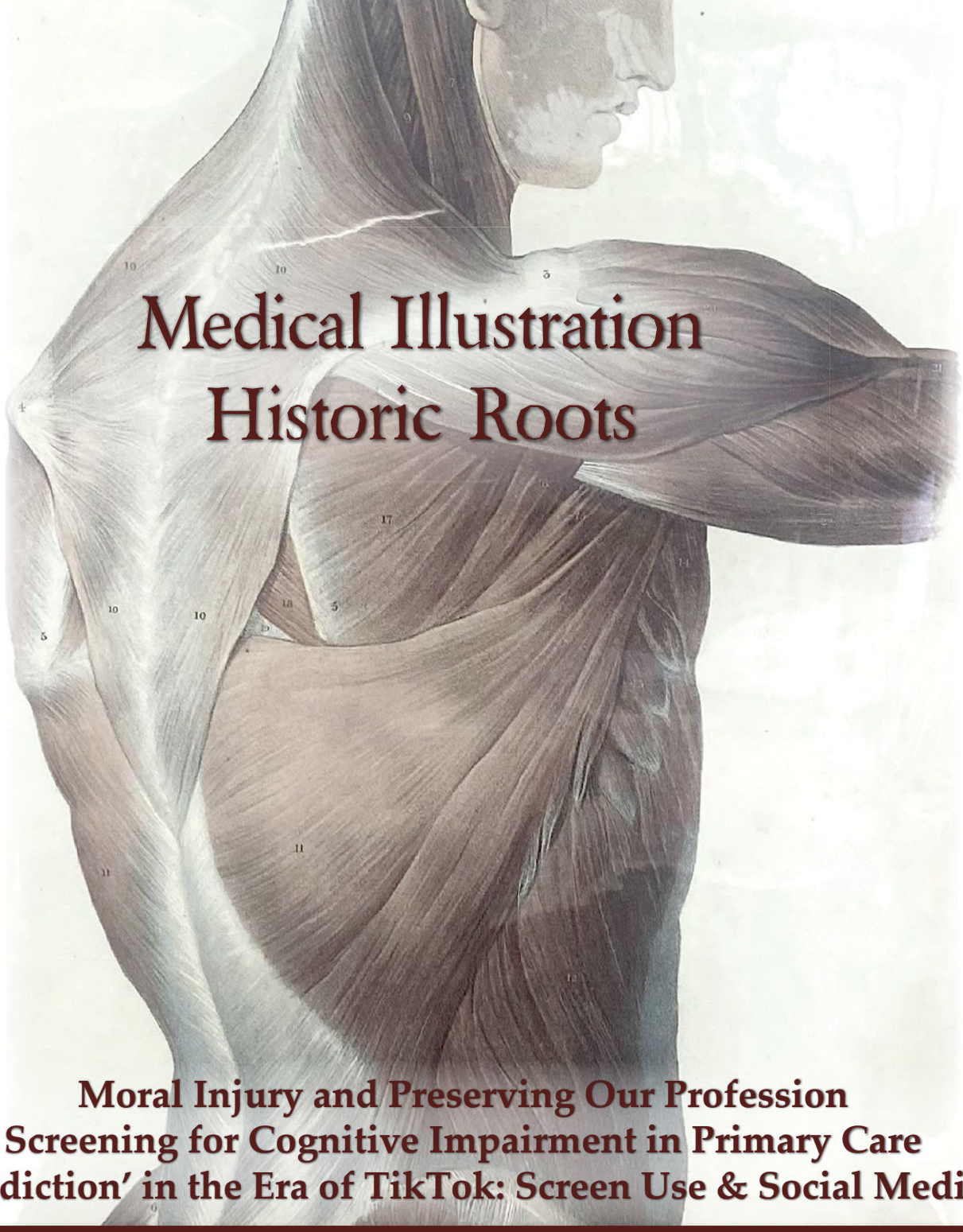
Missouri Medicine

The Journal of the Missouri State Medical Association www.msma.org/missouri-medicine November/December 2023



Medical Illustration Historic Roots

Moral Injury and Preserving Our Profession

Screening for Cognitive Impairment in Primary Care

'Addiction' in the Era of TikTok: Screen Use & Social Media

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The Journal of the Missouri State Medical Association – Since 1904

Volume 120 | Number 6 | November/December 2023 **www.msma.org/missouri–medicine**

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Muscles of the Human Body. Hand-painted lithograph, printed by Taylor and Walton: 1836. From the collection of Lizabeth Starnes Fleenor. Purchased at the 2014 Alliance Missouri State Medical Foundation Fundraiser, St. Louis, Missouri. Printed with permission.

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In publication since 1904, the peer–reviewed, award–winning, bi–monthly *Missouri Medicine: The Journal of the Missouri State Medical Association* is indexed by Index Medicus, MEDLINE, PubMed, ProQuest, and Scopus. Complete issues archived at PubMed Central since 2010. Content appears on EBSCO Research databases.

With a large and respected editorial board and regular participation by Missouri's six medical schools on eight campuses, *Missouri Medicine* is among the nation's foremost state medical journals.

Articles are frequently cited in impact factor journals and regularly featured in national media. Manuscripts are submitted from many countries. Issues of *Missouri Medicine* are printed on acid–free paper with open access to digital issues available at www.msma.org/Missouri–Medicine–Library.

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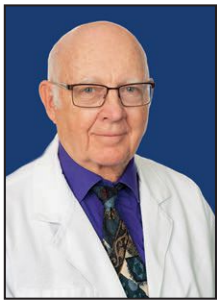


In 2024, *Missouri Medicine: The Journal of the Missouri State Medical Association* will celebrate 120 years of continuous superlative publication. *Missouri Medicine* is one of the oldest state medical journals in the United States and among the most highly regarded. In 1904, MSMA presciently began publishing a medical journal devoted to the art and science of medicine, and collegiality among Show-Me state physicians and county medical associations. More on that in future issues, but a well-deserved appreciative nod to our physician forebears.

As editor of *Missouri Medicine*, I am pleased to present our stellar 2024 publication calendar:

January/February 2024: Kansas City University School of Medicine
March/April 2024: Neurosurgery | Missouri University-Columbia
May/June 2024: Pediatrics | Saint Louis University & MSMA Convention Proceedings
July/August 2024: Medical Genetics | Washington University
September/October 2024: Pulmonary | Missouri University-Kansas City
November/December 2024: Annual Advocacy Issue & Open Papers

In 2023, *Missouri Medicine* received a record number of unsolicited manuscripts. About one in six was accepted for publication. We would like to thank these highly qualified physicians for doing invited peer-review: Douglas W. Scharre MD; Brandon D. Barthel, MD; Albert Hsu, MD; Fernanda Bellolio, MD; Jesse Pines, MD; Stephen C. Kosa, MD; Anand Chockalingam, MD; David Ingram, MD; Carri Mintz, MD; Blake Cooper, MD; Sandeep Gautam, MD; Munish Goyal, MD; Albert David, MD, PhD; Kumar Rao, MD; Catherine E. Hagan, PhD, DVM; Sean Gratton, MD; Carrie Beth Robertson, MD; and Tyler Chamberlain, PharmD.



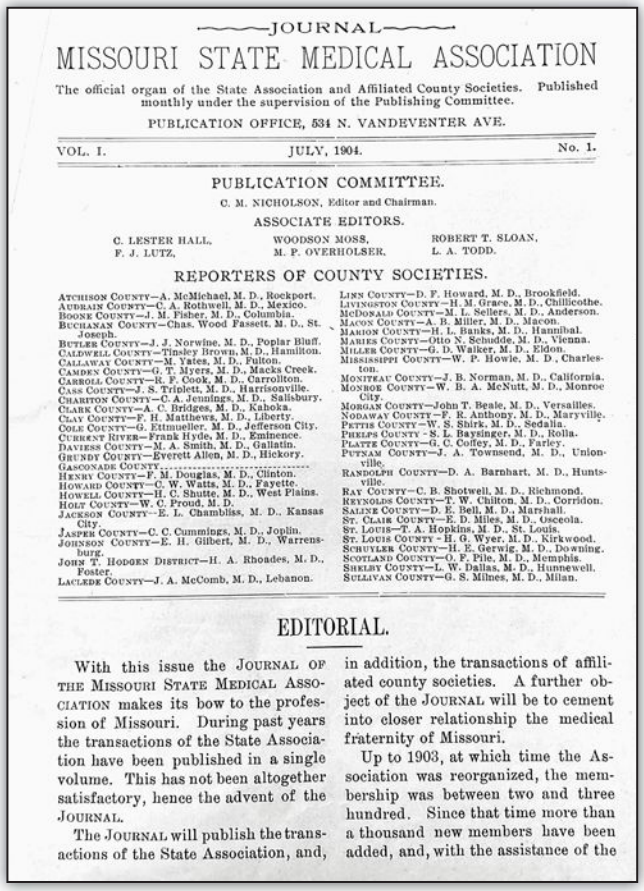
John C. Hagan, III, MD, FACS, FAAO, is a Kansas City, Missouri, ophthalmologist and *Missouri Medicine* Editor since 2000.

Peer review is the heart and soul of a medical journal, and we are deeply grateful for the time and expertise of our illustrious reviewers. Several papers were first literature reports.

We welcome your manuscripts for review. Precedence is given for original research or topics not widely reported in indexed, reviewed journals. In border line situations, MSMA Active members are given priority. Instructions for authors and previous issues of our journal can be found at www.msma.org/Missouri-Medicine. Join or renew your MSMA dues today at www.msma.org/Membership.

Anyone that has been to a grocery store, gas station, or tried to balance their family budget is aware that inflation and the cost of living and doing business are out of control. The escalating costs of publication and distribution of *Missouri Medicine* are no exception.

In 2023, under the rubric of cost containment, the maximum number of journal pages per issue was reduced by MSMA. The May/June issue, our largest as it reports the MSMA Annual Convention proceedings, will no longer include non-theme scientific. This has required changes, some still being formulated, in theme issue format, and even more rigorous peer review. Rare is the week that I do not receive an email from authors asking when their accepted manuscript will be published. Our goal is to review within six weeks and publish within six months.



JOURNAL

MISSOURI STATE MEDICAL ASSOCIATION

The official organ of the State Association and Affiliated County Societies. Published monthly under the supervision of the Publishing Committee.

PUBLICATION OFFICE, 534 N. VANDEVENTER AVE.

VOL. I. JULY, 1904. No. 1.

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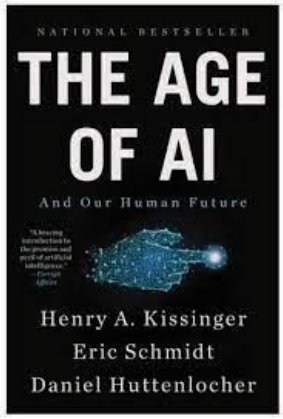
EDITORIAL.

With this issue the JOURNAL OF THE MISSOURI STATE MEDICAL ASSOCIATION makes its bow to the profession of Missouri. During past years the transactions of the State Association have been published in a single volume. This has not been altogether satisfactory, hence the advent of the JOURNAL.

The JOURNAL will publish the transactions of the State Association, and, in addition, the transactions of affiliated county societies. A further object of the JOURNAL will be to cement into closer relationship the medical fraternity of Missouri.

Up to 1903, at which time the Association was reorganized, the membership was between two and three hundred. Since that time more than a thousand new members have been added, and, with the assistance of the

July 1904, Volume 1, Number 1 is the first Journal of the Missouri State Medical Association.



As I wrote in the July/August 2023 Editorial, "Artificial Intelligence (AI) may be creating humankind's foremost paradigm." You may ignore AI, but AI will not ignore you. Make time to read The Age of AI and Our Human Future by Henry A. Kissinger†, Eric Schmidt, and Daniel Huttenlocher (Bay Back Books, November 2022). You cannot have standing in the contemporary scientific world without AI familiarization. The book is inspired and comprehensive. For better or for worse, AI will change our world as nothing before. †Died November 29, 2023.

Our journal is changing its disclosure statement to include the use of AI in scientific studies and in manuscript preparation. This follows the lead of most major world medical journals. We will use the JAMA guidelines. Visit www.msma.org/Instructions-For-Authors to view disclosure guidelines.

Missouri Medicine remains one of the country's foremost state medical journals. Thanks go to MSMA for 120 years of supporting its journal, Walsworth Publishing Company for 100 years of printing and digital production, our highly qualified and experienced Contributing Editors, our specialty board experts, and the chairs and coordinators at Missouri's six outstanding medical schools on eight campuses.

For over two decades, I have collaborated with Lizabeth R. S. Fleenor, BJ, MA, our highly talented and dedicated Managing Editor. It is difficult to describe how satisfying this collaboration is. I thank MSMA leadership and the financial support of dues-paying members for the honor of editing your journal for the past 23 years and on the board for over 40 years.

Disclosure

Artificial intelligence was not used in the composition of this editorial. **MM**

Looking into the Legislative Session Crystal Ball

The 102nd General Assembly will convene January 3, 2024, for its Second Regular Session. This year we expect more than 2,000 bills to be introduced, and with history as a guide, we know a significant portion of those will be related to health care.

We're excited to get going! MSMA added Jacob Scott and Rachel Bauer to your legislative team this year, plus three excellent and knowledgeable contract lobbyists from last year. Here is a preview of the hot topics that we expect will dominate the session, as well as some items that we are hopeful the legislature will meaningfully address.

Scope of Practice

A new year means renewed attempt by advance practice registered nurses, pharmacists, and other professionals to expand their scope of practice and weaken existing collaborative practice laws. Specifically, we anticipate legislation that would aim to allow optometrists to perform eye surgery, certified registered nurse anesthetists to independently administer anesthesia, and pharmacists to prescribe. Moreover, we are monitoring an initiative petition filed by nurses with the Secretary of State's office to expand their scope of practice in the Missouri Constitution.





Jacob Scott, MA, is Director of Legislative Affairs, and Rachel Bauer, is Director of Government Relations.

Federal Reimbursement Allowance

Missouri's largest source of federal money to pay for Medicaid, the Federal Reimbursement Allowance (FRA), must be reauthorized by the General Assembly this year. The program, which draws down federal money, is expected to generate about two billion dollars. However, in the last decade, its renewal has become something of a "political football" as some Senators have sought Medicaid reforms and other changes by saddling it with irksome amendments. We expect that this legislation will be debated early in the session, and might present a unique test of whether the legislature can manage their diverse personalities through early political hijinks.

Tort Reform

Missouri has seen its courts systematically repeal much of the healthcare tort reform achieved in the mid 2000s. Unfortunately, this, coupled with an increasingly litigious society, has complicated the malpractice insurance marketplace, driving up costs, placing a major burden on physicians that the

legislature simply hasn't addressed. We are hopeful that the legislature will tackle these important issues. But, if recent history is a guide, it will run into resistance from the trial attorneys.

Prior Authorization

MSMA will be working with other healthcare groups to pursue a more favorable law regarding prior authorizations. Legislation was filed last year to address this issue, but was stalled before the finish line. We are hopeful that a united front with other groups will yield a positive legislative result.

Emergency Room Safety

MSMA will be supporting legislation that would require emergency rooms to be always staffed with at least one physician. Some emergency rooms only have APRNs and we believe this is problematic for the best medical outcomes for patients. Moreover, the association will be supporting legislation to address workplace violence in the clinical setting. Many physicians report that additional measures are needed to ensure physician safety in the emergency room and elsewhere.

Billing and Claims

The Association will seek opportunities to legislatively improve laws related to best billing practices and claim denials. MSMA is looking at legislation to increase patient satisfaction with simplified billing with plain language so the patient knows exactly what the charges are for and when payment is due. Also, with the recent advances in artificial intelligence (AI), MSMA is laying the groundwork for safeguards to be put in place to keep AI from being used as a weapon to deny claims.

Restrictive Covenants

This legislative session we expect an effort will be made to address restrictive covenants for physicians who are employed by a nonprofit hospital. Nonprofit status is based on the concept of community benefit, and MSMA believes restrictive covenants run counter to that concept. This topic has been growing in importance to members in recent years. We will also be keeping an eye on other physician contracting language that may be ripe for change.

Title Protection

An important issue this year is supporting and growing efforts to protect titles in the clinical setting. There will be a few different versions in this upcoming legislative session that are worthy of further scrutiny. A truth in advertising law would be helpful for patients to understand not only who is giving them care, but also that clinician's expertise and training. MSMA is aware of examples where APRNs identify themselves as a doctor in the clinical setting which can be confusing for patients who believe they are seeing a physician.

Election Year

We shouldn't preview the legislative session without acknowledging the elephant(s) in the room, the upcoming election.

This year all the statewide offices are up for election, with the exception of the State Auditor. In fact, so many legislators are running for higher office this year it's easy to lose track of who's running against whom.

MSMA Keeps You Informed

Between January and May, MSMA increases the amount of advocacy content it produces. Each week (with the exception of the legislative spring break), MSMA members will receive our *5 Things You Need to Know* every Monday morning. As usual, the world famous MSMA *Legislative Report* is distributed to the membership each Thursday afternoon during the session. Look for the year–end *Legislative Review* in late June.

Volunteer for Doctor of the Day

MSMA is excited to launch the revamped 2024 Doctor of the Day program where your role will be more focused on advocacy. As the Doctor of the Day, you will join MSMA at the Capitol on Tuesdays and Wednesdays to educate legislators and their staff on issues pertinent to medicine in Missouri (instead of attending to minor ailments.) MSMA members can have scheduled one-on-one time with their elected officials and will likely be introduced in the House and Senate chambers. It's a great experience and a great service to your peers, your profession, and your patients. All specialties are welcome and encouraged to serve. Sign up at msma.org/DoctorDay.

Physician Advocacy Day

We are joining forces with the Missouri Association of Physicians and Surgeons (MAOPS) again this year to sponsor a single Physician Advocacy Day! Save the date for Tuesday, March 5 and register at msma.org/PAD.



MMPAC held a fundraiser dinner for Senator Karla Eslinger (center) recently.

Sen. Eslinger-R is the Majority Caucus Whip and serves District 33, which encompasses the counties of Douglas, Howell, Ozark, Shannon, Stone, Taney, and Texas.

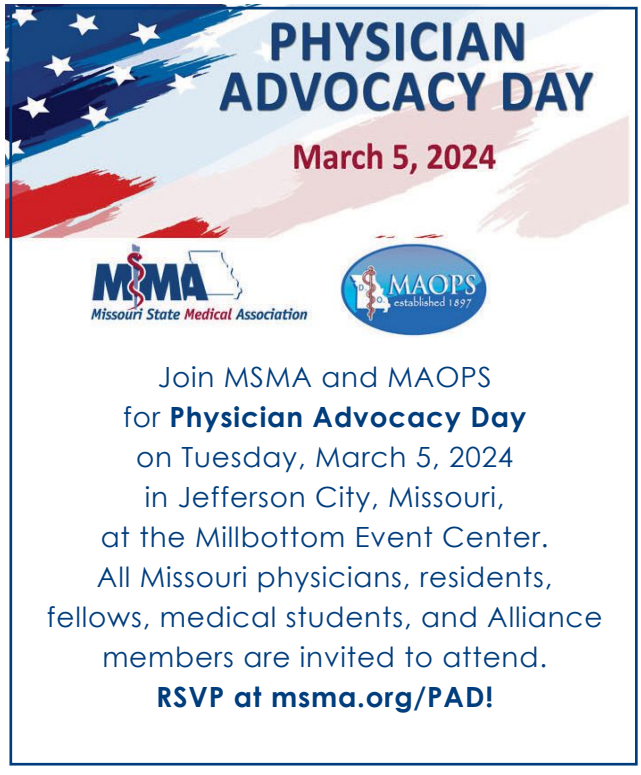
With Sen. Eslinger L to R is MSMA President Lancer Gates, DO, George Hruza, MD, Representative Lisa Thomas, MD, and David Barbe, MD.

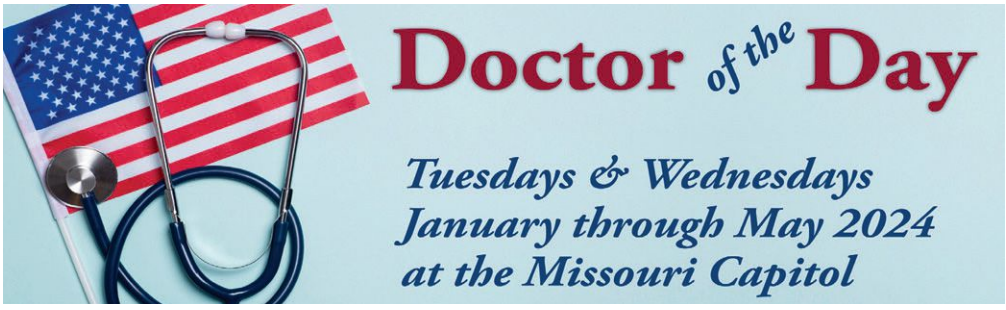
Just to name a few, you have a Lieutenant Governor running for Governor, the Speaker of the House running for Lieutenant Governor, the Secretary of State running for Governor, the President Pro Tem of the Senate running for Secretary of State, and several Representatives and Senators running for statewide office or are rumored to run.

Campaigning for higher office these days can come with some ... shall we say ... politically charged debate and legislation. This all too often creates a counterproductive environment where the politics can outweigh the policy.

Questions?

As your legislative team, at any time you have questions and concerns about advocacy, bills, or have an anecdotal story to share that can help us illuminate the complexities of medicine, please contact Jacob Scott: jscott@msma.org and Rachel Bauer: rbauer@msma.org.





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Report of the American Medical Association Interim Meeting

by Charles W. Van Way, III, MD & the Missouri AMA Delegation

The 2023 Interim Meeting of the American Medical Association (AMA) House of Delegates (HOD) was at the Gaylord National Hotel, National Harbor, Maryland, near Washington, DC., November 10-14, 2023. The Interim Meeting focuses on advocacy, particularly on current and pending legislation, other urgent issues, and ethics.

Some resolutions offered were not considered at the meeting. Too many resolutions were submitted to permit adequate consideration of all of them. Many resolutions simply restate existing policy. There is a task force charged with finding ways to limit the number of resolutions. In the short term, there seems little alternative to screening resolutions before accepting them for consideration.

Jesse Ehrenfeld, MD, AMA president, addressed the meeting. This is a difficult environment for physicians. He has seen many of the problems for himself: a physician friend overwhelmed by pressures of the COVID pandemic. Another left her practice and her home because of interference by legislative action. More than one hundred million patients have no access to primary care. Payment has been flat relative to inflation and is going to be cut next year. Physician burnout is at 60%. Physicians must advocate for patients and for themselves. No one else can do it as effectively, and no one knows the problems as well as physicians.



Missouri Delegate Betty Drees, MD, and Alternate Delegate Joanne Loethen, MD.

James Madara, MD, Executive Vice President, focused on how we balance the immediate needs of patients and physicians with an effective long-term strategy to improve the health care system. The AMA has a well-shown ability to respond to short-term challenges, such as the COVID pandemic. Starting 10 years ago, the AMA has been pursuing the formation and implementation of a long-range strategic plan. The plan was derived in large part by analyzing and evaluating existing activities.



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The Heart of America Caucus with the Missouri and Kansas Delegations.

The process remains dynamic, yearly refining a long-term projection. There are three arcs. First, reimagining medical undergraduate education, residency training, and lifelong learning. Second, confronting chronic disease, specifically focusing on hypertension. Third, removing obstacles that interfere with patient care. Examples are reforming Medicare policy and the Physician Recovery Plan. There are three accelerators: equity, advocacy, and innovation.

Willie Underwood, MD, Chair of the Board of Trustees (BOD), read a statement that the AMA is in solidarity with all the physicians caring for patients in Israel and Gaza. The HOD refused to consider a resolution calling for a ceasefire and has avoided involvement in the political issues surrounding the war.

Moving to the core business of the HOD, more than 100 resolutions and reports were considered. The HOD was well attended, drawing 672 of 705 (95%) of delegates.

"Fix Medicare Now" was the major theme of the meeting. First, inflation-adjusted physician payments have been reduced 26% in the last 20 years and will be cut another 3.4% in January 2024. We must convince Congress that these cuts are totally unsustainable. Second, physician payments must be indexed to inflation, like all other participants in Medicare. Third, MIPS has failed, and must be discarded. Go see the website www.fixmedicarenow.org.



Missouri Delegates Joe Corrado, MD, and Ed Cabbabe, MD.

There continues to be issues surrounding medical education. The Council of Medical Education (CME) issued reports advocating personal days for medical students (#1); ensuring equity in interview processes (#3); and advocating unions for residents and fellows (#5). Resolution 208 called for

minimizing the impact of training of mid-level providers on medical education. Resolution 301 advocated for additional protection for residents when hospitals close. Resolution 302 expressed concern over the treatment of students with disabilities. Resolution 304 advocated for increased health insurance options for medical students.

Drug use continues to kill people each year. An exponential increase has been caused by fentanyl, often mixed with other opioids or amphetamines. At the meeting of the Organization of State Medical Association Presidents (OSMAP), speakers from four states discussed harm-reduction strategies. These include legalization of fentanyl test strips, and availability of naloxone, drug injection centers, and recovery centers. Mental health resources are terribly inadequate to deal with the problem. As an aside, Resolution 916 advocated for the elimination of artificial dose limits for buprenorphine. Payers often impose such limits even though contradicted by evidence and clinical experience.

Cannabis use, despite legalization in a majority of states, remains a health concern, especially for pregnant women and children. Resolution 205 called for model state legislation for warnings to be placed on cannabis products. Council on Science and Public Health (CASPH) report #6 assessed marketing practices for cannabis, also calling for state legislation and package labeling to warn patients of hazards.

Gun violence is a perennial concern of the HOD. Board of Trustees (BOT) report #14 discussed whether physicians should be funded to provide safe storage devices to patients. Its conclusion was that safe storage devices are a "Good Thing" but did not recommend that physicians distribute them.

Another perennial concern is health system reform. The Council on Medical Service (CMS) reports #6 and #7 addressed payment models and sustainability for rural health systems. CMS #3 addressed adequacy of insurance networks. CMS #5 discussed the problems with unwinding of the broadened Medicaid eligibility introduced during the pandemic.

Resolution 210 advocated for the expansion of



Missouri Alternate Delegate and KCU medical student Charlie Adams.

Medicaid and CHIP to undocumented immigrants, as has been done in New York and California. This was highly controversial and was referred to the BOT for further study. The cost would be quite high. Resolution 803 advocated legislation to prohibit states from charging co-pays or other fees for Medicaid and CHIP. Pediatric practice has been very severely affected, with pediatric hospital beds closing across the country. Better reimbursement policies are urgently needed. Resolution 817 recommended expanding Medicare reform efforts to include pediatric populations covered under Medicaid and CHIP.

Resolution 224 recommended changes in ERISA to increase accountability of pharmacy benefit managers. Resolution 818 called for the AMA to begin considering a single payer system. Because the AMA has long opposed a single payer system, some newspapers reported this with approval. But it was not accepted and was referred to the BOT for further study.

Obesity remains a serious health problem. Now that anti-obesity drugs are available, insurers are refusing to cover it. Resolution 806 called for the AMA to promote inclusion of anti-obesity drugs as standard insurance benefits.

There was extensive discussion over Resolution 4, which called for the AMA to advocate for decriminalizing physician-assisted suicide. Even the terminology is controversial; other terms are "end of life expanded treatment options" and "medical aid in dying." This is a perennial ethical problem and was not going to be settled at this meeting. The resolution was referred to the BOT to be studied further.

The Council on Science and Public Health (CSAPH) report #1 analyzed the causes of medication shortages and possible remedies. This remains a severe problem, and these reports are issued each year. Little progress has been made. CASPH report #2 summarized the conflicts between health equity and personalized medicine. Such conflicts are not inherent but are common at our current state of genetic knowledge. Resolution 922 addressed the issue of transferring scarce supplies of drugs among pharmacies to address local shortage issues. CASPH report #5 discussed the use of re-usable devices instead of single-use devices. The movement away from reusable devices and towards single-use devices, especially in the operating room, appears to have gone too far, and is now a major contributor to excessive hospital waste and to the overuse of plastics.

BOT report #12 dealt with restrictions on just where the AMA allows itself to meet. Over the last eight years, the AMA has become increasingly restrictive. Now, California adopted similar restrictions by law in 2016. The state maintains a list of states to which state employees were not allowed to travel. So, the AMA staff adopted the California list. But the list has expanded to 26. All states in the southern tier, favored for late fall meetings, are on the banned list save for New Mexico and California itself. Forget having regional meetings in the South. Florida is off limits (except for the 2024 Interim Meeting, which was arranged some years ago). The AMA, which represents physicians in all states, has engaged in a circular firing squad. The report concludes with a recommendation that the ban on unfavored states be lifted, with the caveat that no hotel or convention center with



Missouri Delegates Betty Drees, MD, and Charles Van Way III, MD.

restrictive policies would be acceptable. There was a furious debate. The report went through two separate revisions before it was even discussed. It was sent back to the BOT for further revision.

Regulation and/or legislation was advocated in several areas. Good Samaritan laws vary greatly across the states, creating confusion. BOT report #6 called for developing model legislation to bring order to the situation. Resolution 206 expressed concern about augmented intelligence in health care, which requires oversight and regulation. Scope of practice in emergency departments is a thorny problem. There are many hospitals in which no physician is physically present. Is an emergency department (ED) staffed by nurse practitioners or physician assistants able to provide adequate care? Resolution 207 called for legislation requiring that EDs operate only under direct physician supervision. This is a complex issue, affecting rural hospitals in states like Kansas, and will be further considered by the BOT.

Climate change continues to concern many physicians. BOT report #3 was on AMA policies and actions on climate change. However, it failed to meet the expectations of climate change

advocates that the AMA present a plan for dealing with climate change, so it was not adopted and was referred to the BOT to be reconsidered.

As usual, the HOD dealt with a mixture of physician-specific issues, such as Medicare, and societal issues, such as the public health impact of climate change. The AMA sees itself as having an additional role beyond simple physician advocacy. There was a lot of specific action on specific issues. For example, there was a general session on climate change and another on the ethical conflicts involved in working within large health care systems. There was a growing consensus at this meeting that the AMA is most effective when it works on physician-specific issues and other issues affecting the health care system.

Several Missouri physicians continue to serve in leadership roles. **Edmond Cabbabe, MD**, serves as past chair of the Council for Long Range Planning and Development. **Elie Azrak, MD**, serves on the board of AMPAC, the AMA Political Action Committee. **Jerry Kennett, MD**, is on the AMA Foundation board. **Kelly Schmidt, MD**, is the past Chair of the Resident and Fellows Section. **David Fleming, MD**, serves on the Council on Ethical and Judicial Affairs. **Marc Mendelsohn, MD**, serves on the Council on Science and Public Health. **Charles Van Way III, MD**, is secretary of the Steering Committee of OSMAP, the Organization of State Medical Association Presidents.

Your AMA delegation would very much like to hear from AMA members throughout Missouri about the issues discussed at the meeting, especially Fix Medicare Now. For further information, the business of the meeting is available on the AMA website. Highlights and all of the reports and details are at www.ama-assn.org/house-delegates/interim-meeting/business-ama-house-delegates-interim-meeting. The Annual Meeting of the HOD will be in Chicago, June 12-16, 2024. Meanwhile, the AMA continues to advocate for physicians and their patients across the country. **MM**



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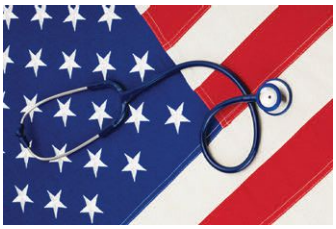
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MM

Investing in the Future of Medicine

by Lancer Gates, DO



Inoculating the Next Generation[1]

The smallpox epidemic was ravaging Dorset, England, in the 18th century. A local farmer, Benjamin Jesty, heard that prior cowpox infection provided immunity to smallpox. Jesty, who previously had cowpox himself, inoculated his wife and two children with cowpox, providing them with immunity to smallpox.

The Student Loan Interest Epidemic

The financial epidemic of the 21st century is student loan interest. It was briefly eradicated from March of 2020 through August of 2023. It reappeared in the United States on September 1, 2023. Some borrowers are making their loan and interest payments by cutting their discretionary spending, some have re-enrolled in college to postpone payments, some are suspending their contributions to their 401k accounts, some are drawing upon their 401k accounts, a few are boycotting their loan payments, and some are getting another job rather than another jab.

A few students receive financial aid by serving in the National Health Services Corps or the US Military; however, most students receive financial assistance from subsidized and unsubsidized Stafford loans, Grad PLUS loans, and Parent PLUS loans. The origination fees of these loans range from 1.057% on Subsidized and Unsubsidized Stafford loans to 4.23% on Grad PLUS loans to 4.22% on Parent PLUS loans. In 2023-2024, the nominal interest rate on the Unsubsidized Stafford loan is 7.05%, and the nominal interest rate on the Grad PLUS loan is 8.04%.[2] Applying the "Rule of 72," the loan balance will double within ten years if payments cannot be made on loan principle or interest.[3]

There are six student loan repayment and forgiveness options (Table 1).

1. Pay It Yourself (PIY)
2. Public Service Loan Forgiveness (PSLF)
3. Pay As You Earn (PAYE)
4. Saving on a Valuable Education (SAVE)
5. Income-Based Repayment (IBR)
6. Income Sharing Agreement (ISA)

Medical students are apprehensive about their loan repayment. Projected debt influences which medical schools they apply to, and which they choose to attend. Debt also affects their residency application competitiveness. Nicholas Woessner, DO, MIMFA,



Lancer G. Gates, DO, FACOI, is President of the Missouri State Medical Association for 2023–2024. He is a Hospitalist from Kansas City, Missouri.

Table 1. Repayment & Forgiveness Options for Educational Debt

	PIY	PSLF	PAYE (phased out July 2024)	SAVE	IBR	ISA
Years of Qualified loan payments	NA	10	20	10 for $12,000 or less (add'l year of repayment for every 1,000 borrowed, up to max 20-25 years)	25	variable
% of discretionary income for qualified loan repayments	NA	NA	10%	5% for undergrad loans and 5%-10% for undergrad and grad loans	15%	NA
Discretionary income definition	NA	NA	AGI minus 150% of the federal poverty level	AGI minus 225% of the federal poverty level	AGI minus 150% of the federal poverty level	NA
Loan forgiveness taxable	NA	NA	Y	Y	Y	NA
Repayment clock reset if borrowers consolidate loans	NA	NA	Y	NA	Y	NA
Practice location limitations	NA	1. federal, state, local, or Tribal gov. agency 2. Americorps or Peace Corps 3. 501c3	NA	NA	NA	NA
Interest covered by the federal government	NA	NA	100% on subsidized loans for the first three years	If monthly payments are made, then any interest that would make the loan grow is forgiven	NA	NA

during his fourth year of medical school, had limited financial resources for travel and lodging for his sub-internship rotations for residency auditions. Those who don't match into a residency have difficulty improving their residency application for the following year with medical research or medical missions because they lack money to cover their costs of living and loan payments. Finally, debt burden affects young physicians' choice of the medical practice that they will pursue their medical career.

A United Coalition to Create a Student Loan Interest Vaccine

During the past several decades the student loan industry has gone unchallenged, uniting nearly every participant in the process.

Students and parents have become frustrated with student loan origination fees and high-interest rates. They are frustrated with educational costs that exceed the maximum federal subsidized and unsubsidized student loan limits. They need help finding supplemental sources of educational funding. They are fed up with private lenders charging high-interest rates because prior students defaulted on their loans.

New-to-practice physicians are frustrated that they cannot take the job they want at a private medical practice because they have to take the job they need from a not-for-profit hospital that provides them with the benefit of PLSF.

Taxpayers are suffering from "compassion fatigue" and "forgiveness fatigue." Many lowly compensated taxpayers are developing animosity as they foot the

loan forgiveness bill for highly paid physicians. These taxpayers did not have the opportunity, financial resources, or ability to get a college degree; if they did get a college degree, they likely paid for it themselves with loans and interest.

Investors are frustrated with market volatility, disappointed with the returns on long-term bonds, and frustrated with available investment opportunities. Many values-based investors are willing to invest in opportunities that match their values regardless of whether they realize financial gain.

What if medical students could access loans that don't have origination fees and don't accumulate interest during medical training? What if medical students who fail to match into residency didn't have to choose between improving their residency application and financial survival? What if more medical students chose their medical specialty based on their passion rather than their projected paycheck? What if physicians could select the location of their medical career based on their future goals rather than past financial woes? What if taxpayers weren't saddled with others' educational debt? Finally, what if values-based physician investors could directly invest in the future of medicine?

The ISA Vaccination Against Student Loan Interest

You may have heard of "taking stock of yourself." Income Sharing Agreements (ISAs) are "selling stock of yourself." The renowned American economist Milton Friedman first introduced the concept of investing in people for a share of their future earnings in his 1955 book "The Role of Government in Education" and referenced it again in his 1962 book "Capitalism and Freedom."[4,5] Private investors loan interest-free money to students in exchange for a fixed percentage of their future income for a fixed period of time. The ISA percentage and duration may be tailored to maximize the benefit of the investment for both the student and the investor.

Today, we have students, new-to-practice physicians, parents, investors, and taxpayers willing to embrace an alternative funding source that can supplement and ultimately supplant traditional educational loans. Today, we have the technology to track digital transactions and collect future income. Today, ISAs are defined as "private educational loans" by the United States government and are subject to the regulatory framework described in the "Investing in Student Success Act" of 2014.

ISA Experience and Risks

We have gained undergraduate ISA experience at Purdue University ("Back a Boiler" ISA est. 2016) and at Rockhurst University in Kansas City, Missouri. Both Purdue University and Rockhurst University ISAs were paused in 2022 because their ISA servicer, Vemo Education, went bankrupt following several lawsuits from borrowers alleging that they were not provided adequate loan education and transparency.[6]

ISAs are the perfect fit for medical students because as physicians they will have a high income and a low unemployment rate,[7] however there will be risks. A few medical students don't graduate from medical school, and a few don't match for a residency. A few physicians experience a temporary income disruption due to changing jobs, parental leave, temporary disability, short-term unemployment, return to training, a brief hiatus, or a medical mission trip. A few physicians experience a permanent income disruption due to becoming unemployable, changing careers, retiring early, becoming completely disabled, or dying. All these risks can be mitigated within the ISA design.

Designing the Most Efficacious Medical Student Loan Vaccine

The optimal medical student ISA include the following considerations:

1. Provide both a competitive funding opportunity for students and a competitive investment for investors
2. Educate borrowers
   a. Disclosure of key terms
   b. The fact that ISAs are private educational loans
   c. Define qualifying temporary income interruptions which will precipitate a pause in collections, ending when the income salary floor is once again achieved
   d. The ISA will purchase a term corporate-owned life insurance (COLI) policy for each borrower with a death benefit equal to the principal investment and payable to the ISA
3. Educate Investors
   a. Disclosure to investors that their initial investment may be lost and that there is no guarantee of return
   b. Disclosure of preferred lender agreements (PLAs) to creditors
4. Require investors to sign documents including:
   a. Conflict of interest
   b. Exclusivity contracts
   c. Non-disclosure agreements
   d. A code of conduct

e. Non-compete clauses
f. Adherence plan for the Higher Education Act (HEA)

5. Prohibit physician educators and medical schools from participating as ISA investors
6. Include at least one medical student on the ISA board of directors
7. Include a protocol for non-discriminatory review of applicants
8. Outsource the following services:
   a. Actuary
   b. Attorney with "smart contract" experience
   c. Liaison to educate medical students and medical school financial aid departments about ISAs
   d. Reputable service provider that properly educates borrowers and reliably retrieves payments
   e. Corporate owned life insurance carrier
   f. Collection agency.
9. Spread the risk by offering many fourth-year medical students a competitive but limited amount of supplemental funding to cover costs, including their sub-internships for their audition rotations.
10. Set the salary floor (the minimum salary that must be earned before ISA payment comes due) at a salary higher than that earned in residency and fellowship.
11. Provide payback equity across specialties by setting specialty-specific ISA percentage and duration.
12. Provide ISA percentage credits to medical students who choose to practice in Missouri.
13. Set the minimum payback at 1.5x the initial investment, and the maximum payback at 2x the initial investment.
14. Provide an enticing early buyout provision to borrowers, giving investors an earlier return.

Medical Student ISAs are Scalable and Perpetual

Medical education ISAs are scalable for both borrowers and investors. The maximum loan amount extended to each fourth-year medical student can be increased. ISAs can be provided to fourth-year medical students from across the country. ISAs can be offered to residents, fellows, and to physicians who are new to practice. ISAs can be offered to third-year medical students, followed by second-year medical students, and finally first-year medical students.

The ISA can receive more capital funding from individual values-based physician investors by offering values-specific ISA portfolios such as funds which match physician investors with medical students attending their medical school alma mater. State, national, and specialty-specific medical societies can also invest in ISAs. Finally, venture capitalists can get in on the action. All of these investors may invest and reinvest in ISAs year after year because medical education will always be costly.

ISA Vaccinations Start at Home

As a youth, I remember a family vacation at my uncle's home in New Hampshire before GPS and Google Maps. A driver with New Jersey license plates stopped to ask for directions, my uncle asked the flatlander for the name of his destination. Upon hearing the destination my uncle, in his finest New England dialect, wryly told him "You can't get there from here."

So, how do we get there from here? Most private businesses start small, demonstrate a return on investment, obtain venture capital by selling stock, and then upscale. Unfortunately, medical student ISAs will have a long cash conversion cycle (approximately 7-11 years), and also prohibitive start-up costs including attorney, management, service, director, and officer insurance premiums, COLI policy premiums, and collection agency fees.

We, the values-based physician investors who have sons and daughters in medical school, should consider starting a cottage industry of extending ISAs to our fourth-year medical school children. We could share our personal "Benjamin Jesty" ISA experiences fighting the student loan epidemic with our other MSMA colleagues. Perhaps this might lead MSMA to consider administering its own ISA version of "medical student loan vaccine" first to medical students in Missouri and then to medical students nationwide, reaffirming our status as the "Show-Me" state.

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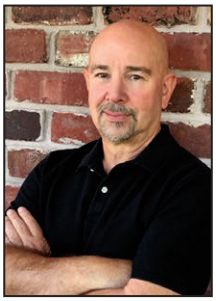


Medical Illustration Historic Roots

Illuminating Medicine & Science - Part I

by Mark M. Miller, MA

I am a professional medical illustrator. My profession has existed in the United States for about 130 years. Yet, I am often met with a look of puzzlement when asked about my profession. Medical illustration is indeed an esoteric field, but one comprised of highly skilled individuals working in a multitude of disciplines. 'One picture is worth a thousand words'; it is axiomatic that visuals illuminate complex medical, biological, and scientific material.



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As with all histories, past informs present, thus it's worthwhile to present the roots of medical illustration. The polymath Leonardo da Vinci (1452-1519), is the godfather of medical illustration within western culture. Da Vinci's pen and ink illustrations of his own anatomic dissections are quite famous and admired (Figure 1), despite the occasional anatomic error. As both investigator and artist, Da Vinci foreshadowed the profession to come.

Renaissance physician Andreas Vesalius' (1514-1564) landmark textbook *De Humani Corporis Fabrica* (Of the Structure of the Human Body) revolutionized the understanding of human anatomy by correcting centuries of erroneous dogma. Unfortunately, the names of the artists of the magnificent woodcut illustrations contained within remain a mystery, though some evidence suggests the work was performed by students of the celebrated Venetian painter Titian.

Dutch artist-engraver Jan Wandelaar (1690-1759) is credited for making the superbly detailed engravings of the human skeleton and musculature in Bernhard Seigfried Albinus's monumental *Tabulae*

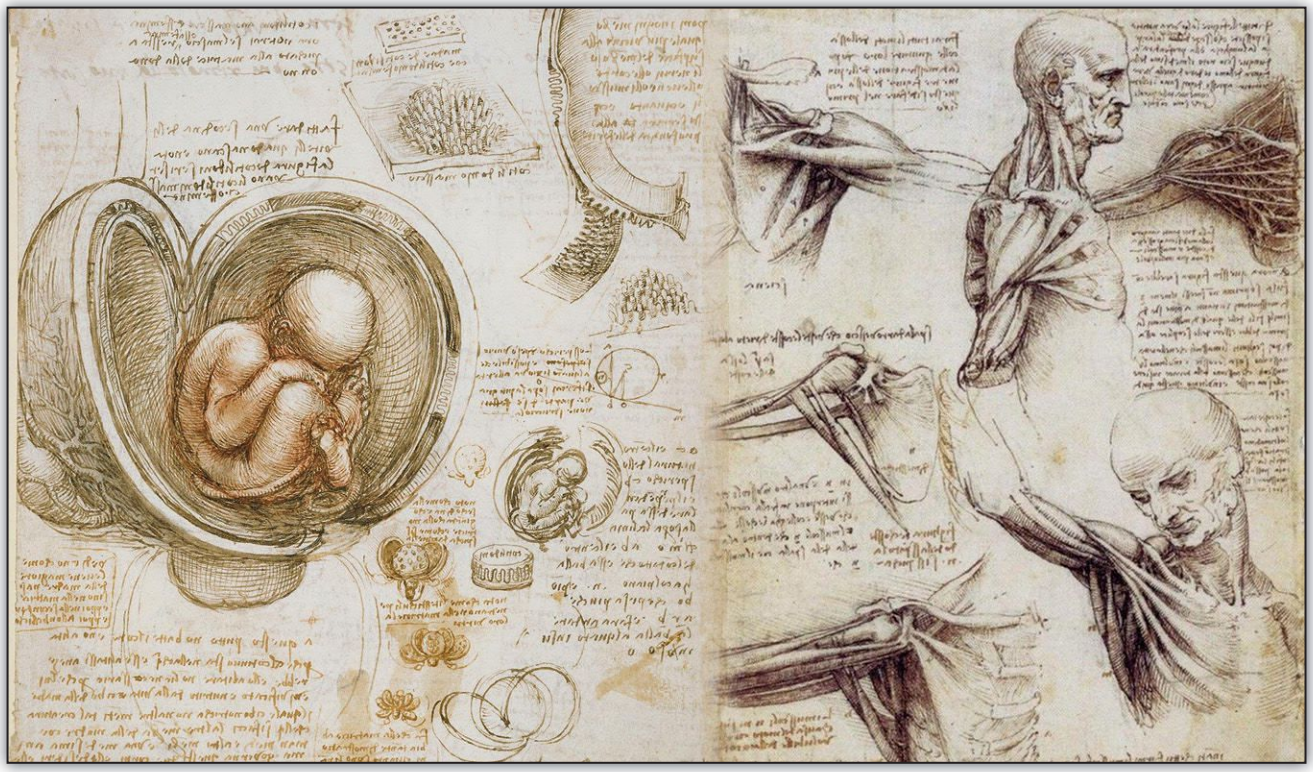


Figure 1. Pages from sketchbook, Leonardo Da Vinci. A genius with insatiable curiosity, seeking answers to questions about nature.

Sceleti et Musculorum Corporis Humani, (Tables of the Skeleton and Muscles of the Human Body), published in Leyden in 1747. The illustrations within this atlas-folio sized book are a wonder to behold, (Figure 2) notwithstanding the sometimes amusing and fanciful backgrounds. French surgeon Jules Germain Cloquet (1790-1883) is well recognized for his work on hernia repair, ("*Cloquet's septum*"), and was also a skilled artist, illustrating most of the figures in his best-known work, *Anatomie de l'homme* (Male Anatomy). Also worth noting, Ernst Haeckel (1834-1919), naturalist, philosopher and artist (among other titles), created arguably the most famous early collection of biological art in *Kunstformen der Natur* (Art Forms of Nature). Haeckel's beautiful paintings are widely admired by art collectors and biologists alike.

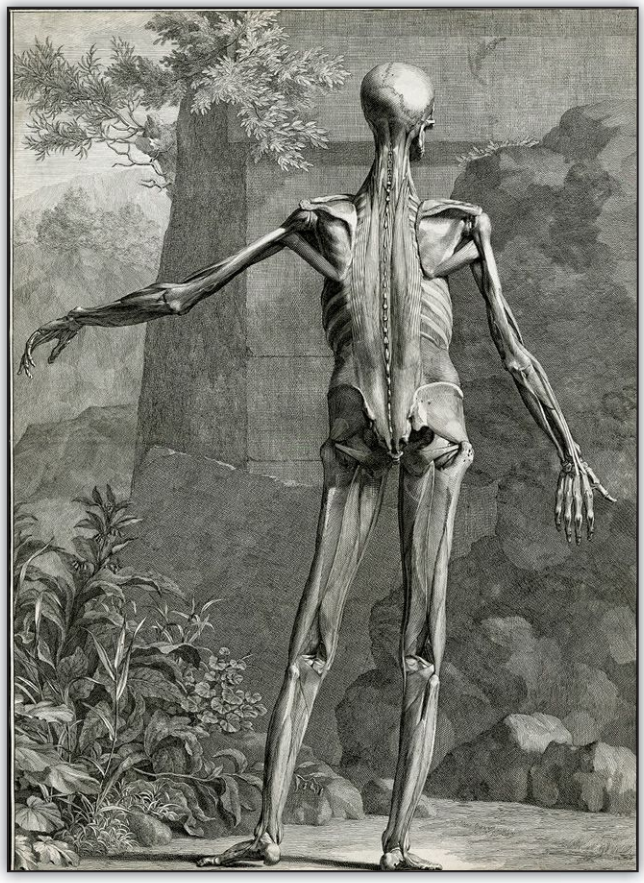


Figure 2. Plate (table) from Tabulae Sceleti et Musculorum Corporis Humani. Bernard Seigfried Albinus. Engraver Jan Wandelaar.

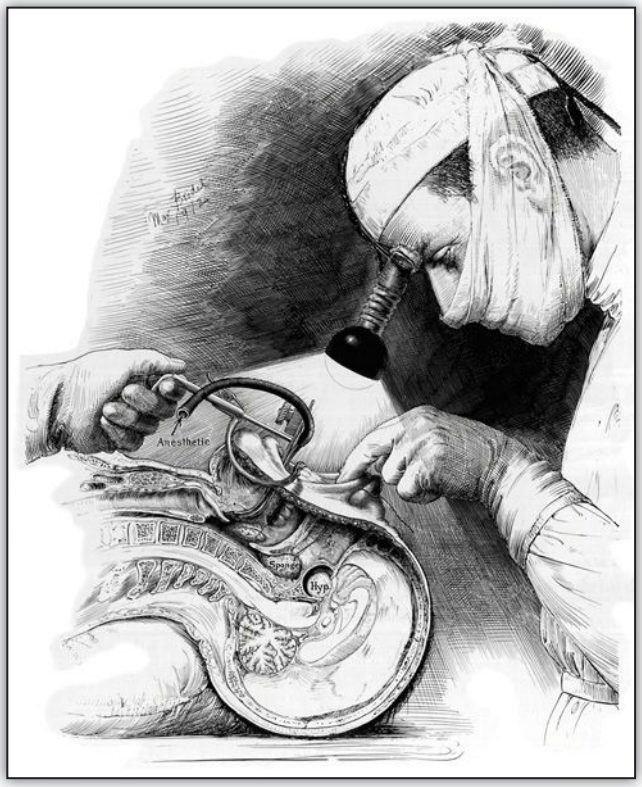


Figure 3. Transsphenoidal Hypophysectomy, Max Brödel. Pen and ink. From The Journal of the American Medical Association, author Harvey Cushing, M.D., 1914. Original illustrations from the Max Brödel Archives in the Department of Art as Applied to Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland. The combination of a cross-section within a natural scene was groundbreaking, and a perfect example of why the camera did not replace medical illustrators.

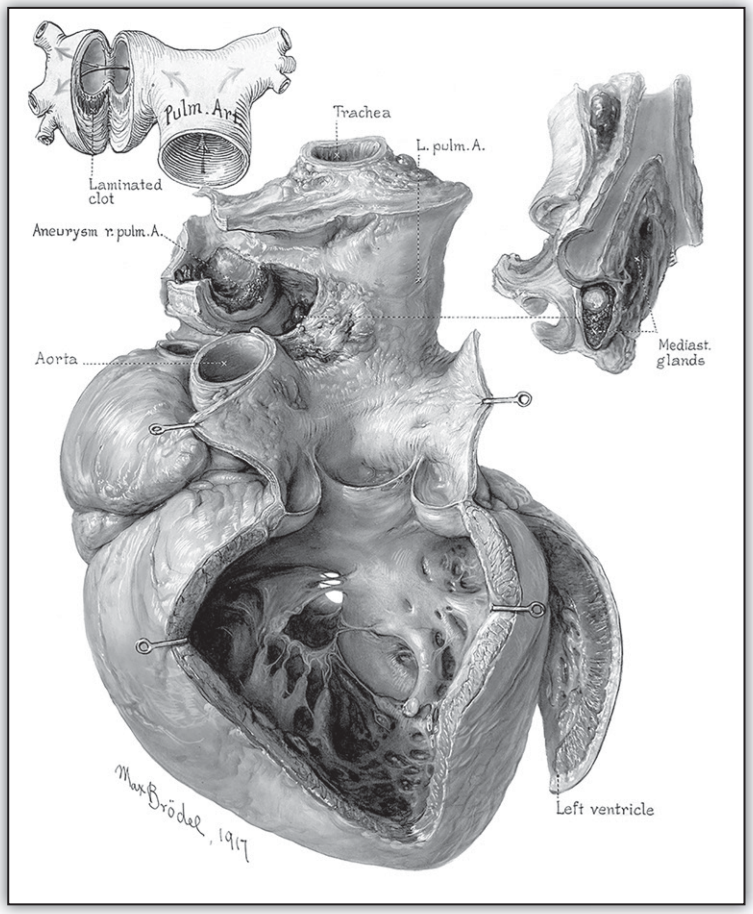
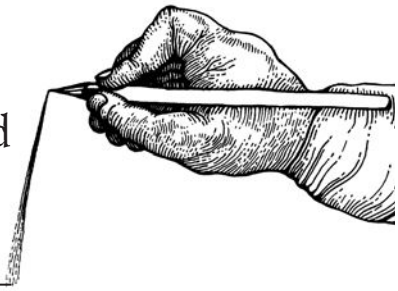


Figure 4. Mesarteritis of the Pulmonary Artery, Max Brödel. Carbon pencil and dust. From MC Winternitz and HC Schmeisser, The Johns Hopkins Reports, Vol. 18, 1919. Original illustrations from the Max Brödel Archives in the Department of Art as Applied to Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland.



Brödel's legacy continues today, though he would certainly be utterly astonished at the technological advances in the field since his death in 1941.

Despite those just mentioned, many pre-twentieth century artists (not yet called medical illustrators), toiled in anonymity, having the misfortune to work during a period when artists were not routinely credited by authors or publishers. Lacking the credentials of the more highly trained surgeon or anatomist author, many artists' identities remain unknown. Change began with the establishment of formal training in the field by Max Brödel and the Department of Art as Applied to Medicine.

Paul Heinrich Max Brödel was born in Leipzig, Germany in 1870. An astonishingly precocious child, both artistically and musically, Brödel was trained as a youth under the demanding tutelage of the Leipzig Academy of Fine Arts. Upon graduation, he was recruited to work as an illustrator in the lab of world-renown physiologist Carl Ludwig, where, with a great deal of life altering serendipity, he met both Johns Hopkins' pathologist William H. Welch, and anatomist Franklin P. Mall, who were in Leipzig to study with Ludwig. Brödel made an impression on Mall in particular, considering the encounter resulted in Mall convincing the 23-year-old Brödel, in 1894, to leave Germany for America and work for the fledgling Johns Hopkins Hospital in Baltimore.

Brödel's medical illustration career began at Hopkins working primarily with young, but destined to be eminent, gynecological surgeon Howard A. Kelly, producing work for the two-volume *Operative Gynecology* (pub. 1898), but he also created illustrations for other notable Hopkins' physician-surgeons, including Thomas S. Cullen (who became a close friend and confidant), Harvey W. Cushing, (Figure 3) William S. Halsted, William Osler, Walter E. Dandy and others (Figure 4).

Brevity will prevent a detailed exploration of Brödel's brilliance as a medical illustrator, teacher, and independent researcher, but it is noteworthy that his early renown elicited multiple recruiting efforts to Rochester, Minnesota, by Dr. William J. Mayo, with the last attempt unwittingly prompting the establishment of the Department of Art as Applied to Medicine in 1911.

Prior to 1911, Brödel's compensation was funded largely from Kelly's personal wealth, but upon Kelly's completion of his textbooks, his compensation, and thus ties to Hopkins, became tenuous. Consequently, Mayo's persistent offers grew almost impossible to rebuff. Cullen, responding quickly and desperately to avoid losing the now celebrated medical illustrator to Mayo, convinced local railroad magnate and philanthropist Henry Walters to financially support Brödel with a new department of medical illustration. Initial funding was $5,000 per year (matching Mayo's offer), for three years. The annual gift was subsequently extended through the decade, concluding with a bountiful endowment of $110,000 in 1921. (Approximately $1.8 million today). Thanks to Brödel's genius, Walters' generosity and Cullen's dogged persistence, in 1911 Art as Applied to Medicine was established as the first training department for medical illustrators in the world (Figure 5). (Prior to 1911, Brödel did train a number of young artists, mostly medical students and physicians, including Cushing, who was noted by Brödel to be quite talented).

Today Max Brödel is considered *The Man Who Put Art into Medicine*, to borrow the title of the 1991 biography by Ranice Crosby and John Cody. (Ranice Crosby was a student of Brödel's from the class of 1939, and Director Emeritus when I arrived at the department in 1984). Between 1941 and 1952, eight of nine comparable programs in the US and Canada were directed by Brödel-trained medical illustrators. His legacy continues today, though he would certainly be utterly astonished at the technological advances in the field since Brodel's death in 1941.



Figure 5. Brödel with his students, circa 1917. Beginning in the 20th century, woman have played a major roll in the field of medical illustration.

Hopkins' Art as Applied to Medicine has produced many notable medical illustrators in its 112-year history, but the legacy of a few, during a period of explosive growth in medical, surgical, and scientific knowledge, deserve special mention. Brödel's first student, James F. Didusch, is widely praised for his groundbreaking embryological illustrations. He succeeded Brödel as Department Director. Brother William's historic illustrations of Urology are displayed at the American Urological Association's William P. Didusch Center for Urological History, in Maryland. Another early trainee, Dorcas Hager Padget, illustrated the pioneering neuroscience and neurosurgical work of Walter Dandy, and became a celebrated neuroscience researcher in her own right, all without a college degree.

William Mayo procured an exceptional medical illustrator in Russell L. Drake (class of 1920). Among the most admired medical illustrators of the twentieth century (Figure 6), Drake spent 44 years at what became The Mayo Clinic. He focused largely on illustrating the advancing art of surgery. Ranice Crosby, mentioned previously, succeeded James Didusch as Art as Applied to Medicine's Director, a title now held by my classmate and colleague Corinne Sandone, class of 1986.

Max Brödel's influence permeated much of twentieth-century medical illustration in North America, but other illustrators rose to prominence, including Tom S. Jones. If Brödel had not been recruited to Hopkins in 1894, Tom Jones would have likely been considered the father of medical illustration. Born in Virginia in 1885 (15 years Brödel's junior), Jones studied at the Corcoran School of Art in Washington, D.C., as well as the St. Louis School of Fine Arts. It was in St. Louis that Jones encountered anatomist A.C. Eycleshymer, who persuaded Jones to become staff artist at the St. Louis University School of Medicine, and to illustrate the now classic atlas *Cross-Section Anatomy*, published in 1911. Subsequently Jones followed Eycleshymer to Chicago, where the anatomist was appointed Dean of the Department of Anatomy at the University of Illinois College of Medicine.

In 1921, the same year as Henry Walters' largest and last endowment payment to Hopkins' Department of Art as Applied to Medicine, Jones established the

world's second medical illustration program at the Colleges of Medicine, Dentistry, and Pharmacy at the University of Illinois, Chicago (UIC), becoming Director in 1925. Jones worked with several prominent physicians, including Kansas City's Arthur E. Hertzler, illustrating 11 books for the physician. Hertzler would eventually donate $75,000 to UIC in support of the program.

Whereas Brödel is the *Man Who Put Art Into Medicine*, Jones is rightly the *Father Of Modern Biomedical Communication*. A superb natural media artist, Jones is credited with recognizing the value of multimedia, including works in 3D and motion (i.e., animation) in the delivery of medical and scientific information. Influenced by early Disney cartoons, Jones was the first to grasp the added value of the "fourth dimension," that is, time (thus movement), as a powerful teaching asset. Additionally, as the manufacturing of plastics became more common and diverse, Jones and his students innovated the adaptation of the material for 3D models and displays, both for professional and lay audiences. Tom Jones died in 1961, but a direct line can be drawn from his work and influence to the highly sophisticated multimedia tools of today's medical illustrators.

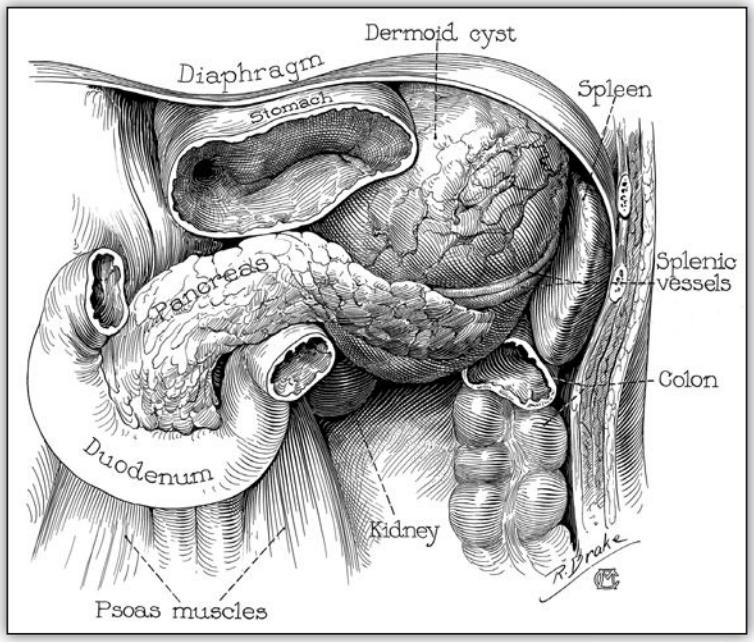


Figure 6. Dermoid Cyst, Russell L. Drake. Pen and Ink, 1929. Used with permission of Mayo Foundation for Medical Education and Research, all rights reserved. Note the looseness of the line work at the head of the pancreas, compared to the almost engraving like precision of the colon and cyst.

Despite Max Brödel's and Tom Jones' brilliance and influence, Frank H. Netter is perhaps the most recognized medical illustrator among physicians, due to his voluminous work with the CIBA Pharmaceutical Company (now Novartis), and the series of "big green books" which resulted. Born in Manhattan in 1906, Netter wished from an early age to be an artist, winning a scholarship to the National Academy of Design while in high school. Nonetheless, family persuasion pushed him towards a career in medicine. Throughout medical school, Netter supplemented his income by producing illustrations for fellow students and professors, but as his brief medical practice declined during the Great Depression, Netter began making lucrative marketing illustrations for pharmaceutical companies, including one in 1936 for CIBA, extolling the virtues of the cardiac drug Digitalis. His new career was thus borne. Netter's decades long association with then CIBA-Geigy, including marketing materials and the popular Clinical Symposia series, eventually coalesced into the thirteen-volume CIBA Collection of Medical Illustrations ("big green books"). His works, now owned by Elsevier, continue to circulate and remain largely relevant. Netter died in 1991. His legacy includes being among the first to employ medical illustration for the marketing of products, and for the use of editorial illustrations to adorn book, magazine and journal covers.

For further information on medical illustration, educational programs and careers, please visit www.ami.org. To support medical illustration education, please visit www.vesaliustrust.org. This two-part series concludes in the January/February edition of *Missouri Medicine.*

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Disclosure

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Moral Injury and Preserving Our Profession

by Wendy Dean, MD



It is time to create morally centered, relationship-focused healthcare.

The publisher at Steerforth Press set only one deadline during the eighteen months it took me to write *If I Betray These Words*. In the spring of 2022, I had four days to choose exactly the right title to encapsulate the heartrending and hopeful stories about physicians' core commitment to their oaths. I read every version of those oaths I could find, which all echoed similar themes: gratitude toward teachers, a commitment to lifelong learning, an obligation to nurture the next generation, selflessness, one's duty to patients above all else, honesty, humility, confidentiality, and love. But the last lines of a 2010 translation of the Hippocratic Oath by Amelia Arenas resonated profoundly:

I pray that the attention I give to those who put themselves in my hands be rewarded with happiness. And in honor of the knowledge I've received from my teachers, I swear to care for anyone who suffers, prince or slave.

If I ever break this oath, let my gods take away my knowledge of this art and my own health.

Here speaks a citizen, a servant of people. May I be destroyed if I betray these words.

Physicians make a promise, when joining this profession, to care for ill and injured patients, to the best of their ability, absent self-interest. Throughout training that obligation is ingrained in our every decision. Mentors and colleagues demand that we live up to the same exceptionally high standards they have maintained, or risk rebuke, shunning, and serious sanctions.

Our patients believe our oath—that we will put their best interests ahead of personal or professional gain—and, as one author said, they "offer their trust as a gift."[2] In accepting the honor of such freely given vulnerability, most physicians strive, in every encounter, to be worthy of it.

However, over the last three decades reimbursement and regulatory pressures have corporatized medicine. Physicians, small business/



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private practice owners in decades past, are now mostly employed and increasingly torn between their covenant with patients and the allegiance they owe to employers. When that rift is irreconcilable, the result can be moral injury.

Psychiatrist, Jonathan Shay, MD, defined moral injury as the confluence of three conditions: 1) betrayal 2) by a legitimate authority 3) in a high-stakes situation.[3] Such betrayal can cause one to transgress deeply held moral beliefs and expectations, heightening the risk of experiencing moral injury. In medicine, those deeply held beliefs and expectations are the oaths physicians take to put patients first. If there is not a safe mechanism for calling out betrayal and instigating relational repair, and if consolidation or noncompete clauses limit career choices, physicians are at higher risk of moral injury. So, for example, when organizations chronically understaff, despite protests by physicians that patients are unsafe, such a decision may be viewed as a betrayal.

Nearly every day since *If I Betray These Words* came out in April 2023, at least one clinician has written to say the concept resonated deeply with their experience. Too many feel that the strain of trying to satisfy too often—competing obligations is too much.

In part this is because our employers, like our patients, believe our oath, too. They leverage that commitment into hundreds of hours of uncompensated labor every year because physicians, like nurses and other healthcare professionals, are loathe to let patients suffer, putting themselves on the line instead. Organizations also rely on our busy-ness and risk-aversion to silence us. Further, they count on the fact that if care standards fall, current regulatory and legislative structures ensure that physicians, not the organization, will bear responsibility. And they count on physicians having too much to lose.

But sometimes, an employer's calculus errs. Ray Brovont, MD, was an emergency physician working at Overland Park Regional Medical Center in Overland Park, Kansas. Dr. Brovont worked for EmCare, a national physician staffing agency hired by Overland Park Regional to staff their emergency room. Dr. Brovont faced EmCare's impossible corporate expectation of potentially being in three places at once: the adult emergency department (ED), the pediatric ED, or the inpatient floors. For years his objections to single physician ED coverage—so scheduled to reduce costs—citing unacceptable patient risk, went unheeded. But when a patient died, Ray intensified his efforts to change the dynamics of risk and responsibility in medicine.

He organized a letter demanding policy change, signed by every ED physician. He was more pointed —though always professional—in his communications with leadership. And when he was fired for speaking out, he successfully sued his employer for wrongful termination. In so doing, he established precedent and wrote a playbook for courageous individuals who, in the future, want to confront corporations inflicting moral injury.[4]

Few individuals are as equipped as Dr. Brovont was—with an attorney spouse, no education debt, and military deployment-tested courage—to confront their employers, even with his example and precedent to follow. Moreover, the betrayal at the root of moral injury suggests the fabric of the community has frayed, something unlikely to improve with isolated individual efforts. Instead, we must insist on rebuilding those communities within organizations committed to being morally centered.

Workforce turnover has been a top concern for most healthcare organizations in 2023. Attempts to reduce burnout and thereby improve retention have been minimally successful, perhaps because addressing burnout is an incomplete approach to the problem. During the COVID pandemic, 45% of workers felt betrayed by leaders they previously trusted—the definition of moral injury.[5] Therefore, it is critical to address the relational ruptures of moral injury while simultaneously reducing the demand-resource mismatches of burnout. Creating organizations that are more responsive to clinicians, and inclusive of their input, is a start.

Non-morally injurious organizations have several characteristics in common. They normalize and prepare individuals for the risk of moral injury in this difficult work. Leaders are humble, curious, and vulnerable, asking for and accepting genuine feedback without becoming defensive or lashing out. They also model morally congruent actions, especially when those choices are difficult. The workforce is sufficiently skilled, exhibits high integrity, and challenges sources and incidents of moral injury. When morally transgressive incidents happen,

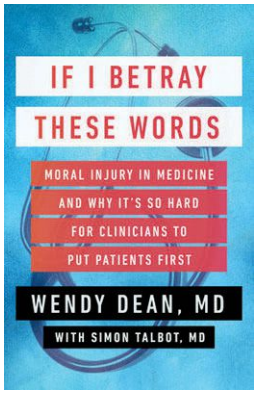
BOOK REVIEW

If I Betray These Words

by Wendy Dean, MD
Review from Amazon

Steerforth Publishing
ISBN-10: 1586423541
ISBN-13: 978-1586423544
Available at Amazon

Offering examples of how to make medicine better for the healers and those they serve, *If I Betray These Words profiles* clinicians across the country who are tough, resourceful, and resilient, but feel trapped between the patient-first values of their Hippocratic oath and the business imperatives of a broken healthcare system.



Doctors face real risks when they stand up for their patients and their oath; they may lose their license, their livelihood, and for some, even their lives.

There's a growing sense, referred to as moral injury, that doctors have their hands tied – they know what patients need but can't get it for them because of constraints imposed by healthcare systems run like big businesses.

Workforce distress in healthcare—moral injury—was a crisis long before the COVID-19 pandemic, but COVID highlighted the vulnerabilities in our healthcare systems and made it impossible to ignore the distress, with 1 in 5 American healthcare workers leaving the profession since 2020, and up to 47% of U.S. healthcare workers now planning to leave their positions by 2025.

If I Betray These Words confronts the threat and broken promises of moral injury – what it is; where it comes from; how it manifests; and who's fighting back against it. We need better healthcare—for patients and for the workforce. It's time to act.

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the investigation is focused on repair, rather than punishment. And finally, organizational culture is not only courageous within its own walls, but encourages leaders to provide difficult feedback to legislators, regulators, and payors in defense of its workforce, calling out potentially morally injurious expectations and demanding change.

Clinicians are hungry to practice in environments that align with their patient-centered values and have leadership and a culture they trust. Organizations that make the shift will substantially reduce their costs of retention and recruitment.

Patients, too, want organizations that facilitate the physician-patient relationship. They *feel* the difference when their doctors are struggling, as reflected in poorer satisfaction scores.[6] When they are less satisfied with their encounters, patients may be less apt to follow the physician's advice, less adherent to treatment, and therefore, may experience poorer outcomes. Therefore, creating healthy physician environments is not only the right thing to do for the workforce, but it is the right thing to do in reducing costs *and* improving patient outcomes.

It is time to create morally centered, relationship focused healthcare.

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MM

Andrew Conway Ivy, MD: The Missouri Physician Who Coauthored the Nuremberg Code

by Arthur Gale, MD

The Nuremberg Code is the most important document in the history of the ethics of medical research. The Nuremberg Code contains ten guidelines for researchers to follow. The most important guideline is obtaining the informed consent of the subject of the research.[1,2] Before the institution of the Nuremberg Code there were only loose interpretations of the 2500-year-old Hippocratic Oath to guide the ethics of human research.



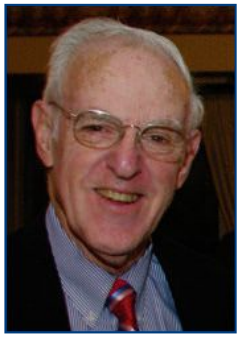
Figure 1. Andrew C. Ivy, MD, from Farmington, Missouri, was the most famous physician of his era.
Source: NLM Digital Collections

A coauthor of the Code was Andrew C. Ivy, MD (Figure 1). Ivy was born and raised in Farmington, Missouri, a small town located about 70 miles south of St. Louis. He also lived in Cape Girardeau, Missouri. He graduated from Southeast Missouri State Normal School in 1913. His father, Henry, was a member of the science faculty.[3] In 1919, Ivy married Emma Anna Kohman who had a PhD in physiology from the University of Chicago. The couple had five sons, four of whom became physicians and one of whom started a pharmaceutical company.

Dr. Ivy received his medical degree from the University of Chicago. From 1926 until 1945, he served as Chairman of the Division of Physiology and Pharmacology at Northwestern University. He was a prolific researcher and the discoverer of several gastrointestinal hormones including cholecystokinin and urogastrone. He and his colleagues published more than 1,500 scientific papers.[2] He was also president of the American Physiological Society.

In what is probably the most famous trial in history, in Nuremberg, Germany, shortly after World War II, top Nazis were tried as war criminals. What is less well known are the twelve subsequent trials held in Nuremberg. The first of these twelve trials is called 'The Doctors Trial.' German doctors were accused of performing gruesome, painful experiments on human subjects, many of whom died during or shortly after the unethical experiment. The German doctors did not obtain informed consent from their subjects. Sixteen of the 23 defendants were found guilty; seven of whom were executed by hanging.[3]

The trial, although held in Germany, was essentially an American affair with American prosecutors and judges. Initially the prosecution's only medical expert giving testimony was Leo Alexander, MD, a Viennese born physician and psychiatrist.[4] Defense lawyers contended that the Nazi doctors were ordered by the state to conduct experiments such as high-altitude hypoxia and hypothermia in freezing seawater to determine how to protect German fliers and soldiers. The defense lawyers accused the United States of also conducting malarial research on prisoners without their consent. Since Dr. Alexander was not an expert in the areas of experimental physiology, the prosecution needed to have a prestigious expert in these areas.[2] The leading American and international expert at that time was the Missourian Andrew Ivy, MD. At the end of World War II Ivy "was probably the most famous doctor in the country."[2]



Arthur H. Gale, MD, is a *Missouri Medicine* Contributing Editor. He is a retired Internal Medicine physician in St. Louis.

Figure 2

The Nuremberg Code (A Summary)

1. Voluntary informed consent.
2. Fruitful result for the good of society.
3. Prior experimentation on animals, and prior knowledge of the problem.
4. Avoidance of unnecessary physical or mental injury.
5. Banning of known lethal or disabling procedures.
6. Degree of risks should not exceed benefits.
7. Proper preparation and facilities to prevent injury or death.
8. Performance of experiments only by scientifically qualified people.
9. Participants may freely end the experiment.
10. The experiment must stop if it proves too dangerous.

During cross examination in the trial, Ivy acknowledged that there were no written principles on the ethics of human research in the United States or elsewhere before December 1946. He stated that the malaria test prisoners at the Illinois State Prison were volunteers and that the research was not intended to result in the death of the subjects as were some of the German experiments.

As a result of the Nuremberg Doctors Trial, 10 ethical principles were written which intended to guide all future human research. This set of principles was the Nuremberg Code (Figure 2). The Nuremberg Code was initially ignored for 20 years after it was written. Since then, it has steadily gained stature and influence.

Although the Nuremberg Code has never been adopted in its entirety by any nation or by any major medical association, it has had a profound effect on human rights and human research. The Nuremberg Code and the subsequent Declaration of Helsinki have served as a model for current US human research regulations. Together, they are responsible for the peer review and institutional review boards (IRBs) that must approve all research projects performed at hospitals or research institutions.

The authorship of the Nuremberg Code is contested. Ivy claimed sole authorship. Leo Alexander, MD, 30 years after the code was written, claimed that he wrote it. Others contend that the Code grew out of the trial itself and that one of the three judges, Harold Sebring, had a hand in writing the Code. Most historians believe that both Ivy and Alexander share authorship of the Nuremberg Code.[4]

At the height of his fame Dr. Ivy did something inexplicable which tarnished his reputation and puzzled his colleagues and many admirers. He supported the use of a putative drug called Krebiozen for the treatment of cancer. It was created by a Yugoslav doctor named Steven Durovic. It was derived from the blood of horses. No researcher could repeat Ivy's claimed positive results with this drug. Instead of rescinding his results, Ivy claimed that the American Medical Association and the American Cancer Society were trying to prevent his and Durovic's drug from being distributed on the market. Ultimately the Federal Drug Administration (FDA) investigated Ivy and charged him with falsification of information and fraud. At the end of the investigation the FDA ruled Ivy was not guilty. Dr. Ivy then belatedly severed his ties with Durovic.

Ivy accomplished much in his life. He was the most famous doctor in America of his era. He and his associates performed a massive amount of research primarily on the gastrointestinal system. If there was a Missouri Hall of Fame for Physicians, Andrew Conway Ivy, MD, would be in it.

Ultimately Ivy will be remembered through the ages as the coauthor of the Nuremberg Code—the most important document in history for setting ethical standards in human research and probably the most influential document on medical ethics since Hippocrates wrote his famous Oath.

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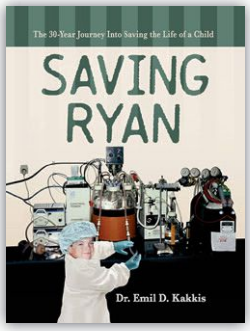
Saving Ryan

by Emil D. Kakkis, MD

Review Joel C. Eissenberg, PhD

Publisher: Impositivity Media, LLC;
First Edition (June 24, 2022)
Hardcover : 352 pages
ISBN-13 : 979-8985505610
Available at Amazon

"Saving Ryan" by Emil Kakkis, MD, is a story every physician needs to read in order to understand how modern pharmacy gets to patients. Kakkis is a physician who pioneered enzyme replacement therapy for Mucopolysaccharidosis I (MPS I), a progressive and fatal disease. The story is about the patients and their families who struggle with the disease and Emil's struggle to deliver life-enhancing therapy against terribly long odds. The Ryan of the book's title is a kid with MPS I. His working class parents were not content to watch Ryan decline and die in his first or second decade. MPS I is an extremely rare disease, so big pharma sees no potential for return on investment for developing treatments or cures. Ryan's parents start a foundation to raise money for a cure.



MPS I is due to a deficiency of alpha-L-iduronidase, an enzyme required for degradation of muclopolysaccharides in lysosomes of all cells. Kakkis was initially beguiled by the promise of gene therapy, but his mentor, Elizabeth Neufeld, PhD, convinced him that the less glamorous approach of giving patients injections of the missing enzyme was the more promising clinical strategy. While conceptually straightforward, producing therapeutic amounts of recombinant enzyme in cultured cells is an immense and expensive technical undertaking. Even when the technical barriers are overcome, Kakkis had to implement enzyme production and testing by the exacting FDA "Good Manufacturing Practice" before his enzyme could safely be used in clinical trials.

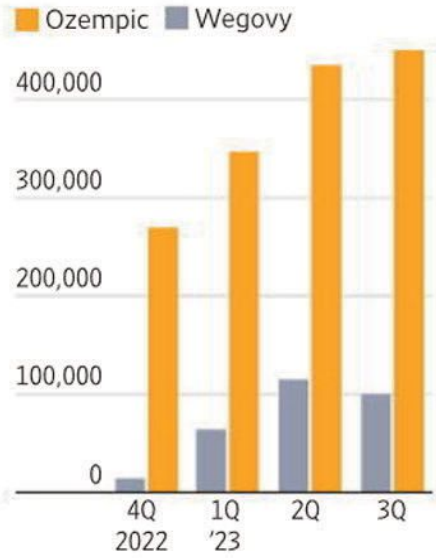
I seldom read lay science/medical books because they usually spend too much time explaining technical details that I already understand, and I find myself wincing at the imprecision and outright errors. This book avoids that pitfall, both by being scientifically sound and concise, and by keeping the focus on the emotionally gripping struggle to validate a therapy and get it approved by FDA regulators and into patients. The patients and their families were essential in generating the initial funding that enabled Kakkis to get proof-of-principle data using a dog model of MPS I. The reader rides an emotional roller coaster as Kakkis works through technical barriers, funding and personnel challenges, corporate critics and regulatory anachronism.

The publisher of "Saving Ryan" is Impositivity Media, which bills itself as "Impossibly Positive Stories." Emil's book certainly delivers, although during some of the bleaker sections, I had to remind myself that this has a happy ending. The writing is neither maudlin nor saccharine, but tells a story that connects at a human level.

The mark of a good book is that the reader finds themselves reflecting on what they read long after they put the book down. The thoughtful reader will certainly do that with "Saving Ryan." I strongly recommend this book, both as a chronicle of clinical translational research and as an uplifting story in our cynical age. **MM**

1 PICTURE = 1,000 WORDS

Weighty Matters: Weekly Average Prescriptions for Each Quarter



Ozempic prescriptions cover its uses for diabetes and weight loss. Wegovy prescriptions are primarily for weight loss. Data for 3Q 2023 is through week ending July 21. Source: IQVIA

In the News



Jessica Gold, MD, *Missouri Medicine* Editorial Board member for Physician Wellness, has accepted a new post as the inaugural Chief Wellness Officer for the University of Tennessee System and as Associate Professor of Psychiatry at the University of Tennessee health Science Center. Dr. Gold will be receiving the *Missouri Medicine* Distinguished Service Award for her time with the Journal.



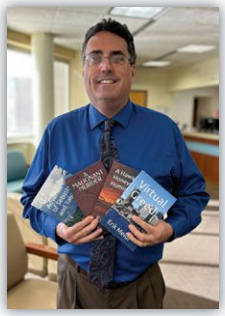


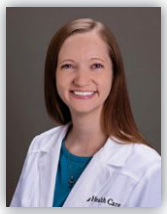
Nathaniel Murdock, MD, OB/GYN, was honored on by Washington University School of Medicine during the 27th Homer G. Phillips Public Health Lecture. He is with his wife, Sandra Murdock.

Congratulations to **John Lucio, DO**, who is the new Mid-Missouri regional chief medical officer of SSM Health St. Mary's Hospital in Jefferson City.



If you are interested in a good mystery, google **Erik Meidl, MD**, Blessing Health Hannibal, the author of several children's books who has now turned his talent to mystery writing. His main characters include an infectious disease specialist who has a connection to the same small Missouri town and solves mysteries. You can find his mysteries on Amazon: *A Malignant Murder, Virtual Greed,* and *A Hawaiian Honeymoon Homicide*.







Congratulations to two MSMA members: **Melanie Oler, MD**, who is the newest member of MU Health Care Family Medicine team, providing family care for all ages as well as obstetrics; and **Abhinav Golla, MD**, who joined MU Health Care as an ophthalmologist who specializes in advance eye surgeries for cataracts and glaucoma. **MM**



NEW MSMA MEMBERS!

* = Medical Student

** = Resident/Fellow

Rima Abhyankar, MD – Anesthesiology – Kansas City
Javaughn Baker, MD – Anesthesiology – St. Louis
Michael Beckman, MD – Pain Medicine – Kansas City
Molly Bliss, MD – Family/Preventative Medicine – Kansas City
Robert Clark, DO – Manipulative Medicine – Kirksville
Jordan Farley, DO – Anesthesiology – Creve Couer
Ifrah Fatima, MD – Unspecified**
Stephen R. Gallo, DO – Vascular Surgery – Springfield
Allison Goldenstein, DO – Dermatology – Kirksville
Claire Gray, MD – Family Practice – St. Louis
Rafael Gutierrez, MD – Neonatal-Perinatal Medicine**
Douglas Haase, MD – Orthopedic Trauma – Columbia
Jesse Hatfield, MD – Emergency Medicine – Tulsa
Angela Hulsey, MD – Plastic Surgery – St. Louis
Brett Jagger, MD, PhD – Infectious Disease – St. Louis
Alok Jain, MD – Psychiatry – Springfield
Brian Jao, MD – Plastic Surgery – Kansas City
John Lucio, DO – Pain Medicine – Jefferson City
Nathaniel Nielsen, DO – Family Practice – Liberty
Magnus Nwora, DO – Internal Medicine – Overland Park
Eric Penton, MD – Family/Preventative Medicine – Hermann
Laraib Sani, MD – Internal Medicine**
Ximena S. Schnurr, MD – Family Practice – O'Fallon
Seresa Smith-Haxton, MD – OB/GYN – Jefferson City
Mitchell Tarka, MD – Ortho Foot & Ankle – St. Louis
Kimberlie Wells, DO – Psychiatry – Kansas City
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Screening for Cognitive Impairment in Primary Care: Rationale and Tools

by Mehwish Siddiqui, MD, Tarisai Nyahoda, MD, Christina Traber, APRN, Susan Elliott, DNP, APRN, Veena Wang, MD, Lina Toledo-Franco, MD & Miriam B. Rodin, MD, PhD

Effective medical and surgical treatment for cardiovascular disease and many malignancies are readily available. This is not yet true for neurodegenerative diseases resulting in loss of cognitive function.



Mehwish Siddiqui, MD, Tarisai Nyahoda, MD, Christina Traber, MSN, APRN, GNP-BC, Susan Elliott, DNP, APRN, FNP-C, Veena Wang, MD, Lina Toledo-Franco, MD, and Miriam B. Rodin, MD, PhD, (pictured),are all affiliated with the Division of Geriatric Medicine, Department of Internal Medicine, Saint Louis University School of Medicine, St. Louis, Missouri.

Abstract

Cognitive impairment is common and often under diagnosed in the early stages. Patients and family caregivers benefit from early diagnosis of reversible causes and longer lead time for care planning in primary dementia diagnoses. Primary care physicians are the first and best providers for diagnosing common, serious, and progressive cognitive disorders.

Introduction

Dementia is a cluster of age-associated neurodegenerative diseases that affect increasing numbers of families and that challenge the social and financial resources of the American health system. The global prevalence of cognitive impairment in older adults may be as high as 9%, affecting 50 million people. Some predictions are that this number will triple by 2050.[1] In the advanced economies such as Japan, the US, and the EU, countries are experiencing the impact of an estimated 10 million new cases each year. China's mandated strict population control has led to economic effects of demographic aging as well. For the first time in 2020, there were more people in the world over age 60 than children under age 5. In addition, the number of very old people increases every decade. Japan has the oldest population we have ever seen resulting in fewer working age people to financially support and care for the increasing numbers of very old people suffering from the syndromes of aging including dementia, frailty, and functional dependence.[2]

Primary care practitioners who provide health promotion, disease prevention, and care of acute and chronic conditions are on the leading edge of this demographic shift. Professional bodies such as the American Geriatrics Society (AGS), governmental agencies such as the United States Preventive Health Task Force (USPHTF), and others routinely review the published research literature and convene experts to assess preventive practice with age-specific guidelines for example for vaccination and periodic screening for common illnesses. Screening is a useful population strategy when conditions are common and treatable even if not curable when detected at an early, asymptomatic stage. The calculation is that early detection is cost-effective if there are enough cases that can be cured, such as early-stage breast cancer, or managed effectively to reduce

long term morbidity, such as cardiovascular disease and diabetes.

The guidelines over the years have tailored screening to estimated individual risk. Better understanding of the genetics of breast, colon, and prostate cancer identifies high risk individuals who would benefit from screening at younger ages, in their 40s, compared to average risk individuals who may begin screening in their 50s. This strategy conserves individual and societal costs. Similarly, considering lag-lead time to benefit, cervical cancer screening is no longer recommended for women over age 65 who have had consistent well-woman care. But the genetics and risk factors for dementing diseases are less well understood. Effective medical and surgical treatment for cardiovascular disease and many malignancies are readily available. This is not yet true for neurodegenerative diseases resulting in loss of cognitive function. For these reasons the USPHTF has been equivocal in its recommendations for population screening for dementia.[3] The British National Institute for Health and Care Excellence (NICE) guidance (NG97: June 20, 2018)[4] also advises against routine dementia case-finding in asymptomatic patients due to the lack of demonstrably effective treatment. The recent events surrounding FDA approval of new Alzheimer disease drugs is one example.[5]

Why Should We Screen for Dementia?

The cost of caring for people with dementia is substantial. An analysis of the Health and Retirement Study (HRS) longitudinal cohort of Medicare beneficiaries aged 70 and older reported that the cost of five years of care for an Alzheimer's disease patient was over $100,000 greater than that of a heart or cancer patient.[6] Although Medicare paid the same amount for covered costs regardless of diagnosis, the difference is accounted for by out-of-pocket costs for paid caregiving and loss of employment income by family caregivers.[6] About 10% of today's generation of 70-80 year-olds already suffer with dementia. The prevalence is estimated to increase by 10% in each successive cohort so that about 20% of 80-90 year-olds and a third of the oldest ages over 90 require supervision due to cognitive decline. The family caregivers of the old are themselves older. With no imminent change in how care for "memory" patients will be financed, the bulk of the care is provided by lower income, older women caregivers.[6,7,8]

In the absence of clearly effective therapeutics, the USPHTF did not change the 2014 guideline in 2020.[3] However, professional and advocacy organizations including the Gerontological Society of America Workgroup on Cognitive Impairment and Earlier Diagnosis advocate for early diagnosis of dementia to allow patients and families time for financial planning and mobilization of support systems.[9] In 2018 the American Diabetes Association recommended annual screening for adults over age 65 at initial and annual clinic visits for early detection of MCI (mild cognitive impairment not meeting DSM 5 criteria for a diagnosis of dementia), and dementia to improve diabetes outcomes.[10] A survey of patients and caregivers sampled their opinions about dementia screening. There was agreement that early diagnosis in addition to planning time, would allow patients to participate in planning for their own futures while they still had capacity. Family members also believed that having planning time would help them learn about the disease and make housing decisions.[7,11] Patients and family members report being more comfortable discussing cognitive impairment with a familiar PCP.[12,13]

A delayed diagnosis of dementia encourages the thought that memory loss is normal aging until it results in crises that challenge relationships, mistaken attributions of mental illness, wandering, traffic accidents, and police encounters. Financial exploitation of cognitively-impaired elderly is a real risk. Often there were signs that might have been evident to an expert examiner. Several screening tools we will discuss are available to primary care providers and have been calibrated to detect early-stage cognitive impairment MCI.[14,15] Similarly to a slightly elevated HgA1c indicating glucose intolerance not meeting criteria for diabetes, MCI informs a surveillance strategy. About 15% of MCI diagnosed patients will progress to dementia in a year. The finding of MCI should prompt patients and clinicians to engage in evidence-based activities to preserve cognitive performance. These include physical exercise, cognitively engaging activities such as music and chess, social engagement, and cardiovascular risk modification.[16]

Primary care providers have a distinct advantage over episodic providers in that they have a relationship with the patients. Visiting out-of-town family members may be shocked at changes that were not evident on the weekly phone call. At a routine visit a family member may raise concerns about getting lost while driving, repetitive questions or stories and "apathy." Patients themselves may complain about word-finding problems, forgetting names, and losing their keys. Sometimes there is an "unmasking" in which an older patient becomes agitated or confused in response to an acute illness.[14]

What Are the Barriers to Cognitive Screening in Primary Care?

The main barriers to dementia screening in primary care are the insidious onset of cognitive impairment, the tendency for us to politely "normalize" it in old patients and the lack of a clear mandate to screen. This is coupled with the rapid pace of primary care visits that are already crowded with routine monitoring and documentation demands. A third barrier is lack of training and familiarity with screening tools and referral resources.[12,13,14]

In 2011 the Centers for Medicare and Medicaid (CMS) recommended physicians use the Medicare Initial and Annual Wellness Visits (MAWV) to assess cognitive function by direct observation, history gathering including, with patient consent, from family members if present, chart review for concerns expressed by other clinicians and with consent, a brief, validated assessment tool.[17] The Welcome to Medicare Initial Visit, Medicare Annual Wellness Visit, or Medicare Annual Exam can be conducted face-to-face or by telehealth as convenient, fully reimbursed and contextually easily understood platforms for cognitive screening.[17,18] For residents of long-term care and skilled nursing facilities, CMS mandates quarterly assessments using the Minimum Data Set 3.0 which includes cognitive screening of verbal patients. The Veterans' Affairs Health System[16] guideline advised screening only in the presence of warning signs such as inattention, failure to follow up on medication instructions, inability to provide information, family reports of confusion, wandering, deficits in self-care, nutrition, and safety.[17] The AGS, however, recommends routine screening at all Medicare mandated visits to establish a documented baseline for other clinicians. Insurance companies with Part B and Part C plans have Annual Wellness home visits during which they perform a routine screen.

The utility of a screening test depends on its diagnostic accuracy as measured by sensitivity, which has few false negatives, and specificity, few false positives. Greater sensitivity is useful for surveillance and longitudinal follow up of subjective symptoms and MCI. Sensitivity is influenced by the setting, for example delirium during acute illness, environmental distractions in an ED, sensory deficits of hearing and vision and importantly, the lack of a common language between the patient and the examiner. All these may result in false positive cognitive screening. When embedded in a more comprehensive functional assessment such as those contained in MAWV templates, the finding can guide further decisions for evaluation. There are more than 30 cognitive screening tools in use in the US and internationally. We do not intend to present a comprehensive review, but we will compare several widely used English language tools that are available to primary care providers, and which can be easily uploaded to EHR pull down menus or dot phrases. Value-based EHRs have already incorporated such tools especially in the Medicare Annual Visit templates.

Cognition and thinking involves several anatomically distinct yet integrated neural pathways. Neurogenerative diseases may initially affect specific circuits. A screening tool must be able to sample different cognitive functions.[19] Although specific diagnosis is desirable, it is sometimes more important in primary care to establish a baseline for referral or surveillance and establish what the patient can or cannot safely do. The tools we discuss probe neural pathways involved in several cognitive domains because we believe that reliance on only one short-term memory can miss important functional deficits.

Antegrade memory loss (STM) is rapid forgetting of new information and emerges early in Alzheimer's disease. Visual spatial dysfunction may begin as a new difficulty with procedural tasks such as cooking, filling out forms or way finding in familiar areas emerge later in Alzheimer's disease. Visual spatial difficulty appears early in diseases such as posterior cortical atrophy and dementia with Lewy bodies (LBD). Visual hallucinations emerge early in LBD but are rare in mild-moderate Alzheimer's disease. Apathy and social

Table 1: Summary Characteristics of Three Dementia Screening Tools and Short Forms

Tool (date of publication)	MMSE [20] (1976)	MoCA [25] (2005)	SLUMS[22] (2006)	Mini Cog [46] (2003)	MiniMoCA[30] (2015)	RCS (2015)[26]
Minutes to administer	8-10	10-12	8-10	3	5	3
Public domain	No	No (current)	Y	Y	partially	Y
Sensitivity to MCI%	18	90	92	NA	NA	NA
Sensitivity to Dementia%	90	100	100	76-99	NA	89
Specificity for dementia%	100	87	81	89-93	NA	94 (70 MCI)
Adapted for visually impaired?	Y	Alternate form available	Y	Y	Y	Y
Adaptation for hearing impairment?	Y	Alternate form available	Y	Y	Y	Y
Influenced by education	Y	Y	Y	N	NA	NA
Scoring adjusted for education	N	N	Y	N	N	N
Score ranges for severity (WNL MCI, mild, moderate, severe)	26-30 normal 19-25 mild 10-20 mod. ≤ 9 advanced	26-30 normal 19-25 MCI 11-21 mild, ≤ 10	<HS 25-30 nl >HS 27-30 nl 24-26 MCI ≤ 23 mild+	5 nl 3-4 possible 0-1 likely	24 normal Not scored for MCI	10 normal 5-7 mild <5 dementia
Adaptation for telehealth?	N	Y	N	N	N	N

withdrawal may represent depression which should be treated before a diagnosis of Alzheimer's disease is made. Personality changes and social or emotional disinhibition emerge early in frontotemporal dementia (FTD) before there is evidence of STM loss. Executive dysfunction, impaired judgement, difficulty with multitasking or complex tasks that were easily done in the past occurs in multiple diagnostic groups. Vascular dementias, including post-stroke, multi-infarct, chronic small vessel disease or microangiopathy have variable presentation depending on the brain region affected. Classically, multi-infarct dementia develops as stepwise, abrupt changes compared to insidious decline seen in Alzheimer's disease. Cardiovascular risk factors are present.

Less common syndromes affect isolated abilities. Prosopagnosia affects facial recognition; primary progressive aphasia affects language function without a history of alcohol abuse. Normal pressure hydrocephalus, Parkinson's disease, multiple sclerosis, and supranuclear palsy (SNP) have characteristic early onset physical and radiological findings. Prion diseases, e.g., Creutzfeldt Jakob (CJD), follow a rapid course. A screening test might detect cognitive impairment but for these uncommon diseases the specific diagnosis should be delegated to a neurological specialist or research center.

Screening Tools Compared

Table 1 compares several commonly used brief (≤5 items) or short (≤15 items) screening tools. Table 1 is not exhaustive, but it presents comparative characteristics of the screening tools most used in primary care. The most well-known tool is the Folstein Mini-Mental Status Examination (MMSE).[20] It is an 11-item 30-point questionnaire introduced in 1975. It takes 8-10 minutes to administer to an alert, cooperative patient with intact hearing, visual, and motor functions. It is widely used in clinical practice and research. However, the MMSE is now copyrighted so clinicians and researchers have had to seek alternative tools.[21,22]

In response to that, the Saint Louis University Mental Status Exam (SLUMS) was developed in 2006

and validated by Divisions of Geriatric Medicine at Saint Louis University and the John Cochrane Veterans Administration Medical Center for use with male veterans. [23,24] It has since been validated in women, and multiracial community samples. It has been translated into French, Spanish, Korean, and Mandarin Chinese. The SLUMS is calibrated to the MMSE as an 11-item 30-point scale. It differs from the MMSE in that it assesses episodic and rote memory. Episodic memory tests remembering embedded details of a story, a necessary ability for remembering medication instructions. The SLUMS assesses visual spatial executive function, important for driving, with the clock draw test (CDT) which is more sensitive than the overlapping pentangles figure drawing in the MMSE. The SLUMS queries verbal fluency as well as verbal recall. The SLUMS also has published calibration of scoring for educational level and MCI.[25,26] The SLUMS is available online for free with accompanying training video on the Gateway Geriatric Education Center. [27]

The most widely used and validated dementia screening tool is the Montreal Cognitive Assessment (MoCA.)[28] The MoCA is also a 30-point scale. Standardization for discriminating between MCI and dementia are not established,[29] however, a short form and a telephone form are available.[30] The MoCA is available in 65 languages. Paper versions 7.1 and 8.1 are free on-line for clinicians, teachers, and researchers on the MoCA institute website. To protect reliability of the instrument, since 2020 the MoCA Institute requires paid on-line training and certification for non-licensed professional use.[28] The Institute training site is on youtube.com (January 28, 2018) The MoCA also uses the CDT to assess executive function. MOCA tests visual naming recognition rather than free verbal recall. The items vary[22] and the MoCA takes a few minutes longer to administer than the MMSE and the SLUMS.[24]

There are several published head-to-head comparisons of the three screening forms. The SLUMS is not as widely used as the MMSE and the MoCA so there are fewer psychometric data for comparing populations.[24,29] There are limited data on test-retest variability in practice for the SLUMS and the MMSE,[28,23] however, the SLUMS was crafted to increase sensitivity to detect MCI.[22] The Alzheimer's Disease Assessment Scale cognitive subscale (ADAS-cog) is often used in clinical trials. However, it is intended for research use by clinically-trained specialists and is not appropriate for rapid primary care screening.[31] Two systematic reviews concluded that the MOCA and the Mini-Cog had the best sensitivity among available tools in common use to detect MCI.[21,29,32,33]

Each of the 30-point scales can take up to 15 minutes of office time. There are several widely used rapid screening tools that can trigger one of the more sensitive tools. The Mini-Cog asks the subject to remember three words, perform the CDT, and then recall the three words.[31] It cannot be used on the telephone or reliably with patients with hearing or visual impairment. The Rapid Cognitive Screen (RCS) uses three SLUMS items: the five-word delayed recall, the CDT and one item of embedded memory from the story.[32] The mini-MoCa is a five- minute version of the MoCA that correlated r=0.87 with the full MoCA and has published test-retest reliability.[33]

The Short Blessed Test has been used since 1983 but it requires calculating weighted scores from six items. The scores corelate very well with MMSE but calculations make it more difficult to use.[34] If a patient is not able to perform a screening test due to illness, hearing loss or other cause, the Alzheimer's Disease eight-item caregiver checklist (AD8) is widely used internationally. [35] It queries whether the family member has noticed specific problems in memory, self-care, and task performance. For residents of long-term care and skilled nursing facilities, CMS mandates quarterly assessments using the Minimum Data Set 3.0 which includes cognitive screening of all verbal patients. The MDS 3.0 uses a tool called BIMS, the Brief Interview for Mental Status.[36] A social worker usually administers the 15-point BIMS. It has been validated as a predictor of need for ADL assistance in LTC, but it does not perform well outside that setting.[37]

How to Perform Office-Based Screening

Medicare Annual Wellness and annual physical exams are a convenient way to introduce screening to establish a baseline. It should be part of the flow of the visit, in a quiet private space. If the patient does not speak English fluently, an on-line interpreter or family interpreter is not optimal because instrument reliability depends on standardized delivery and

minimizing distractions and coaching. If a native language translation and administration is not possible, in this setting, AD8 may be more useful.[28] For English-speaking patients, the family should be instructed to avoid talking, coaching, or gesticulating. It is important to keep to the recommended time limits as speed is a component of the scoring. Using interpreters has not been factored into reliability and it is not advisable without extensive pre-visit training. It is important to note whether the patient makes a good effort to respond or gives up easily, which may indicate depression or delirium. Visually-impaired patients can skip the visual tasks in the SLUMS and calculate the score as a percentage.[37] Patients with hearing loss may perform better if examiners take off their masks to normalize frequencies and permit lip-reading. It is also useful to find out if the patient has "a better ear." Hearing loss is increasingly being identified as a risk factor for cognitive impairment. [38]

In the flow of a routine follow up or acute visit, complaints of memory loss should be directly addressed with screening, even if it only occurs in the review of systems and not in the chief complaint. It can be revisited at another time if there is not time immediately. Having "trouble remembering things lately," having to think harder about things that used to be easy are clues as are respectful queries about family complaints about missed bill payments or repetitive questions or stories. For new patients, a brief screen will indicate if one of the longer screening tests will be useful. Knowing the patient's educational and occupational attainment are important indicators of health literacy.

Screening for cognitive impairment is required to complete a MAWV. EHR templates for AWV, Welcome to Medicare and Medicare Annual Physical Visits include brief screening tools. Screening, evaluation, and counselling about cognitive screening is covered by CMS under the AWV G codes. Use the CPT 99483 if screening is performed in the setting of a newly detected cognitive impairment during the AWV or during a routine office visit. It is reimbursed at $266 in most locations. More detail on coding is available at the CMS website.[18]

What To Do with Screening Results

The Alzheimer's Association video demonstrates administering screening tests and, more importantly, video models of explaining results to family and patients.[39] Figure 1 walks through a branching clinical pathway for following up on cognitive screening results. As with other tests, what the clinician does with the results is important. A "normal" test is a baseline, however even small "mistakes" within the tests' range of normal represent a benchmark for follow up at another time or as an advice to another clinician.

Reversible causes of cognitive impairment should be addressed. A thorough medication review is mandatory at the first sign of cognitive impairment. This should include "natural" supplements, over-the-counter remedies, alcohol, and cannabis products. All prescription drugs must be reviewed for dose and timing with respect to onset of symptoms, indication, dose, and correct use. In our experience anticholinergic medications, sedatives, hypnotics and opiates, overly aggressive blood pressure, and glycemic control, especially in combination, are very commonly at the root of reversible cognitive impairment. Even if used safely for many years, pharmacodynamics and kinetics do change with aging and that may be the cause of new adverse effects of old drugs. The Beers criteria is a guide to drugs poorly tolerated by older adults which is available on-line at the American Geriatrics Society website.[40] We also use validated tools for "deprescribing."[41]

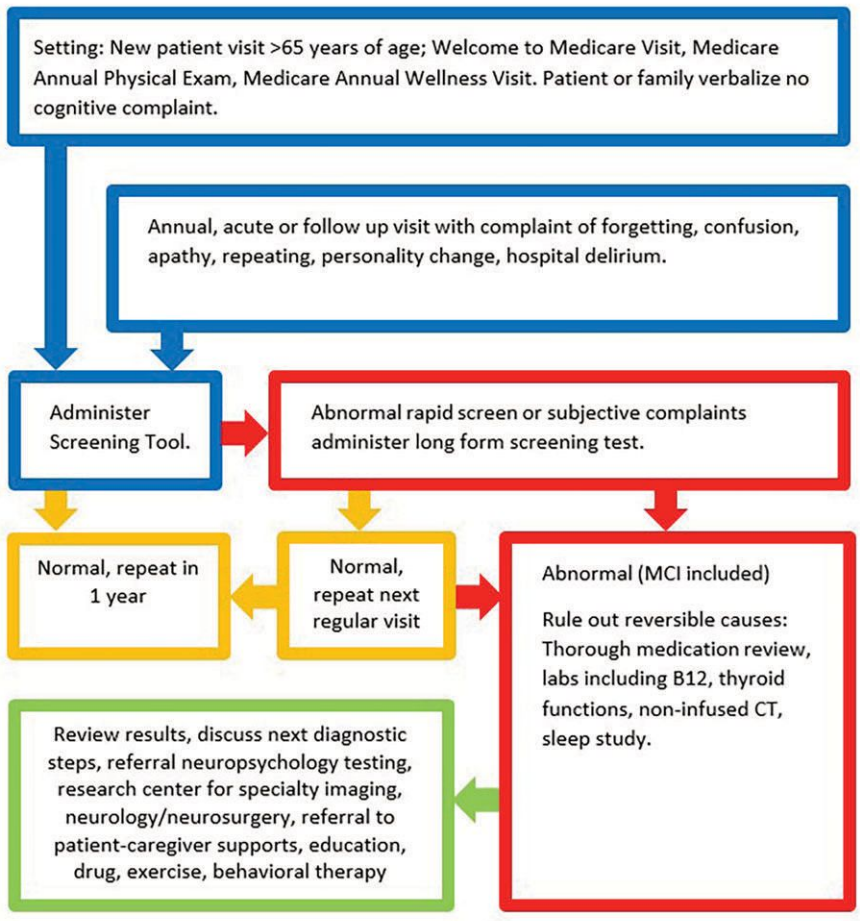
A laboratory evaluation should identify electrolyte imbalances, renal and liver dysfunctions, endocrine abnormalities including thyroid dysfunction (both hypo- and hyper-), or evidence of poorly controlled or overly tightly controlled glycemia. Unrecognized anemia can be primarily responsible for or due to a common underlying condition. We always check vitamin B12 levels. Though it is a rare cause of dementia, it is easily treatable.

Sleep disorders are common in older adults. Persistent complaints about insomnia may lead patients and physicians to use over the counter and prescription remedies with adverse effects on cognition. Sleep disorders should be evaluated in any case. There is an established association between sleep apnea and mild cognitive impairment.[42] Several studies provide evidence of improved cognitive performance with appropriate treatment of obstructive sleep apnea.[43]

Abnormal results, especially if they are unexpected, require discussion of the meaning and next steps. If the patient is willing and the resources

Figure 1

Decision Tree for Cognitive Screening in Primary Care



are available, referral to a PhD neuropsychologist or other certified psychometrician for a diagnostic assessment is especially useful and normally covered by insurance. A standardized two-hour battery of paper and pencil tests assess the "cognitive circuits." The value of formal testing is that the pattern of deficits may indicate a specific diagnosis which is useful for prognosis and treatment. It can suggest whether treatment for co-morbid mental illness or depression may be useful. The battery also develops information about the patients' relative strengths and deficits to guide them and their caregivers about how best to preserve their independence and dignity.

Further diagnostic evaluation includes brain imaging. The recommended first step is a non-contrast CT to rule out obvious pathology such as strokes, hemorrhages, mass lesions, or infiltrating lesions. For example, an early sign of central nervous system lymphoma can be cognitive loss. In the presence of known vascular disease, focal neurological deficits, gait abnormalities, or tremors and sensory abnormalities, referral to a neurologist is useful. Neurologists often prefer MRI for the finer structural detail but as a first step it is not necessary. If physical and radiological findings suggest normal pressure hydrocephalus (NPH) referral to neurosurgery for a diagnostic large volume spinal tap and shunting can be curative. Prior to referral and advanced imaging, routine blood tests including CMP, CBC, drug levels, thyroid functions, and vitamin B12 should be performed to rule out both acute problems and reversible subacute causes of cognitive dysfunction.

There are now many imaging options for specific diagnosis of cognitive impairment and dementia. Functional PET and MRI studies examine patterns of uptake of radiolabeled glucose, beta-amyloid, and dopamine to map regional brain metabolism and locate pathologic deposits of amyloid (Alzheimer's disease) or deficiency in dopamine (Parkinson's disease). There have been recent breakthroughs in identifying useful markers for diagnosis and disease monitoring using blood and CSF markers of beta amyloid and phosphorylated tau for tracking

Alzheimer's patients in research and drug trials. They are not widely available for clinical use outside of research centers.

Many primary care providers feel comfortable prescribing oral medications including rivastigmine, galantamine and donepezil, the central acetylcholinesterase inhibitors (CAI). Memantine is a central NMDA receptor antagonist for clinical cognitive impairment. The indications for starting CAIs are not entirely clear. Early treatment for MCI or mild dementia may provide the greatest benefit. Except for adverse drug reactions, the guidelines for stopping therapy are not clear. Memantine is added later for moderately advanced to severe dementia though the benefits also require discussion. The cost-effectiveness of starting or continuing these drugs in moderately advanced and advanced disease is unclear.[44]

There are presently two FDA approved antibody infusion therapies directed at beta amyloid.[45] Lecanemab blocks the formation of beta-amyloid plaque in neuron cell bodies. Aducanumab removes beta-amyloid from the brain. They are expensive and not widely available. At present they should be used by specialists at specialty centers with the capacity for beta-amyloid scanning as proof of diagnosis and treatment response. As always, it is essential to stop any drugs that may be impairing cognition before starting another one to treat it.

The most important intervention for a patient and family with a new diagnosis of a progressive cognitive illness is the assurance of support from their physicians and other health and social service providers. Early referral to senior and caregiver support services in the community and on-line is important to help patients address the need for direct care, caregiver support and education and other needs that emerge. If the patient experiences behavioral symptoms, early referral to psychiatry is useful. In sum, therapeutic alliance among patients, family caregivers, and primary care practitioners is the bedrock of care for patients with dementia.

Conclusion

Dementia is a cluster of neurogenerative diseases that affect cognition. They are most common among older adults. As the population ages, the prevalence of dementia is increasing. There are no cures for these diseases despite considerable progress in research on Alzheimer's disease. Because of the lack of effective treatment, the question of screening for early detection of dementia has been debated. However, the current consensus is that it is useful for patients and families because it provides a framework for adaptive strategies, time to learn about the disease ,and time to plan for future care needs. Screening, care planning, and patient education are billable and easily incorporated into annual exams and particularly the MAWV.

The initial work up for cognitive impairment includes a rigorous medication review and reconciliation, basic imaging, and laboratory investigation for reversible causes. Referral to neuropsychological testing, specialized neurological investigation, and psychiatric assessment should be individualized based on the clinical presentation and family and patient preferences. Effective pharmacological management is emerging. It is always necessary to connect patients and caregivers with community support and educational resources.

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Disclosure

None reported. **MM**

Screen Use and Social Media "Addiction" in the Era of TikTok: What Generalists Should Know

by Kevin Y. Xu, MD, Tiffany Tedrick, MD & Jessica A. Gold, MD

Recognizing that screens are here to stay in the post-COVID era, we provide guidance on how to reduce potential harms associated with screen exposure without necessarily requiring people to abstain or stop using screens.



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Abstract

While the term "screen addiction" or "social media addiction" is gaining steam in the popular media, preclinical, clinical, and population health research have not caught up with regards to the diagnosis and treatment of unhealthy screen use. The overarching goal of this article is to provide broad clinical tips to generalists, working outside the mental health specialty, on the evaluation and treatment of unhealthy screen exposure in children and young adults. We will clarify the difference between addiction and overuse, and why this distinction matters. Recognizing that screens are here to stay in the post-COVID era, we will provide guidance on how to reduce potential harms associated with screen exposure without necessarily requiring people to abstain or stop using screens.

An Introduction to Unhealthy Screen Use

Children and adolescents in the United States (US) are having relationships with their screens at younger ages than ever before, as levels of screen exposure have surged since the start of the COVID pandemic.[1] Per recent estimates, children 8-12 years spend four to six hours a day on their devices, increasing to nine hours per day for teenagers.[2] Against this backdrop, there are mounting concerns about the potential negative impacts that screen exposure is having on young people with regards to mental health consequences. Concern has also been raised about the potential for screen "addiction" or social media "addiction."

The Language of Addiction and Why It Matters

Popular culture is saturated with the language of addiction. Consider the case of a person who consumes coffee every day who refers to themselves as having "caffeine addiction." A recipe for corn tortillas in *The New York Times* referred to the masa's "addictive" aroma and flavor.[3] Alternatively, an individual may state that they enjoyed a "mildly addictive" television show that was featured on the summer's Netflix "binge" list.[4] While it is not our goal to regulate people's language choices, we emphasize that the colloquial use of the term "addiction" in the case of unhealthy social media use may obfuscate diagnosis and treatment. Throughout this article, we will describe the distinction between the colloquial connotations of "addiction" in contrast to scientific definitions, and why these distinctions are essential.

While "regular use," "unhealthy use," and "use disorder" are often employed interchangeably in daily verbiage, these terms are not

synonymous. The Diagnostic and Statistical Manual of Mental Disorders (DSM-V) has a very specific definition of addiction ("use disorder"), typically used in the evaluation of substance use disorders, which can be distilled to several general principles: tolerance, cravings, withdrawal, greater amount consumed than intended, unsuccessful attempts to quit use, use despite knowledge of negative consequences, important activities given up due to use, recurrent use causing inability to fulfill role obligations, recurrent use resulting in physically dangerous situations, and continued use despite recurrent social problems.[5] In contrast to "addiction," the term "unhealthy use"[6] is employed to cover the entire spectrum of behavior that increases the likelihood of negative consequences, pathological or not, ranging from at-risk use through overt addiction. Particularly when the science on "screen addiction" remains in such a nascent phase, "unhealthy use" may be a particularly useful[6] descriptive term for describing all conditions of a behavior (in this case, screen exposure) that can be a target for preventive interventions.

To illustrate how "addiction" or "use disorder" is different from other use behaviors (that do not reach the threshold for addiction), let us consider a person who has been drinking caffeine for many years and describes themselves as "addicted to coffee" in colloquial settings. Over time, as this individual increases their coffee consumption from one cup, to two cups, and eventually five cups per day, they are developing tolerance. If a person stops drinking coffee, they may experience symptoms of fatigue, headaches, and irritability because their body has grown dependent[7] on coffee. Importantly, this person is not necessarily "addicted" to coffee in the absence of frank functional impairment, apart from the need to drink an extra cup of coffee daily. Thus, this is a case of tolerance and dependence in the absence of a diagnosed, formal "use disorder." An argument can be made that this person is experiencing a pattern of unhealthy caffeine use, as five cups of coffee per day constitutes a large enough caffeine dose to cause adverse health effects in some individuals; [8] however, unhealthy use does not equate use disorder (addiction) without fulfilling the aforementioned functional impairment criteria.

Our effort to differentiate between addiction, dependence, and unhealthy use—and caution against the cavalier use of the term "screen addiction"—is not merely a semantic exercise. In an article by Maia Szalavitz, Khary Rigg, and Sarah Wakeman,[9] it was emphasized that semantic distinctions between dependence and addiction are clinically important, as the misdiagnosis of addiction can exacerbate stigma, hinder scientific communication, obfuscate diagnosis, result in inappropriate treatments, and even culminate in cases of overdose and suicidality.[9] Notably, there is a history of researchers and physicians conflating addiction with dependence, particularly in the case of opioid use disorder, which has even adversely affected the accuracy of International Classification of Diseases (ICD) codes for use disorders in the electronic medical records. Szalavitz and colleagues shrewdly point out many drugs can cause dependence while remaining net-beneficial in keeping a chronic condition in remission.[9] Furthermore, when people are tapered off such medications, like antidepressants and antihypertensives, they do not necessarily crave them or return to recurrent use.[9] An editorial by the leadership of the American Society of Addiction Medicine echoes this sentiment, noting that the use of precise language is essential for clinicians to accurately communicate with researchers and policy makers in order to obtain epidemiological estimates and develop targeted treatments.[6] If the term "addiction" is devoid of a precise clinical meaning, how are we supposed to develop effective interventions for it?

Screen Use, Unhealthy Use, and "Addiction"

While social media use has increased over the last decade among children and adolescents, the research base on the spectrum of screen use, unhealthy screen use, and "screen addiction" remains in an early stage of development. Broadly speaking, research on behavioral addictions lags in comparison to substance use disorders, and there is debate on whether behavioral addictions should be viewed through the framework of substance use disorders.[10] At this current time, gambling disorder is the only behavioral addiction explicitly listed in the DSM-V; in addition to social media, other behavioral disorders such as addiction to sex, gambling, and exercise have been deemed to lack sufficient "peer-reviewed evidence to establish the diagnostic criteria and course descriptions" for the identification of such behaviors as mental health disorders.[10] Still, several studies have found robust evidence for reward pathways implicated in substance use disorders (i.e., mesolimbic dopaminergic pathways) being activated in people with internet and gaming addictions[11,12] as well as in cases of people struggling with compulsive checking of social media feeds, notifications, and pornography.[12] Other analyses have demonstrated that short-term rewards from screen use can contribute to persistence of behaviors such as screen-checking,

exacerbated by ease of access amid the small latency time between uses.[13]

Of note, habit-forming behavior does not equate addiction, and the extent to which social media use morphs into unhealthy use and formal use disorder remains poorly characterized. Some studies have found that even if young adults are not "addicted" to their phones, use can still lead to impaired social functioning, worse sleep quality, and intolerant boredom,[12,14,15] although the extent to which such impairment reaches the threshold for a formal psychiatric disorder is unclear. Even though some studies have suggested detrimental associations between screen time and self-reported measures of mental health may begin when screen time exceeds one hour per day,[16] such self-reported variables do not necessarily equate functional impairment. Furthermore, there is increasingly a critique being made that screen quantity may be less useful than screen quality in capturing their risk of downstream harm. For instance, there is a vast amount of information that is accessible via the screens (i.e., online journals, Wikipedia, YouTube lectures) meant to enhance learning, and the premise of using absolute screen time as a proxy for unhealthy screen exposure has been the subject of critique.[17-19] While some studies[20,21] have suggested that co-viewing of educational programming may offset developmental risks posed by screen use in young children, this has been disputed by other analyses.[22-25]

Currently, the American Academy of Pediatrics (AAP) recommends no screen exposure before 18 months, no more than one hour of high-quality programming per day for children ages two to five years, and that children over six years receive consistent limits on the quantity and quality of screen use, with co-viewing with parents encouraged for children,[26] with similar guidelines in place by the American Academy of Child and Adolescent Psychiatry (AACAP).[2] There remains no clear professional organization guidance on screen time objectives for children over five years of age and limited guidance on age cutoffs to which older children should be permitted supervised acquisition of phones or mobile devices,[27] with some analyses suggesting that age of screen device ownership is less important for mental health outcomes than the quality of screen device use.[28] As we struggle to delineate the risks and benefits of screen exposure, it is difficult for parents, and clinicians, to know what to recommend to their children and what limits to impose.

Screen Time, Mental Health, and "Self-Medication"

There has been a burgeoning body of literature characterizing a high prevalence of co-occurring mental health conditions in people who have high levels of screen time exposure. Consider that in an analysis of almost 4,000 adolescents in Canada, an association between social media exposure and severity of depressive symptoms was observed in both within-person and between-person analyses.[29] Another study showed that compared to children with lower levels of screen use, peers with higher screen exposure had greater burden of attention deficit hyperactivity syndrome (ADHD) and anxiety disorder symptoms.[30] Studies have illustrated an increased burden of anxiety, social isolation, and depressive symptoms associated with screen exposure,[29,31-35] worse self-esteem,[36] and worse ADHD symptoms with more screen time.[37] Yet, most existing studies have measured screen time while remaining agnostic to whether patients' screen use crossed the threshold for an addictive disorder, and it would thus be inappropriate to make inferences about "screen addiction" being precipitated by underlying mental health problems from the current data. Are our patients depressed, isolated and anxious, and seeking out connection through social media? Is screen time causing heightened feelings of isolation, anxiety, and depression? The correlation between mental health comorbidities and screen exposure do not equate causation, as a high amount of internet and social media exposure could represent both a cause and manifestation of another psychiatric disorder. In some cases, screen time has even been helpful for boosting social connectedness[38,39] or providing peer support in people struggling with depressive symptoms[40] and social anxiety.[41]

While we await more research to emerge on the pathophysiology of screen addiction and its overlap with other psychiatric conditions, clinicians should not miss out on the opportunity to diagnose and treat common co-occurring conditions, like major depressive disorder and generalized anxiety disorder. Interventions such as antidepressant initiation and psychotherapy referral, while awaiting intake with a psychiatry specialist, are efficacious in treating co-occurring mental health conditions and are within the scope of practice for pediatricians and family physicians. Although motivational interviewing[42] and short term CBT[43] for screen addiction has shown promise, the development of targeted interventions remains in a nascent stage. To be clear, there is not enough data to suggest that unhealthy screen use is the result of patients trying to "self-medicate" underlying psychiatric illness ("SMH," the self-medication hypothesis of addiction). The SMH has been

Table 1. Adapted HEADS4 Social Media Use Screener for Generalists

1. Do you have your own cell phone? Tell me about the social media apps and sites that you use (examples: Instagram, TikTok, Snapchat, Facebook, iMessaging)
2. How much time do you spend on social media each day? If the patient has a smartphone, consider examining their weekly usage to obtain a more accurate data point. Note that >120 minutes/day has been considered a concerning response.
3. How do you feel about the amount of time you are spending on social media? Alternatively: Do your parents think you use social media too much?
4. How does social media affect your mood?
5. Have you experienced or witnessed cyberbullying? Or sexting and people asking to have sexual relations with you?

criticized for encouraging clinicians to target only the underlying psychiatric illness and ignore addiction, on the premise that should underlying mental health issues be treated, addiction problems will resolve.[44,45] In other words, the SMH runs the risk of impeding recognition of addictive disorders, particularly in generalist settings where many patients do not identify as having an addiction problem.[44] Furthermore, there are myriad structural risk factors for addiction (i.e., family dynamics, social stressors, school environment), and it is often inappropriate to assume psychiatric problems uniquely contribute to addiction.

To Take Away the Screen or Not? Lessons From Harm Reduction Principles

Our article is not intended to be prescriptive, particularly amid an absence of diagnostic and treatment guidelines for unhealthy screen use. A tactful approach is needed for adult parents and physicians to be seen as credible when engaging children and young adults in conversation about screen time. A recent article noted that in an era of virtual connectivity and heightened screen time during the post-COVID era, people are in need for recommendations that aim for a healthy coexistence with screens rather than rigid adherence to current screen time guidelines.[1] In this context, screen overuse can be conceptualized through the lens of harm reduction, a framework that seeks to reduce the negative consequences associated with a particular behavior without necessarily requiring people to abstain or completely stop a behavior. Practical suggestions for engaging people in discussion about unhealthy screen use, informed by harm reduction perspectives,[46]include the following:

Be Practical

Heightened screen use is difficult to avoid in the post-pandemic world. However, this doesn't mean there is nothing we can do to encourage safer screen use. Non-judgmentally, ask your patients about their screen use and social media use without assuming "addiction" or unhealthy use. Discuss the risks and benefits as able with parent and child. A useful screening tool called HEADSSS (home life, education, activities, drugs, sexual activity, safety, and suicide and/or depression) has been adapted for the assessment of social media use in patients older than 11 years (Table 1).[47]

Recognize That Everyone is Different

Screen use is a complex phenomenon with a continuum of behaviors ranging from severe use to complete abstinence. Some forms of use are safer than others and this should be discussed with children upfront. Remember that use and unhealthy use aren't the same as addiction.

Be Mindful that People Do Things for a Reason

People are responsible for their screen use, which should be assessed for potential perceived benefits by the patient and weighed against risks. It can be helpful for parents to be curious and listen for why their children are drawn to the screen. Parents can ask their children to educate them about their social media applications, as they may know far more about TikTok than the parents do. This can open the door for a more fruitful discussion, as opposed to attempting to scare children about the negative effects of screens on the brain (or trying to take their iPhones away by force). Studies have shown positive outcomes between parent-child discussions and screen use problems.[48,49] Although many people obtain relief

of psychiatric symptoms from addictive behaviors, unhealthy use (or use disorders) can also worsen psychiatric symptoms.[44]

If There are Treatable Co-occurring Mental Health Problems, Treat Them Without Assuming Self-Medication

Discussion about the reasons why patients are drawn to the screen can also provide clues for potential mental health etiologies associated with unhealthy use (i.e., distractibility and poor impulse control as a sign of ADHD, ruminations and social comparisons as a sign of an anxiety disorder). If this is the case, a referral to a child and adolescent psychiatrist and/or psychotherapist is in order. Patients could potentially be started on an antidepressant with a therapy referral while waiting for psychiatrist intake. Importantly, avoid the temptation of Occam's razor[44] and do not assume that people are escalating their screen time to self-medicate underlying psychiatric problems,[44] especially as the evidence base has not demonstrated causality. While we should treat co-occurring psychiatric conditions like depression and anxiety, we need to avoid thinking that underlying psychiatric problems are the only etiologies contributing to unhealthy screen use. Other structural factors like family distress,[50] poverty,[51] or lack of government allocation for extracurricular programming[51] may be present.

Remember that Improvement Will Not Happen Overnight

Overall well-being and functional status is often a more worthwhile goal than cessation of screen use. Listening and encouragement of changes, or even motivation to change, can be significant.

Try To Model Appropriate Screen Interactions and Routines Surrounding Screen-Related Behaviors

Parents can model screen-free quality time, which may correspond to increased engagement with their children.[1] Parents can create times when phones are left at home by the entire family or create a charging station for everyone's phones, so that they are kept out of the bedroom to minimize impact on sleep. During the waking hours, the family can consider co-viewing television or video content together, which can provide impetus for screen-free discussion. Some have also proposed incorporating movement while using screens (i.e., standing desks) to reduce sedentary time.

Do Not Shame the Patients or Their Families

Patients and their families should be subject to non-judgment and shared decision-making. They may experience much guilt and shame surrounding their unhealthy screen use, particularly since many people have been unable to follow current guidelines for optimal amounts of screen use in children during the COVID pandemic.[1]

Conclusion

This article provides broad suggestions for the diagnosis and evaluation of unhealthy screen use for generalists. We note that screen use, unhealthy use, and formal "addiction" (use disorder) represent three distinct entities, stressing that sloppy language can come with negative consequences for patient care. We also take a harm reductionist approach to the treatment of unhealthy screen use, noting that in the absence of well-defined diagnostic and treatment guidance, generalists retain the ability to screen and treat common co-occurring conditions such as a depression and anxiety while waiting for specialist referrals.

In closing, one of our addiction psychiatry colleagues often remarks that "Cake isn't [necessarily] good for you; getting in a car isn't [necessarily] safe… Life has risks." In the case of screen time, the complete elimination of screens in a person struggling with unhealthy screen use may not be practical in an era of increased virtual learning and social connectivity via smartphones, laptops, and tablets. After all, life has risks and screens are a part of modern life, especially in our post-COVID new "normal."

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Acknowledgment

We thank Sarah Hartz, MD, PhD, for her contributions to conceptualization. Effort was supported in part by the National Institutes of Health (NIH) (K12 grant, DA041449) and the American Psychiatric Association Psychiatric Research Fellowship funded by NIH.

Disclosure

None reported.

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ACL Injuries in Soccer Players: Prevention and Return to Play Considerations

by Husam Nawas, MD, Hunter Fleming, MD & Steven Purcell, MBA

The FIFA 11+ is a neuromuscular injury prevention program that can help identify and treat functional deficits. Additionally, research has shown that using objective and functional criteria when returning athletes to contact sports can decrease the rate of recurrent knee injuries.



Logo for 2026 Men's Soccer World Cup in Kansas City.



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Abstract

Soccer is the most popular sport in the world, with an estimated 270 million people, or 4% of the world's population, currently playing.[1] Soccer has recently enjoyed an elevated profile with the US women's national team competing in the 2023 World Cup. Meanwhile, there is regional excitement with Kansas City selected as a host city of the upcoming 2026 men's World Cup (logo left). Knee injuries, particularly ACL tears, are common in soccer and can lead to extensive time away from sport. Increasing emphasis is being placed on reducing soccer related injuries as well as improving outcomes when returning players back to competitive play.

Prevention of ACL Injuries

Anterior cruciate ligament (ACL) rupture is one of the most serious injuries in the soccer community as it can not only lead to considerable time away from sport or even retirement, but also long-term health issues, such as degenerative joint disease. A systematic review with meta-analysis found an overall incidence of 1.7 ACL injuries per 10,000 athlete events. Male athletes had an incidence of 0.9/10,000, while female athletes had a higher incidence with 2.0/10,000.[2] Given these findings, there has been an abundance of research evaluating ways to prevent ACL injuries in sports, especially in the female athlete.

To help in the prevention of ACL injuries, Hewett et al. researched videos of non-contact ACL injuries in the female athlete.[3] The key finding of their research was that female athletes landed with a pronounced knee valgus angle and more lateral trunk motion during the ACL injury than male counterparts as well as control females in landing and cutting tasks. These results suggest that deficits in neuromuscular control of the hip and trunk are an important predictors of ACL rupture during landing and cutting. Hip abductor strength and recruitment are of particular importance in reducing trunk lean in addition to dynamic valgus stress on the knee during these maneuvers. This study and others like it have led to a focus on neuromuscular control in ACL injury prevention.

There have been multiple studies looking to see whether neuromuscular training has led to a reduction in ACL injuries in sports. A study in Norway aimed to answer this very question over the course of three seasons



Figure 1. Hop tests - maximal hop (tests force production), maximal controlled leap (tests force absorption), and triple crossover hop (test limb symmetry)



Figure 2. FMS Inline Lunge - Place the body in a position to focus on the stresses as simulated during rotation, deceleration, and lateral movements

of Norwegian handball.[4] The first season was a control with 29 ACL injuries. The following two seasons had the intervention of neuromuscular training and saw fewer ACL injuries with 23 and 17, respectively.

This knowledge has eventually led to the development and implementation on many teams of the FIFA 11+, which is a neuromuscular injury prevention program (Figures 1-6). Research has been conducted to validate the FIFA 11+ program and find out if it can help reduce ACL injuries in the collegiate soccer player.[5] A 4.25-fold reduction in the likelihood of sustaining an ACL injury was found after it was instituted. There is more research to be done, but there are exciting results for neuromuscular training in reducing ACL injuries in athletes.

Implications of ACL Injuries in Soccer Players

ACL rupture is not only one of the most common injuries afflicting soccer players, but it also requires one of the longest recovery periods. Non-surgical management remains an option but surgery is typically indicated in competitive soccer players to maximize return to play (RTP) potential and reduce the risk of subsequent meniscal injury.[6] The mean time to RTP in elite soccer players has ranged from six to 13 months.[7] Consequently, ACL injuries result in long periods of lost play for athletes, lost productivity, and profitability for clubs, and also impacts player career length.[8] For perspective, costs for ACL reconstruction (ACLR) are estimated to be up to $1 billion for high school athletes in the US on an annual basis.[9]

Reconstructive surgery unfortunately does not guarantee a future without further injury. Studies have found an incidence of graft retear ranging from 8% to 17% and contralateral ACL tear as high as 24%.[10] There is research providing helpful RTP statistics for competitive soccer players following ACLR and the level of success that we are achieving as an orthopedic community with this population. There are encouraging and sobering elements to the data. A study published last year in the *Orthopedic Journal of Sports Medicine* followed 195 professional soccer players from the top eight European soccer leagues who sustained ACL injuries over three seasons.[8] Ninety-five percent (95%) of players returned to competitive play, with a mean RTP time of just over eight months. However, within the third postoperative season, 36% of these players competed in a lower-level



Figure 3. Pro agility - Requires athletes to accelerate 5 yards, change direction, accelerate 10 yards, change direction again and accelerate 5 yards to the finish line



Figure 4. Y-balance – Used to measure dynamic balance. The 3 directions anterior, posteromedial, and posterolateral

national league, and 13.6% ended their careers. A significant reduction in minutes played per season was found in all three postoperative seasons.

In a prospective cohort study of 100 US soccer players with a mean age of 24.2 years at the time of ACLR, 72% were able to return to soccer.[11] But only half as many were still playing competitive soccer at an average follow up of seven years (36%). Females were more likely to have future ACL surgery (20% versus 5.5%). The same author more recently conducted a study to investigate RTP for soccer players who specifically underwent revision ACL reconstruction.[12] Overall, only 62 percent of soccer athletes returned to the sport at an average of 9.6 months after revision ACL surgery. Twelve percent (12%) of patients underwent subsequent knee surgery. At an average follow-up of 6.4 years, only 19 percent of these players were still playing the sport. These results highlight the importance of avoiding recurrent knee injuries and specifically ACL graft tears to reduce the impact on these players' playing careers.

Optimizing Return to Play Outcomes

Previous meniscal repair, allograft use, female sex, and previous surgery have been identified as risk factors for reinjury and reoperation.[12] But the orthopedic and sports medicine community has been challenged with identifying and addressing functional deficits that may improve outcomes. Historically, few criteria have been used to assess readiness to RTP after ACLR including time from surgery and perhaps objective measures such as isokinetic quadriceps/hamstring strength or thigh circumference. With current protocols, individuals may be cleared for full activity despite strength and neuromuscular deficiencies that predispose them to further knee injury.

The sports medicine team at Rothman Orthopaedic Institute at Thomas Jefferson University felt there was a need for more precise criteria, such as functional and dynamic testing, to achieve lower rates of knee injuries after ACLR. As such, they completed a cohort study aimed to develop and validate a RTP checklist consisting of both subjective and objective functional tests that can be implemented into a sports medicine practice.[13]

After a systematic review of 60 studies, seven criteria were included in the final checklist and fell under three major categories: physical examination findings, kinematic sport-specific

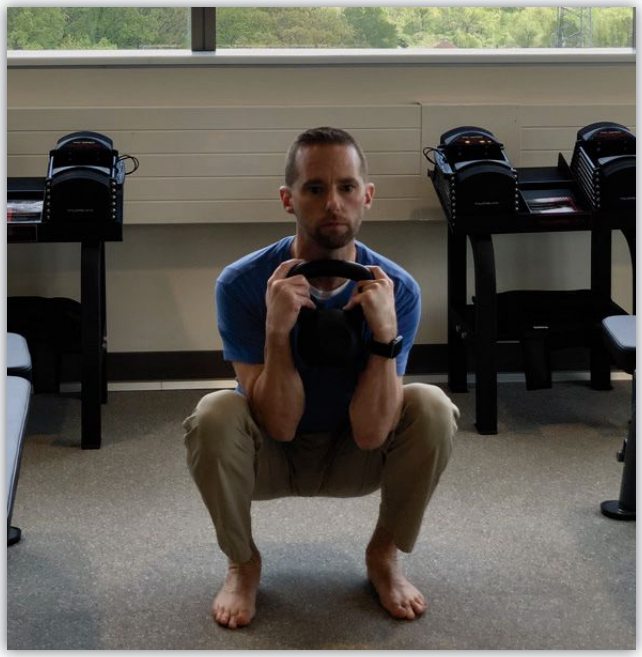


Figure 5. Weighted squat – Consistently maintain the following criteria: neutral lumbar spine, elbows come down inside knees, no valgus/varus sway at knees, no lateral weight shift, feet stay flat, no trunk rotation, femurs at least parallel to floor, and knees track over feet



Figure 6. Single Leg Romanian Dead Lift - Consistently maintain the following criteria: neutral spine, no valgus collapse, no knee hyperextension, no midline crossover of back leg, and no hip rotation

testing, and the IKDC questionnaire. Kinematic testing consisted of the Functional Movement Screen, all four hop tests, Pro Agility, and an internally generated movement assessment.

A total of 222 patients aged 15 to 35 undergoing primary ACLR were evaluated using the checklist by a trained physical therapist at six to 12 months after surgery. Once they returned to play, patients were followed prospectively for a minimum of two years to determine the incidence of injury to the knee. Patients need to pass six of the seven criteria, and if they fail, the patient receives an additional six weeks of training. Of the group that passed the checklist, 5.5% patients sustained an injury to the ipsilateral knee, as compared with 18.4% in the group that did not pass. Furthermore, athletes who passed the checklist demonstrated a lower risk of injury to either knee (16.4% versus 26.3%). This research highlights the importance of using functional objective criteria when guiding athletes back to play after primary ACLR.

At our institution we use validated and standardized tests to evaluate the athlete's progress and utilize technology to obtain objective recovery data so we can better determine safety in returning to sport. We use specifically tailored interventions to address the possible fear of movement and fear of re-injury while improving confidence in participation. The goal is to achieve full functional performance, return to pre-injury level movement, reduce associated risk factors, prevent re-injury, and ensure a safe return to competition.

Conclusion

There has been an increasing amount of research into ACL injury prevention as well as safer return to sport protocols following primary ACL reconstruction. Neuromuscular control and hip abductor strength have been identified as key factors in preventing ACL injury. The FIFA 11+ is a neuromuscular injury prevention program that can help identify and treat functional deficits. Additionally, research has shown that using objective and functional criteria when returning athletes to contact sports can decrease the rate of recurrent knee injuries. Crucially, this includes ACL graft rupture. Recent study results are promising and will hopefully translate to keeping more players on the pitch.

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Disclosure

None reported.

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Effects of Ketogenic Diet Intervention on Metabolic Acidosis in Patients with Obesity and Chronic Kidney Disease

by Reuben J. R. De Almeida, MD, Fouad Jaber, MD, Rawan Rajab, MD, Mallak Zatreh, MD, Peminda Cabandugama, MD & Nada Bader, MD

Further studies involving a larger sample size and biochemical analysis to ensure that patients are indeed in a ketogenic state may help further elucidate the safety profile of KD in patients with CKD stage 2 and 3.



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Abstract

In this study, we found no significant acid-base changes after six weeks of ketogenic diet in patients with obesity with Chronic kidney disease) 2 or 3. A ketogenic diet was well tolerated overall with no gross changes to serum creatinine, anion gap, serum, or venous bicarbonate, or albumin. We were limited by a small sample size, and we did not confirm whether patients achieved a biochemical ketogenic state.

Introduction

Ketogenic diets (KD) are very low carbohydrate diets (5% to 10% of total daily caloric intake).[1] The appeal and increasing popularity of KD lies in its association with significant weight loss its association with significant weight loss in patients with obesity.[2,3,4]

The KD relies on fat as the main energy source, as opposed to glucose, and forces the body to activate lipid metabolic processes that ultimately increase serum ketone bodies (acetoacetate, hydroxybutyrate, and acetone), a process that is referred to as ketogenesis.[5] These are acid products that are excreted through the kidneys and can lead to a decrease in alkaline reserves or bicarbonate ions. In Wistar rats, KD for two months had a significant decrease in serum pH, reduced base excess, and a non-significant decrease in serum bicarbonate compared to rats fed a standard diet.[5] In a group of 21 participants with obesity, Yancy et al. found that after six months of KD, mean serum pH was significantly lower.[6] However, mean serum bicarbonate decreased and mean anion gap increased at the start of the study but later returned to baseline, indicating compensated metabolic acidosis.[6] In 20 non-diabetic obese patients, Gomez-Arbelaez et al. found no significant acid-base changes (as measured by serum pH, bicarbonate, and osmolality) after three months of KD.[7]

As renal dysfunction progresses, the ability to compensate for acidosis decreases. Patients with chronic kidney disease (CKD) may be at risk for metabolic acidosis due to impairments in the kidneys' ability to excrete acid.[8,9,10] In an observational prospective study, three months of very low-calorie KD in patients with obesity and CKD stage 2 had no significant difference in renal parameters such as BUN, creatinine, estimated glomerular filtration rate (eGFR) compared to patients with normal renal function.[3] Also, pH changes were not reported as a measure.

Testing the safety of KD in CKD populations with respect to the risk of metabolic acidosis may provide another tool to ameliorate long-term health outcomes in patients aiming for weight control. We propose a prospective observational study that includes both CKD stage 2 and CKD stage 3 patients to examine the effects of a six-week KD intervention on acid-base changes.

Methods

Study Design

This was an open, prospective, nutritional intervention pilot study conducted and performed at a single center: University Health-Truman Medical Center in Kansas City, Missouri. The study protocol was in accordance with the Declaration of Helsinki and was approved by the University of Missouri-Kansas City Institutional Review Board (IRB). The study included a nephrologist and four internal medicine resident physicians.

Recruitment

Participants were selected from primary care clinics, the endocrinology clinic, and the nephrology clinic. Upon signing consent to participate, each patient was mailed a check for $125 USD as compensation, which was not contingent on their completion of the study.

Inclusion and Exclusion Criteria

Eligibility criteria: adult patients diagnosed with stage 2 or 3 chronic kidney disease and concomitant BMI 30-40 kg/m2. Exclusion criteria included: patients who were already on a KD or had completed one within the past three months, current use of SGLT2 inhibitor, or hemoglobin A1c (HbA1c) ⩾ 10%. Patients with hepatic impairment (defined as liver enzymes greater than twice the upper limit of normal), a history of excessive alcohol consumption, pregnancy, lactation, a known eating disorder, and/or gout.

Schedule of Visits and Patient Education

Patients completed two in-person visits and two telephone follow-up visits. During the first clinic visit, patients signed informed consent, had baseline blood drawn (basic metabolic profile, serum albumin, venous blood gas), and anthropometrical assessment. The care providers explained the KD verbally and in writing, including mechanisms of KD, benefits/risks, implementation, and foods to eat or avoid. KD-related

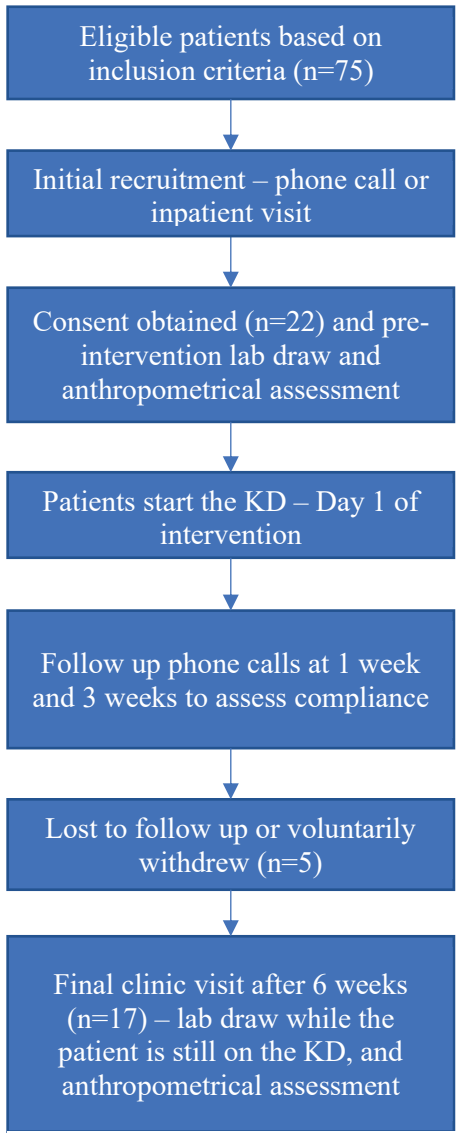


Figure 1. Process map of the study's recruitment and implementation.

pamphlets were provided. The average visit time was 30-40 minutes. Patients were free to choose the composition of their specific ketogenic meal plan, as long as the macronutrients were in accordance with KD. Intermittent fasting was not recommended to the patients. Recommended daily water intake was in accordance with general guidelines for CKD patients, which is about 64 ounces per day. A follow-up phone call was conducted by the recruiting provider at one and three weeks to ensure diet compliance and ask about side effects. Adherence was assessed by asking about meal composition and checking the ketogenic and non-ketogenic ingredients. Care providers offered dietary instructions, individual supportive advice,

and encouragement to continue the diet. Patients were encouraged to make use of either a food diary or any online phone application of their choice to keep track of their meals, however, this was not a requirement for participation as patients had varying comfort in the use of online technologies. A phone number was offered for all participants to address any concerns at any time. The last clinic visit took place after the patient had been on the KD for at least six weeks, and blood was drawn at that time before allowing the patient to come off the diet. Figure 1 shows a flowsheet of the study process.

Anthropometrical Assessment

BMI was calculated by dividing body weight in kilograms by the square of height in meters.

Biochemical Parameters

A basic metabolic profile was run using an automated chemistry analyzer. HbA1c was not one of the labs included in the study, however, it was noted if obtained before and after the study.

Peripheral venous blood gas samples were collected according to standard procedure,[11] and have proven to be an adequate method for diagnosing disorders of the acid-base balance.[12,13]

We applied the CKD–EPI Creatinine Equation (2021) to estimate GFR and classify CKD. Patients with an estimated GFR (eGFR) of 60-89 ml/min/1.73 m^2 upon enrollment were classified as having CKD 2. Patients with an eGFR of 30-59 ml/min/1.73m^2 were classified as having CKD 3.

Primary Outcome

Six weeks of the KD would not significantly change the venous pH.

Secondary Outcomes

We sought to additionally analyze changes to the body weight, eGFR, and HbA1c%.

Statistical Analysis

The study lacked the power to perform a multivariate non-inferiority statistical analysis. Only the primary outcome, venous pH changes, was reported using a Wilcoxon Signed Ranked test. The secondary outcomes were reported as the mean difference with standard deviation. SPSS (IBM Corp. Released 2021. IBM for Mac, Version 29.0. Armonk, NY: IBM Corp) was used for analysis.

Results

Demographics

Seventy-five patients were eligible for the study. A total of seventeen patients successfully completed the study, nine with CKD 2, and eight with CKD 3. Initially, 22 patients were recruited, however, five dropped out due to either voluntarily wishing to stop participation or being lost to follow-up. None of the patients who dropped out were due to adverse effects of the dietary intervention. Of the 17 patients who completed the study: 13 were on diuretics; six on thiazide diuretics; seven on loop diuretics, but none on a carbonic anhydrase inhibitor. Table 1 shows the demographic data.

Study Adherence

Most patients reported strict compliance assessed through phone calls at week one, three, and on the six-week clinic follow-up. However, there were three patients who had one day per week when they ate high-carbohydrate foods, theoretically removing them from the ketogenic state. Four of the patients presented to follow-up labs after they had already stopped the KD, and we had to ask them to return to the KD for four more weeks to re-enter a ketogenic state to accurately assess the serum pH differences. These four patients had more than six weeks of KD. None of the patients reported intermittent fasting or time-restricted eating.

Primary Outcome

The mean pH before KD = 7.36165, mean pH after KD = 7.36865, and mean difference (after - before) = 0.007. The Wilcoxon Signed Ranked test showed: W=57, asymptotic p value < 0.356, r=96, no significant difference in pH before and after six weeks of KD. The effect size was 0.15 (small effect size). In both patients with CKD 2 (n=9) and CKD 3 (n=8), there was a trend towards an increase in the pH post-intervention (Table 2).

Secondary Outcomes

There was a trend toward a decrease in standing weight post-intervention in all the patients, with a mean loss of 4.21 ± 0.11 kg. CKD 2 patients had weight loss of 3.27±10.77 kg, and CKD 3 patients had weight loss of 5.26±8.12 kg (Table 2).

There was a trend toward an increase in eGFR post-intervention in all patients, with a mean difference of 3.41±1.29ml/min (Table 2). There was a mild increase in eGFR in both CKD 2 and 3 patients post-intervention.

Table 1: Demographics

	Count	%	Mean	SD
Gender:				
Male	10	58.82%		
Female	7	41.18%		
Age (years)			54.82	8.95
CKD Stage				
CKD 2	9	52.94%		
CKD 3	8	47.06%		
Race				
Black/African American	13	76.47%		
White	2	11.76%		
Other	2	11.76%		
Number of patients with T2DM				
All	8	47.06%		
CKD 2	3	33.33%		
CKD 3	5	62.50%		
Number of patients with pre-DM				
All	3	17.65%		
CKD 2	2	22.22%		
CKD 3	1	12.50%		
Baseline Weight (Kg)				
All			103.56	13.65
CKD 2			103.3	14.77
CKD 3			103	12.26
Baseline BMI (Kg/m^2)				
All			35.55	3.72
CKD 2			34.02	4.03
CKD 3			37.28	1.95

There was a trend toward a decrease in HbA1c% in all patients, with a mean decrease of -0.39±0.31 (Table 2). There was an increase in HbA1c% in CKD 2 patients post-intervention and a decrease in CKD 3 patients. Not all patients had HbA1c values to report. HbA1c values were obtained upon chart review after the study was completed.

Table 3 shows the pre-and post-intervention mean and mean difference values in all patients, CKD 2 and 3 patients, respectively, for serum creatinine, serum bicarbonate, serum albumin, serum anion gap, and venous bicarbonate.

Discussion

Six weeks of KD did not significantly alter venous pH in patients with CKD 2 or 3. This is consistent with KD studies in patients without CKD.[6,7] When analyzed separately, there were still no large differences in mean pH in either CKD 2 or 3 patients. We lacked the power to perform a separate statistical analysis of CKD 2 and CKD 3 patients. Only two prior studies investigated low-carbohydrate KD in patients with CKD, but these did not specifically report changes in pH.[3,14]

Table 2: Changes in pH, eGFR, HbA1%, and weight changes. Reported as mean ± standard deviation. Note that for changes in HbA1c%: for all patients, n=11 pre-intervention and n=8 post-intervention; **for CKD 2, pre-intervention n=5, post-intervention n=3; *** for CKD 3, n=6 pre-intervention, n=5 post-intervention. Number and percentage of patients with 0-5%, 5-10%, and >10% weight loss. Note that two patients gained weight, +0.85% and +0.09% increase in weight (not reported in the table).

pH changes			
	Baseline pH	Post-intervention pH	Mean difference
All patients (n=17)	7.362±0.036	7.369±0.035	0.007±0.001
CKD 2 patients (n=9)	7.355±0.034	7.356±0.038	0.001±0.004
CKD 3 patients (n=8)	7.369±0.036	7.383±0.038	0.014±0.002
eGFR changes			
	Baseline eGFR	Post-intervention eGFR	Mean difference
All patients (n=17)	55.76±14.98	59.18±16.27	3.41±1.29
CKD 2 patients (n=9)	67.22±7.31	66.89±8.92	-0.33±1.6
CKD 3 patients (n=8)	42.88±10.14	50.50±18.19	7.63±8.05
HbA1c % changes			
	Baseline A1c	Post-intervention A1c	Mean difference
All patients*	7.27±1.35	6.89±1.03	-0.39±0.31
CKD 2 patients**	6.78±0.84	6.93±1.48	0.15±0.65
CKD 3 patients***	7.68±1.54	6.86±0.63	-0.82±0.91
Weight changes (in kilograms)			
	Baseline Weight	Post-intervention weight	Mean difference
All patients (n=17)	103.56±13.65	99.35±13.76	4.21±0.11
CKD 2 (n=9)	103.31±14.77	100.04±14.04	3.27±10.77
CKD 3 (n=8)	103.84±12.26	98.58±13.39	5.26±8.12
Patients with 0-5%, 5-10%, and >10% weight loss			
	Number and percentage of patients with 0-5% weight loss	Number and percentage of patients with 5-10% weight loss	Number and percentage of patients with >10% weight loss
All patients (n=17)	8 (47.06%)	5 (29.41%)	1 (5.88%)
CKD 2 (n=9)	2 (22.22%)	4 (44.44%)	0 (0%)
CKD 3 (n=8)	6 (75.00%)	1 (12.50%)	1 (12.50%)

Similar to previous studies,[3,7] we found no gross changes in serum creatinine, bicarbonate, albumin, or serum anion gap after six weeks of the KD. This suggests that KD is generally well tolerated and safe as a weight loss intervention when performed in a physician-monitored setting. Previous case reports documented severe non-diabetic ketoacidosis in patients who had tried variations of KD but in settings that were not physician-supervised.[8,9,10] The common risk factors were alcoholism, pregnancy, lactation, starvation, and overlying infections.[10] When comparing patients undergoing diabetic ketoacidosis (DKA) with those on KD, serum pH and bicarbonate were significantly lower in the DKA group, making the pathologic DKA-related changes clear from those non-significant findings in the KD group.[7] In our study, those who were diabetic and on insulin were advised to closely monitor blood sugar daily and be prepared to

Table 3: Baseline and post-intervention mean and mean difference values (± standard deviation (SD)) in all patients (n=17), CKD2 patients (n=9) and CKD3 patients (n=8) of lab values for serum creatinine, serum bicarbonate, serum sodium (Na), serum albumin, serum anion gap, and serum bicarbonate (bicarb).

All patients (n=17)	**Baseline**	**Post-intervention**	
	Mean ± SD	**Mean** ± SD	**Mean difference** ± SD
Creatinine	1.40±0.33	1.35±0.38	0.05±0.05
Serum Bicarb	25.47±3.26	24.65±2.50	0.82±0.76
Na	138.47±2.25	138.94±3.08	-0.47±0.82
Albumin	4.20±0.32	4.07±0.29	0.13±0.03
Anion Gap	9.12±1.64	10.12±2.05	-1.00±0.41
Venous bicarb	24.42±3.05	23.82±2.55	0.59±0.50
CKD 2 patients (n=9)			
Creatinine	1.18±0.13	1.21±0.24	-0.02±0.10
Serum Bicarb	26.00±3.62	25.56±2.87	0.44±0.75
Na	137.67±2.26	138.78±3.88	-1.11±1.62
Albumin	4.27±0.37	4.14±0.26	0.12±0.10
Anion Gap	8.89±1.79	9.33±1.83	-0.44±0.03
Venous bicarb	24.98±3.42	24.39±2.73	0.59±0.70
CKD 3 patients (n=8)			
Creatinine	1.64±0.31	1.51±0.45	0.13±0.14
Serum Bicarb	25.13±2.71	23.63±1.41	1.50±1.30
Na	139.38±1.87	139.13±1.76	0.25±0.10
Albumin	4.15±0.24	3.99±0.29	0.16±0.05
Anion Gap	9.38±1.41	11.00±1.94	-1.63±0.53
Venous bicarb	23.79±2.41	23.19±2.16	0.60±0.25

adjust their meals or long-acting insulin accordingly. Each patient was counseled to ensure adequate fluid intake during the KD. Careful screening of patients for risks of severe ketoacidosis such as alcoholism, pregnancy, and lactation, use of SGLT2 inhibitors, and later stages of CKD (stages 4 and 5) may help mitigate the potential risks associated with KD. In a physician-supervised setting, KD may be a safe option for diet-related weight loss in patients with CKD up to stage 3 and a low risk of acid-base disorders.

Our results showed that six weeks of KD showed a non-statistically analyzed trend toward weight loss of 4.21±0.11 Kg. In 35 adults with obesity, Mohorko et al. examined the effect of a 12-week KD intervention without calorie restriction in the study participants.[2] Their study reported significant weight loss after 12 weeks of KD intervention.[2] Since we did not biochemically confirm that our patients achieved a ketogenic state, it can be argued that the weight loss was attributed to general calorie restriction, although it was not recommended to our patients.

Weight loss through dietary interventions and bariatric surgery have previously been associated with a reduced risk of CKD progression and an increase in GFR.[15] We found a non-statistically analyzed trend towards an increase in eGFR post-intervention in all patients, with a mean difference of 3.41±1.29ml/min. Compared to our relatively short six-week intervention, Mitchell et al. had participants follow a KD for one year, and demonstrated a non-significant improvement in eGFR between 1-4 m/min/1.73 m2 in patients with overweight and obesity after one year of KD.[15] Bruci et al. found no significant eGFR changes after three months of KD in 38 patients with CKD 2 (reported eGFR difference of 1.29±0.23 m/min/1.73 m2), despite a non-significant mean weight loss of 14.64kg.[3]

Therefore, the improved eGFR may reflect overall weight loss rather than any effect of KD itself.

Low carbohydrate diets have been recommended as a strategy to control blood sugar in patients with prediabetes and T2DM.[16,17,18] We found a small, non-statistically analyzed trend towards a decrease in HbA1c% in all patients after the intervention, with a mean decrease of -0.39±0.31. Several studies have examined the role of low-carb diets (including KD) on glycemic control.[4,18,19,20] Gumbiner et al. found that blood glucose levels were lower in KD-treated patients with obesity and non-insulin-dependent DM.[19] There was a strong inverse correlation between fasting plasma ketone bodies and hepatic glucose output, suggesting that higher plasma ketone levels are associated with more favorable effects on glycemic control in diabetics.[19] Goday et al. found that very low-calorie KD significantly reduced HbA1c compared to a standard low-calorie diet in patients with type 2 diabetes mellitus (T2DM).[4]

The high-fat content of KD is a concern for cardiovascular health. KD is associated with both weight loss and a reduction in metabolic syndrome, however, its effects on dyslipidemia, and long-term atherosclerotic risk remain controversial.[21] A recent American College of Cardiology presentation on a retrospective observational study of 305 patients on KD showed that there was a significant increase in LDL and apolipoprotein B and a more than two times higher risk of major cardiovascular events after 11.8 years.[22] A meta-analysis of nineteen randomized controlled trials (RCT) in patients with obesity indicated that there is probably little or no difference in weight change or cardiovascular risk factors when comparing low-carbohydrate diets to isoenergetic diets after two years of follow-up.[23] CKD patients have been shown to have higher cardiovascular risk as early as CKD stages one to three, specifically associated with hypertriglyceridemia, lower high-density lipoprotein, and higher vascular calcification compared to patients without CKD.[24] Counseling patients based on their individual atherosclerotic risk factors will be important as further studies analyze long-term cardiovascular outcomes of KD. In the meantime, it is probably safer to advise against KD for patients with high cardiovascular risk.

There were several notable limitations of our study. The small sample size, as well as the lack of testing of serum or urine ketone levels during our intervention might have affected our results. We had to rely on patients' subjective reports of dietary compliance. Most patients reported strict compliance, however, there were three patients who had one day per week when they ate high-carbohydrate foods, theoretically removing them from the ketogenic state. Therefore, we could not determine if each patient had achieved a true ketogenic state that would alter their acid-base balance. We recognize this limitation of our study. However, we hope for the results to be viewed as being reflective of a pragmatic design that is more consistent with actual patient experiences while trying to follow a particular dietary plan outside of the strictly controlled environment of a clinical trial. Future studies would benefit from including serum or urine ketone levels during and after the intervention to ensure compliance with dietary requirements. Four of the patients presented to follow-up labs after they had already stopped the KD, and we had to ask them to return to the KD for four more weeks to re-enter a ketogenic state to accurately assess the venous pH differences. Therefore, these four patients had more than six weeks of KD, which may have skewed our pH, weight loss, and other measured results. HbA1c was not intentionally checked as part of our baseline pre-intervention and post-intervention labs, and values were instead obtained at chart review, resulting in a less accurate estimate of HbA1c changes. We did not note whether there were concomitant glycemic drug-related changes between pre-interventional and postinterventional HbA1c levels.

Conclusion

We found no significant acid-base changes after six weeks of KD in patients with obesity and CKD stage 2 or 3. We did not find other safety concerns related to serum creatinine, bicarbonate, albumin, and serum anion gap after six weeks of KD. These results are consistent with previous studies examining the safety of KD in a physician-monitored setting. Further studies involving a larger sample size and biochemical analysis to ensure that patients are indeed in a ketogenic state may help further elucidate the safety profile of KD in patients with CKD stage 2 and 3.

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Acknowledgment

We would like to thank David Kihara, RN, and Hanan Ismail, RN, who volunteered to dedicate significant time to the clinical coordination of the study participants.

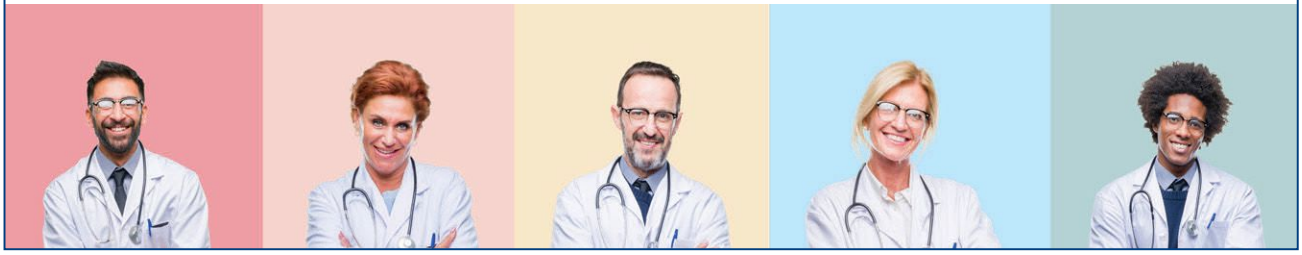
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Awareness Under Anesthesia

by Furqaan Sadiq, MD & Jessica Bauerle, MD

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By maintaining adequate depth of anesthesia and being diligent to ensure patients are in fact anesthetized, patients can rest assured that they will be well cared for during such a critical time.



Furqaan Sadiq, MD, MSc, is Assistant Professor, Department of Anesthesiology. **Jessica Bauerle, MD,** (pictured), is Assistant Professor, Pediatric Anesthesiologist, St. Louis Children's Hospital. Both are at Washington University, St. Louis, Missouri.

Abstract

You begin to hear distant rock music playing, people conversing about their weekend. Then the scalpel is requested—incision. Pain sends you reeling and you attempt to muster a scream. No one seems to hear you and you are unable to lift a finger. The scenario is so rare that numerous movies have been made about awareness under anesthesia. Awareness under anesthesia is a rare event, however, it is a complication that no one ever desires to occur. We will explore how frequent awareness is during surgery, what risk factors are involved, and what tools anesthesia providers utilize to ensure everyone undergoing surgery is adequately anesthetized.

History of Anesthesia

In what may have been the first recorded use of an anesthetic, the ancient Greek god Apollo demonstrated successful use of herbal medicines to achieve hypnosis, anesthesia, and amnesia.[1] Providing sleep was a divine process entrusted to only a few mortals that aimed to shepherd ancient Greeks through their most troubling ailments.[2] The modern anesthesiologist now takes on a similar responsibility of ferrying patients across this perioperative journey—from their preoperative optimization to their postoperative recovery.

Despite the truly amazing achievements that have made undergoing anesthesia in the United States exceptionally safe, adverse events continue to plague clinical care as a whole.[3] One of the most common concerns patients report when undergoing general anesthesia is the fear of being conscious while paralyzed during surgery—unable to move or notify their anesthesiologist of their awareness.

The risk for such an occurrence is thankfully rare. One study reviewed three million cases of anesthesia delivery in the United Kingdom and found that one in 19,000 had some degree of accidental awareness, ranging from relatively benign memories of fleeting ambient sounds to recalling full physical sensations.[4] More commonly, aggregate studies project the risk to be about one to two in 1,000.[5] The gravity of such a horrifying event, as rare as it may be, is enough to percolate through news media, popular culture, and social media, and in turn, terrify prospective patients.

Difference Between Anesthesia and Sedation

Several different types of anesthesia exist and may be utilized to assist a patient through their procedure

Table 1. Risk Factors for Anesthesia Awareness

Chronic Drug Use (opioids, benzodiazepines, alcohol)
Cardiopulmonary Bypass
Emergency Surgery
General Anesthesia for Cesarean Section
Trauma Patients

as delineated in the American Society of Anesthesiology Continuum of Depth of Sedation table. It is important that the patient thoroughly understands the type of anesthesia they will receive and what exactly that means. Anesthesia and sedation are a spectrum. Many procedures do not require general anesthesia and can be done with sedation. Sedation implies that a patient is not completely "asleep" (even though sleep is not exactly the proper term). There are several depths of sedation, and the goal level depends upon several factors, especially the discomfort involved. During propofol sedation, such as for a colonoscopy, a patient could wake up, look around, and remember things from the procedure. All of this is to be expected because the patient is only receiving sedation. It is imperative patients are informed beforehand of when such instances can be expected.[6] On the other hand, anesthesia awareness refers to when the patient is undergoing general anesthesia with a breathing device in place such as an endotracheal tube or a laryngeal mask airway (LMA). Accidental awareness intraoperatively during general anesthesia has serious long-term psychological sequalae and has resulted in post-traumatic stress disorder and other deep psychological trauma for patients and their families.[7]

Risk Factors

Patient and procedural risk factors that heighten the risk for accidental awareness are fortunately well-known. Risk factors include agents that desensitize the brain to sedatives, including chronic alcohol abuse, benzodiazepine use, as well as a history of long-term opioid dependence (Table 1). The method of delivery of general anesthesia may also increase risk. General anesthesia can be achieved by administration of volatile inhaled agents or by intravenous infusion. The former allows for monitoring of exhaled gas concentrations to ensure the patient is adequately asleep. Each inhaled agent has a minimum alveolar concentration (MAC) for different levels of anesthesia, such as MAC awake, MAC for movement with painful stimulus, MAC-BAR (blocking the autonomic response to pain). The intravenous method poses an increased risk of unintended awareness because of the inability to easily monitor sedative concentrations in the blood. Certain surgeries also increase the incidence of awareness, such as cardiovascular bypass surgeries and emergency procedures like trauma and general anesthesia for Cesarean sections, where the hemodynamics dictate a lighter anesthesia to maintain circulation.[8] It is not uncommon for all these risk factors to be compounded in a single patient.

Despite being completely unconscious and asleep, patients undergoing general anesthesia maintain some degree of muscular tone, and their reflexes to pain or intense stimulation remain intact. Without a means to inhibit these reflexes, the patient—unbeknownst to them—may move with stimulation. Therefore, for many procedures, paralyzing agents are requested for surgical exposure. One of the most influential—and modifiable—risk factors for awareness is the use of neuromuscular paralytic agents. The incidence of accidental awareness increases significantly when these drugs are administered.[4] However, up to 40% of surgical cases require paralytic. Evidence shows that the risk of awareness is minimized with extra vigilance in intraoperative monitoring. The American Society of Anesthesiology elucidated a minimum standard for monitoring patients



Figure 1. Oksana Tevis, A. A. with BIS monitor. St. Louis, MO, Feb 2022. Used with permission.

under any anesthetic (Figure 1). These include a patient's oxygenation, ventilation, circulation, and temperature.[9] Basic physiologic parameters, like heart rate and blood pressure, are helpful factors to determine unconsciousness. However, it is not uncommon that sympathetic stimulation can cause tachycardia and hypertension even with adequate anesthetic depth.[10] This scenario can mimic a patient having awareness, when they are in fact adequately anesthetized.

Monitoring General Anesthetics

No one standard monitor measures the target organ for all general anesthetics that aim to induce hypnosis and amnesia - the brain. With the advent of more advanced intraoperative electroencephalographic (EEG) monitoring in the past two decades, anesthesiologists can attempt to titrate depth of anesthesia by analyzing EEG data intraoperatively. The article in *Missouri Medicine* last year entitled Awareness with Recall: Review and Guide to Electroencephalographic Depth-of-Anesthesia Monitoring so nicely outlined the mechanism of the Bispectral Index (BIS) device and its utility in EEG monitoring and assisting in shedding light on the anesthetic depth continuum.[11] This monitor processes the patient's raw EEG signals, and through statistical modeling, computes a scaled 0-100 BIS score, with higher values denoting "awake" states and lower values defined as "asleep."

Large randomized controlled trials, nevertheless, have not shown use of the BIS monitor to be superior in preventing accidental awareness compared to heightened vigilance in monitoring exhaled concentrations of anesthetics.[12,13,14] These studies demonstrate how vigilance and setting appropriate alarms in the operating room can be an effective means to minimize the incidence of intraoperative awareness. Yet, the utility for monitors like the BIS may still lie in helping minimize other neurological sequalae from surgery such as postoperative cognitive dysfunction. There are numerous studies that suggest some benefit to utilizing EEG monitors such as BIS to target the anesthetic depth to a lighter plane of anesthesia, with the hope of decreasing postoperative neurologic complications. One study showed a reduction in postoperative delirium and decreased cognitive impairment at one year.[15] However, a randomized clinical trial failed to show any reduction in postoperative delirium, which is seen more acutely following surgery. They did not look at postoperative cognitive dysfunction however, which is seen from one week up to one year following surgery.[16] Another interesting study utilized the BIS preoperatively in addition to other tools such as the Mini-Mental State Exam, to help establish risk of postoperative delirium and cognitive decline after surgery.[17] Further studies are needed to assist in guiding clinical practice for depth of anesthesia and reducing effects on cognitive decline in our aging population.

Brain Monitoring

Monitoring the brain is strongly advocated when using total intravenous type of anesthesia, to ensure patients are adequately anesthetized. In this scenario, EEG data provides vital information about depth of anesthesia, because again, there is



Figure 1. Continuum of Depth of Sedation: Definition of General Anesthesia and Levels of Sedation Analgesia

	Minimal Sedation Anxiolysis	Moderate Sedation/Analgesia (Conscious Sedation)	Deep Sedation /Analgesia	General Anesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful response to verbal or tactile stimulation	Purposeful response following repeated or painful stimulation	Unarousable even with painful stimulus
Airway	Unaffected	No intervention	Intervention may be	Intervention often
Spontaneous	Unaffected	Adequate	May be inadequate	Frequently
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

Minimal Sedation (Anxiolysis) is a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and physical coordination may be impaired, airway reflexes, and ventilatory and cardiovascular functions are unaffected.

Moderate Sedation/Analgesia ("Conscious Sedation") is a drug-induced depression of consciousness during which patients respond purposefully** to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.

* Monitored Anesthesia Care ("MAC") does not describe the continuum of depth of sedation, rather it describes "a specific anesthesia service performed by a qualified anesthesia provider, for a diagnostic or therapeutic procedure." Indications for monitored anesthesia care include "the need for deeper levels of analgesia and sedation than can be provided by moderate sedation (including potential conversion to a general or regional anesthetic."1

** Reflex withdrawal from a painful stimulus is NOT considered a purposeful response.

Deep Sedation/Analgesia is a drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully** following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.

General Anesthesia is a drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation. The ability to independently maintain ventilatory function is often impaired. Patients often require assistance in maintaining a patent airway, and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.

Because sedation is a continuum, it is not always possible to predict how an individual patient will respond. Hence, practitioners intending to produce a given level of sedation should be able to rescue*** patients whose level of sedation becomes deeper than initially intended. Individuals administering Moderate Sedation/Analgesia ("Conscious Sedation") should be able to rescue*** patients who enter a state of Deep Sedation/Analgesia, while those administering Deep Sedation/Analgesia should be able to rescue*** patients who enter a state of General Anesthesia.

** Reflex withdrawal from a painful stimulus is NOT considered a purposeful response.

*** Rescue of a patient from a deeper level of sedation than intended is an intervention by a practitioner proficient in airway management and advanced life support. The qualified practitioner corrects adverse physiologic consequences of the deeper-than-intended level of sedation (such as hypoventilation, hypoxia and hypotension) and returns the patient to the originally intended level of sedation. It is not appropriate to continue the procedure at an unintended level of sedation.

Source: American Society of Anesthesiologists. Position on Monitored Anesthesia Care. Last amended on October 17, 2019. Used with permission.

no end tidal gas concentration available. The utility of the BIS monitor has also been questioned in pediatric patients. It has been shown that repeated exposure to anesthetics in children under three years of age could negatively affect development.[18] This knowledge adds motivation to try to spare the amount of anesthetic the pediatric patients receive whenever possible. There have been a few studies showing some benefit in using BIS for pediatric patients over age three,[19] while other studies have not shown any difference in anesthesia consumption.[20] Other investigators suggest that the BIS monitor is not effective at all in the younger pediatric population due to poor correlation with the BIS reading and end tidal sevoflurane levels, and that a different monitor all together may be more effective for younger patients.[21] Larger scale studies are needed to further delineate the role of BIS in children. Regardless, interpreting basic EEG waveform analysis, and recognizing sleep versus awake EEG waveforms will only further enhance the provider's ability to quickly and effectively determine when a patient may be approaching an unintended conscious state.

Conclusion

In conclusion, anesthesia has never been safer than the present day. Protecting the patient's mental well-being is just as important as ensuring their hemodynamic stability. By maintaining adequate depth of anesthesia and being diligent to ensure patients are in fact anesthetized, patients can rest assured that they will be well cared for during such a critical time. Medicine is an ever-changing landscape, and the pursuit of improved monitors for our most complex organ, the brain, is paramount.

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Disclosure

None reported.

Acknowledgement

The authors would like to thank Kathy Perryman, MD, for assistance with the manuscript. **MM**

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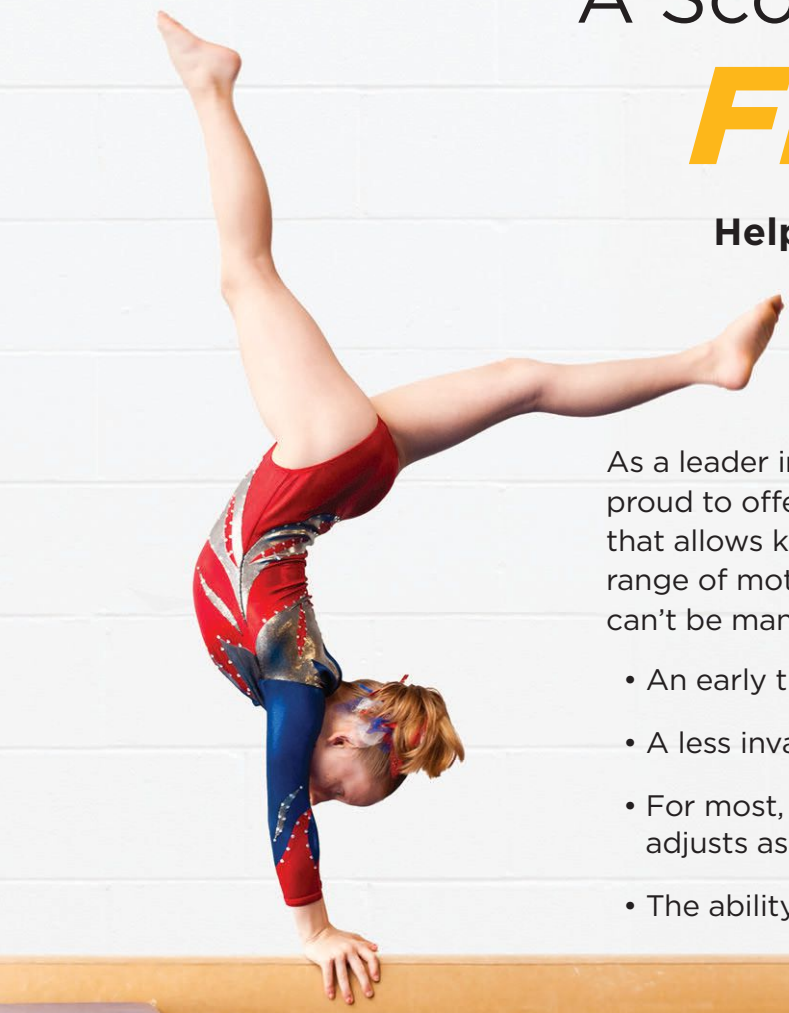
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