 mg/dL, platelets 107 Th/mm³, lactate dehydrogenase (LDH) 261 U/L. During her induction, the patient continued to have severe BPs and reported an intermittent headache. She was treated with intravenous (IV) magnesium sulfate and labetalol, as needed. Her physical exam remained benign. The patient progressed to complete dilation with persistent occiput posterior presentation, despite attempted manual rotation. Labs were drawn before her cesarean delivery for arrest of second stage: platelets 80 Th/mm³, fibrinogen 280 mg/dL, international normalized ratio (INR) 1.4. She was transfused 1 unit of fresh frozen plasma (FFP). Delivery was complicated by a postpartum hemorrhage, due to uterine atony, and was treated with hemabate, pitocin, and massage. Estimated blood loss was 1000 cc. The newborn’s Apgar scores were 9 and 10.

In the recovery room, the patient became profoundly hypotensive and tachycardic, and was empirically transfused with 2 units of platelets, 1 unit of FFP, and 1 unit of packed red blood cells (PRBCs). Stat labs were ordered: platelets 33 Th/mm³, hemoglobin 9 g/dL, creatinine 1.43 mg/dL,
AST 880 U/L, ALT 578 U/L. Urine output (UOP) was 24 cc/hr. The composite clinical picture was thought to be secondary to acute blood loss anemia in the setting of HELLP syndrome.

The patient had a second postpartum hemorrhage associated with hypotension, wherein 300 cc of clot and blood were evacuated with fundal massage. While hypotensive, the patient became confused, stating, “I am ready to have this baby.” She was reminded that she had already delivered her baby, the details of which she recalled once her BP normalized. The neurologic exam findings were normal, but the labs at this time remained abnormal (platelets 70 Th/mm³, LDH 3044 U/L).

Over the next 48 hours, the patient had periods of oliguria interspersed with low–normal UOP. During this time, her creatinine increased to 1.88 mg/dL, 2.26 mg/dL, then 2.54 mg/dL, despite a transfusion of 2 units each of PRBCs and FFP. She continued to have intermittent periods of confusion, complaining of “red spots and words” in her field of vision, “like laser pointers.”

On the evening of postoperative day (POD) 2, the patient complained of chest tightness. Crackles were present in bilateral lung fields, and furosemide was ordered because of concern for pulmonary edema. Severe BPs were noted, requiring treatment with IV hydralazine. When the patient’s nurse returned to the bedside to administer the furosemide, she found the patient with all IV sites, cuffs, and sensors removed. The patient was breathing but unresponsive to verbal stimuli. The physician was notified and, once at the bedside, saw that the patient was responsive and appropriately oriented, though frightened. As a result of acute neurologic change, a stat computed tomography (CT) was ordered to rule out hemorrhagic stroke, which was negative for any acute intracranial abnormality.

Repeat labs on POD2 returned creatinine 4.1 mg/dL, platelets 30 Th/mm³, and hemoglobin 9.5 g/dL. Nephrology was consulted and a renal ultrasound was ordered. The ultrasound demonstrated echogenic kidneys, consistent with medical renal disease. Hyponatremia was noted and 3% normal saline (NS) started.

The neurology service was consulted, and the service suspected encephalopathy secondary to posterior reversible encephalopathy syndrome (PRES). Magnetic resonance imaging (MRI) and an electroencephalogram (EEG) were ordered; unfortunately, the patient was unable to remain still long enough for an MRI.

On POD3, the patient’s creatinine was 5.89 mg/dL, and new-onset hyperkalemia was noted, prompting initiation of hemodialysis. The previously ordered EEG was read as abnormal but nonspecific. Platelets were noted to be 44 Th/mm³. Nephrology believed that the acute kidney injury was secondary to acute tubular necrosis in the setting of acute blood loss anemia.

On PODs 4 and 5, the patient’s creatinine remained stable between 5 and 6 mg/dL. An MRI was negative for any acute structural abnormality of the brain. Repeat EEG was mildly abnormal, suggestive of residual encephalopathy. Platelets were 107 Th/mm³, AST 92 U/L, ALT 232 U/L, and LDH 1233 U/L. The patient’s mental status had improved, but she still had intermittent confusion. An ADAMSTS13 level was ordered, with a concern for TTP.

On POD6, the patient’s creatinine worsened to 7.15 mg/dL, hemoglobin to 7.6 g/dL, and platelets to 78 Th/mm³. Hematology was consulted to test for plasmapheresis, which was performed. The precipitate was not phenotypically consistent with TTP.

On POD7, ADAMSTS13 resulted as mildly reduced, which was nondiagnostic for TTP and more consistent with atypical HUS. With TTP ruled out, a diagnosis of atypical HUS was highly suspected, and eculizumab was ordered. In the setting of progressively deteriorating labs, a single injection of eculizumab medication was administered, after which the patient demonstrated slow but consistent improvement in renal and hematologic parameters. After a complete work-up, her final diagnosis was autosomal recessive atypical hemolytic uremic syndrome (aHUS) associated with mutations in complement factor H-related 1 (CFHR1) protein, as well as membrane cofactor protein (MCP) CD46.

The patient was discharged home on POD13 with a plan for indefinite continuation of eculizumab injections every 2 weeks. At her 3-month follow-up appointment, a levonorgestrel intrauterine device was placed to prevent contraception. She is doing well and continues to be followed by hematology/oncology.

Discussion
Hemolytic uremic syndrome is a type of TMA that develops from congenital, infectious, or acquired causes. While the more common type of HUS is Shiga toxin-mediated, aHUS is a complement-mediated disorder with pathophysiology based on complement dysregulation.2,3
This dysregulation occurs after a genetic or acquired defect causes complement activation to go unchecked, creating membrane attack complexes. The membrane attack complex causes an inflammatory response in the endothelium leading to the clinical manifestations of renal impairment, hemolytic anemia, thrombocytopenia, and, at times, neurologic involvement.2,4

In the setting of pregnancy, symptoms of aHUS may overlap with symptoms of preeclampsia, HELLP, or eclampsia. Even so, accurate and timely diagnosis of these disorders is vital. Factors that may aid in the diagnosis include timing of onset, severity of renal impairment, severity of thrombocytopenia, and presence of neurologic involvement.2

Nearly 80% of P-aHUS cases occur postpartum, while preeclampsia and HELLP are primarily seen after 20 weeks’ gestation during the pregnancy. Only about 5% of preeclampsia occurs in the postpartum setting.1

The renal dysfunction found in P-aHUS is severe.1,2 Unregulated complement causes tissue damage such as renal impairment by inducing endothelial cell activation and producing procoagulative factors. Thrombocytopenia is the result of platelet activation by membrane attack complexes leading to platelet degranulation and aggregation. Neurologic symptoms are likely caused by reduced blood flow to the brain secondary to multiple microthrombi as well as uremia from kidney dysfunction.1,2,4

This patient had mutations in both CFHR1 protein, as well as MCP CD46. This combination of mutations has been described in only 1 other case of P-aHUS, which was successfully treated with eculizumab.1 Factor H and MCP CD46 are proteins central to the regulation of complement activation.2,4,5 They protect the endothelium and prevent events that can cause platelet aggregation and eventually consumptive thrombocytopenia.2

The frequency of factor H mutation in aHUS is 24% to 28%.2 Within 3–10 years after onset of aHUS, 70% to 80% of patients with factor H mutation experience death or end-stage renal disease.1 Isolated mutations in MCP CD46 occur at a frequency of 7% to 8% and in combination with other complement gene mutations at a frequency of up 22%.7 The 3–10 year occurrence of death or end-stage renal disease is less than 20%.1

Eculizumab is a monoclonal antibody directed against the complement component C5. It prevents the cleavage of C5, further reducing the production of C5a and the membrane attack complex. It has been shown to be superior to plasma therapy in inducing remission in patients with acute aHUS.4 We found 8 case reports of P-aHUS treated by eculizumab after 2013.12-13

With the inclusion of our case, 6 of the 9 patients required dialysis due to the development of end-stage renal disease. The timing of disease onset ranged from 17 weeks’ gestation to postpartum day 7, with only 1 case occurring during pregnancy. The average platelet nadir was 41Th/mm³.6 Six of the 9 aHUS cases occurred in the patient’s first pregnancy.

Although renal recovery with eculizumab was noted in 7 of the 9 cases, duration between onset of disease and initiation of therapy ranged from 3 days to 26 weeks.1 Earlier initiation of anti-complement therapy is associated with improved renal outcomes,1,6 which further supports the importance of timely diagnosis and treatment.

**Conclusion**

P-aHUS is a rare but life-threatening disease that is often delayed in recognition and treatment. Because P-aHUS frequently occurs in a patient’s first pregnancy without any associated history, these patients are not identified as high risk—and no protocol for screening exists. With the inability to predict who will develop this disease, we must be diligent in our efforts to diagnose and treat P-aHUS effectively. Our understanding of this disease is improved with the availability of case reports with various presentations and outcomes. Prompt diagnosis and initiation of therapy in this patient likely prevented irreversible renal damage and possibly death.

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P-AHUS SUCCESSFULLY TREATED WITH ECULIZUMAB

References

Greenville Health System’s Patient Engagement Studio

The Patient Engagement Studio is a resource for the Health Sciences Center of Greenville Health System (GHS). The studio serves all 4 academic partners (GHS, Clemson University, Furman University, and the University of South Carolina) by providing a structured opportunity for patients, community stakeholders, physicians, and academic researchers to collaborate on research projects and health system innovations. It operates with an overarching Studio Board consisting of 3 scientists (experienced in quality initiatives), 3 academic physician clinicians from GHS, 1 patient experience expert, and 8 patient partners (“experts”). This diverse Studio Board may be used by any interested researcher from the 4 academic partners.

2016–2017 Projects of the GHS Patient Engagement Studio

1. Evaluating the Effects of Acupuncture in the Treatment of Taxane-Induced Peripheral Neuropathy (TIPN)
   
   Investigators: Renee LeClair PhD; Mark O’Rourke, MD; William Hendry, DAOM; and Regina Franco, MSN, ANP-C
   
   From the University of South Carolina School of Medicine Greenville, Greenville, SC (R.L.); Department of Oncology, Greenville Health System, Greenville, SC (M.O.); Oriental Medicine Associates, Greenville, SC (W.H.); and Center for Integrative Oncology and Survivorship, Greenville Health System, Greenville, SC (R.F.)

2. Patient Preferences in the Treatment of Shoulder Pain
   
   Investigator: Melanie J. Cozad, PhD
   
   From the Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC; Steadman Hawkins Foundation, South Carolina Center for Effectiveness Research in Orthopaedics (M.J.C.); University of South Carolina School of Medicine Greenville, Greenville, SC (M.C.); and Department of Health Information Technology, University of South Carolina, Columbia, SC (F.A.)

3. Tele-Discharge Pilot Study
   
   Investigators: Tracy Weaver, BSN, MBA; Christianna Novacovik, MHA, CAPM; and Ami Hinkle, BSN, RN
   
   From the Department of Care Coordination, Greenville Health System, Greenville, SC (T.W., A.H.), and Department of Clinical Integration, Greenville Health System, Greenville, SC (C.N.)

4. Comparison of Two Survey Methods: Patient Preferences in the Treatment of Shoulder Pain
   
   Investigators: Melanie J. Cozad, PhD; Margaret Caulkins; and Faisal Alabuti
   
   From the Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC; Steadman Hawkins Foundation, South Carolina Center for Effectiveness Research in Orthopaedics (M.J.C.); University of South Carolina School of Medicine Greenville, Greenville, SC (M.C.); and Department of Health Information Technology, University of South Carolina, Columbia, SC (F.A.)

5. Motivation of Patients in the Emergency Department (MOPED)
   
   Investigators: Zachary Kahler, MD, MS, and Page Bridges, MD
   
   From the Department of Emergency Medicine, Greenville Health System, Greenville, SC, and University of South Carolina School of Medicine Greenville, Greenville, SC (Z.K., P.B.)

6. Stroke Education With Middle School Students
   
   Investigator: Thomas Nathaniel, PhD
   
   From the University of South Carolina School of Medicine Greenville, Greenville, SC (T.N.)

7. Evaluation of SmartExam As a Population Health Initiative: Impact on GHS Patients, Health System, and Greenville Population
   
   Investigator: Ronnie Horner, PhD
   
   From the Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC (R.H.)

8. Screening Program for Age-Related Cognitive Decline
   
   Investigators: Matthew Tucker, PhD, and Ronnie Horner, PhD
   
   From the Department of Biomedical Sciences, University of South Carolina School of Med-
GHS PATIENT ENGAGEMENT STUDIO PROJECTS

cine Greenville, Greenville, SC (M.T.), and Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC (R.H.)


Investigators: Cole G. Chapman, PhD; Melanie J. Cozad, PhD; John M. Brooks, PhD; Jennifer Robinson, MD, MPH; and Mary Schroeder, PhD

From the Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC; Steadman Hawkins Foundation, South Carolina Center for Effectiveness Research in Orthopaedics, Greenville, SC (C.G.C., M.J.C., J.M.B.); and Department of Pharmacy Practice and Science, Division of Health Services Research, University of Iowa College of Pharmacy, Iowa City, Iowa (J.R., M.S.)

10. Comparative Effectiveness of Surgical and Conservative Treatment for Rotator Cuff Tears in the Elderly: What Can Be Learned From Changing Rates?

Investigators: Cole G. Chapman, PhD; Melanie Cozad, PhD; Sarah Floyd, PhD; and John M. Brooks

From the Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC, and Steadman Hawkins Foundation, South Carolina Center for Effectiveness Research in Orthopaedics, Greenville, SC (C.G.C., M.J.C., J.M.B.)

11. Why Do South Carolina Breast Cancer Survivors Continue or Discontinue Endocrine Therapy?

Investigators: Julie Summey, EdD; Rachel Mayo, PhD; Liwei Chen, PhD; Windsor Sherrill, PhD; Lori Dickes, PhD; Karyn Jones, PhD; and Regina Franco, MSN, ANP-C

From the Department of Public Health Sciences, Clemson University, Clemson, SC (J.S., R.M., L.C., W.S., L.D., K.J.), and the Center for Integrative Oncology and Survivorship, Greenville Health System, Greenville, SC (R.F.)


Investigators: Kait Crosby, MHA, and Melanie J. Cozad, PhD

From the Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC, and Steadman Hawkins Foundation, South Carolina Center for Effectiveness Research in Orthopaedics, Greenville, SC (K.C., M.J.C.)

13. Usability Assessment of a Patient-Centered Mobile Health Application (iHeartU) for Self-Management of Heart Failure

Investigators: Lingling Zhang, ScD; Shrish Babu, PhD; Ronald Gimbel, PhD; Joel Williams, PhD; and Meenu Jindal, MD

From the Department of Public Health Sciences, Clemson University, Clemson, SC (L.Z., S.B., R.G., J.W.), and Department of Medicine, Division of Internal Medicine, Greenville Health System, Greenville, SC (M.J.)

14. Food Insecurity—A Social Determinant of Health

Investigators: Sonya J. Jones, PhD; Angela D. Liese, PhD; and Rachel E. Davis, PhD

From the University of South Carolina Center for Research in Nutrition and Health Disparities, Columbia, SC (S.J., A.D.L., R.E.D.); Department of Health Promotion, Education, and Behavior, University of South Carolina Arnold School of Public Health, Columbia, SC (S.J., R.E.D.); and Department of Epidemiology and Biostatistics, University of South Carolina Arnold School of Public Health, Columbia, SC (A.D.L.)

15. Cognition in the Multiple Myeloma Patient

Investigators: Valorie Brooks, CRRN; Sara Roman, MS; and Lynette Gibson, PhD

From the Department of Orthopaedics, Roger C. Peace Rehabilitation Hospital, Greenville Health System, Greenville, SC (V.B.); Blood & Marrow Transplant Program, Greenville Health System, Greenville, SC (S.R.); and Mary Black School of Nursing, University of South Carolina Upstate, Spartanburg, SC (L.G.)

16. Advance Care Planning in Faith-Based Communities

Investigators: Teny Gomez, MD; Jennifer Dill, MDiv, BCC; Anna Cass, PhD, MPH; and Colleen Christensen

From the Department of Medicine, Division of Palliative Care, Greenville Health System, Greenville, SC (T.G., J.D.), and Furman University, Greenville, SC (A.C., C.C.)

17. The CONNECT Study: COordiNated wellNess in familiEs with Children with disabiliTies

Investigators: Ann Blair Kennedy, DrPH; Rebecca Russ-Sellers, PhD; and Michaela Schenkelberg, PhD

From the Department of Biomedical Sciences, University of South Carolina School of Medicine Greenville, Greenville, SC (A.B.K., R.R.S.), and Department of Exercise Science, University of South Carolina, Columbia, SC (M.S.)
Diagnostic-Specific Studios

Rheumatoid Arthritis Studio
Lead Facilitator: Melanie J. Cozad, PhD

18. Integrating a Personalized Patient-Specific Preference Tool to Enhance Shared Decision Making for Rheumatoid Arthritis (RA) Patients
   Investigator: Melanie J. Cozad, PhD
   From the Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC, and Steadman Hawkins Foundation, South Carolina Center for Effectiveness Research in Orthopaedics, Greenville, SC (M.J.C.)

Breast Cancer Studio
Lead Facilitator: Peggy Wagner, PhD

19. Why Do South Carolina Breast Cancer Survivors Continue or Discontinue Endocrine Therapy?
   Investigators: Julie Summey, EdD; Rachel Mayo, PhD; Liwei Chen, PhD; Windsor Sherrill, PhD; Lori Dickes, PhD; Karyn Jones, PhD; and Regina Franco, MSN, ANP-C
   From the Department of Public Health Sciences, Clemson University, Clemson, SC (J.S., R.M., L.C., W.S., L.D., K.J.), and Center for Integrative Oncology and Survivorship, Greenville Health System, Greenville, SC (R.F.)

Virtual and Specialty Studios

20. Patient Evaluation of Patient Education Brochures Developed by Medical Students in Mind, Brain, and Behavior Module
   Investigator: Matthew Tucker, PhD
   From the Department of Biomedical Sciences, University of South Carolina School of Medicine Greenville, Greenville, SC (M.T.)

21. Comparison of Shoulder Pain Themes to Patient-Reported Outcomes
   Investigators: Melanie J. Cozad, PhD, and Kait Crosby, MHA
   From the Department of Health Services Policy and Management, University of South Carolina Arnold School of Public Health, Columbia, SC, and Steadman Hawkins Foundation, South Carolina Center for Effectiveness Research in Orthopaedics, Greenville, SC (K.C., M.J.C.)
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