Missouri Medicine

MSMA 175 Years 1850-2025

The Journal of the Missouri State Medical Association www.msma.org/missouri-medicine May/June 2025

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Elevating Function—Enhancing Lives

Fake Science in the Age of Artificial Intelligence

How Physicians Might Get in Trouble Using AI (or Not Using AI)

We Have to Say Not Every Student Deserves an A

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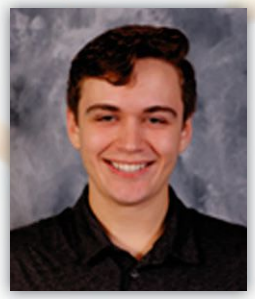
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Missouri Medicine
Mission—Submissions—Peer Review—Polices

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- Feedback and correspondence is encouraged

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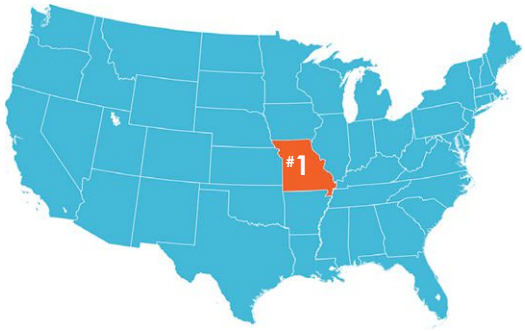
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Journal of the Missouri State Medical Association - Since 1904
Missouri Medicine

ChatGPT4, Perplexity, and Copilot Artificial Intelligence Rank *Missouri Medicine* Top State Medical Journal

by John C. Hagan, III, MD



In the quarter century that I have edited *Missouri Medicine*, I have never begun an editorial with a disclosure. Until now! I used Artificial Intelligence (AI) to rank the overall quality of state medical journals. Like the rest of the world, I am fascinated, even awed, by AI and its potential.[1] That's what I think of AI; read on to find out what AI thinks of *Missouri Medicine.*

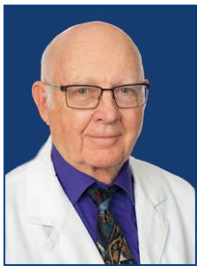
I have also never used AI to write an editorial or scientific manuscript. Several years ago, our Journal introduced into "Instructions for Authors" a disclosure statement for the use of AI in submited articles. It was modeled after that of the *Journal of the American Medical Association* and other national journals.

I have spent much of my professional life developing and polishing my writing skills. I'm troubled that an individual with no writing ability but facile with computers and AI can, in seconds, turn out an essay reasonably similar to my own which took hours to compose.

I have a relative who is head of Pre-Professional Studies at a major so-called 'elite' Ivy League University. I am tempted to wander off into the weeds and write about the regrettable and disgusting events playing out on many Ivy and other campuses. This is not the time or the place beyond saying reform and retribution are desperately needed.

Back to my relative, who tells me that a rapidly increasing percent of applicant essays for undergraduate admission, as well as post-graduate schools such as medicine, law, and business, are authored using AI. So widespread is the applicant non-disclosed use of AI, and so difficult to detect, that some faculty feel essays should be eliminated from the admission process.

Other faculty feel that it is no longer necessary to teach compositional writing skills. They assume that writing will be done almost entirely by AI in the near future. This is along the same lines of educators who feel math skills no longer need to be taught since computers can do complex math much faster that



John C. Hagan, III, MD, (pictured) is Past President of the Kansas City Medical Society, the Missouri Society of Eye Physicians & Surgeons and the Clay-Platte County Medical Society. He is Editor of *Missouri Medicine* and a Contributing Editor to *Kansas City Medicine*. Dr. Hagan is an ophthalmologist, author, and researcher. Learn more at www.msma.org/MoMed-Editor.

humans can. And who doesn't have access to a computer these days? Computers have become our peripheral brains!

Our Journal was told recently by the indexing service Scopus, that for a state medical journal, *Missouri Medicine* is cited in references more than most state journals. Having too much time on my hands one evening, I did an internet search to see if there are organizations that rank state medical journals. I found none.

So I turned to my good friend ChatGPT4. I used these prompts: "Give me a list of the top 10 state medical journals in the United States. Exclude *The New England Journal of Medicine* and national and international medical journals. Use these criteria in your assessment and ranking: in publication for at least 25 years; published at least six times per year; owned by a not-for-profit organization; peer-reviewed; indexed by all leading world services; and having an editorial and speciality board from at least four different medical schools."

ChatGPT4 response: *"Sure John! Here's a revised list of top state medical journals in the United States based on the updated criteria of being in publication for at least 25 years, indexed by major indexing services, peer-reviewed, published at least six times a year, and having an editorial board from at least four different medical schools:*

1. *Missouri Medicine*
2. *Texas Medicine*
3. *North Carolina Medical Journal*
4. *Virginia Medical Journal*
5. *Florida Medical Journal*
6. *New York State Medical Journal*
7. *Hawaii Journal of Medicine & Public Health*
8. *California Journal of Health Promotion*
9. *Alabama Medical Journal*
10. *Oregon Medical Journal*

Thank you for your understanding, and if you need further assistance, feel free to ask!"

Me being me, ever the skeptic, I thought I should get a second and third opinion before I took this ranking public.

My second most used AI is Microsoft Copilot. It's free and speaks to me in a lush female voice that reminds me of a high school girlfriend. I used these prompts to Copilot: "Can you rate the top state medical journals as far as peer-reviewed, indexed, and frequently cited by other authors?"

Copilot: *"Certainly! Based on available information, here are some state medical journals that are peer-reviewed, indexed, and frequently cited:*

1. *Missouri Medicine* – Indexed in Index Medicus, MEDLINE, PubMed, ProQuest, and Scopus. Articles are frequently cited by high-impact journals and featured in national media.
2. *Texas Medicine* – Published by the Texas Medical Association, often referenced in regional healthcare discussions.
3. *Journal of the California Medical Association* – Historically indexed and cited in medical literature.
4. *Journal of the New York State Medical Association* – Covers state-specific medical research and policy.
5. *Journal of the Ohio State Medical Association* – Includes peer-reviewed studies relevant to Ohio's healthcare landscape.
6. *Journal of the Pennsylvania Medical Society* – Indexed and cited in regional medical research.
7. *Journal of the Michigan State Medical Society* – Publishes peer-reviewed articles on state healthcare issues.
8. *Journal of the Wisconsin Medical Society* – Frequently cited in Midwest medical research.
9. *Journal of the Minnesota Medical Association* – Indexed and referenced in state healthcare discussions.
10. *Journal of the North Carolina Medical Society* – Covers peer-reviewed studies on healthcare in North Carolina."

I don't use other AIs, so I asked ChatGPT4 to give me a free AI that is good for this type of research. Several names popped up and I chose Perplexity AI. Same prompts. I hold my breath and press "enter." Top three in order:

1. *Missouri Medicine*
2. *Tennessee Medicine*
3. *South Carolina Medicine*

So, it is unanimous!! All three consulted AIs rate *Missouri Medicine* as the number one state medical journal.

Whoa! No AI hallucinations here. "Sorry you don't drink ChatGPT4, Copilot, and Perplexity. I would buy you three a beer." **MM**



Combating Fake Science in the Age of Generative Artificial Intelligence: A Biomedical Perspective

by Xing Jian, PhD & Lauren H. Yaeger, MA

While Gen AI allows paper mills to produce more sophisticated fake papers in larger quantities, the scientific community is also actively developing AI-based tools to detect fake science.

Fake science, a form of false information in science, slows scientific progress and undermines trust in science and the capacity of individuals and society to make evidence-informed choices, including life-or-death issues.[1,2] Fake science produced from "paper mills" appeared in the biomedical literature around 2010 and poses issues with scientific integrity and credibility of research findings.[3] Researchers are increasingly concerned that fake science is further exploited by Generative Artificial Intelligence (Gen AI) to generate fake text and altered images.[4] The purpose of this perspective article is to discuss features of fake science related to the biomedical community, the role of Gen AI, and share resources and tools to help combat dissemination of false information.[1,2]

Background of Paper Mills

The term "paper mill" describes the process by which manufactured manuscripts are submitted to a journal for a fee on behalf of researchers with the purpose of providing an easy publication for them, or to offer authorship for sale.[5] Originated from China, this malpractice was initially reported in *Science* in 2013.[6] The term "paper mill" was first noted in a news report on *Nature*.[7] Although the definition itself does not the imply the research is fraudulent, the vast majority of research published by paper mills is not trustworthy.[8] The rise of paper mills has caused significant damage to trust in scientific literature.[9] For example, Wiley (a global publisher) acquired Hindawi (an open-access publisher) in 2021 and discovered that Hindawi journals were flooded with articles from paper mills. Wiley retracted more than 11,300 Hindawi articles, shut down 19 journals, and discontinued the "Hindawi" name in 2024.[10] Several recent studies found other examples illustrating the



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extent and scope of paper mill publications. A 2022 analysis over 53,000 journals from six publishers revealed that most journals reported 2-46% of suspect papers being submitted for review.[8] In the same year, one research group used a software tool to flag publications in PubMed and found that 1% of publications contained text similar to publications from paper mills.[11] Another analysis estimated that 1.5-2% of scientific papers published in 2022 were potential paper mill products, and the rate raised to 3% in biology and medicine papers.[12] The editors of *Naunyn-Schmiedeberg's Archives of Pharmacology* recently provided a detailed analysis of retracted papers in the journal, identifying many research integrity issues due to paper mills.[13]

The editorial office of *Nature* is planning to publish a large database on retracted scientific articles in the near future, and some preliminary analysis has been published recently.[14] For additional readings about paper mills, please refer to two recent publications, and as well as a book chapter.[3,15,16]

Besides creating fake research papers, paper mills operate on other channels. Paper mills have registered many bizarre designs for medical devices with the UK's Intellectual Property Office, and are actively selling "scientific inventorship" to many researchers in India.[17] Some organizations sell paper authorships to non-US physicians to acquire the necessary publication records to apply for US residency positions.[18] The Springer Nature journal, *Cureus*, closed six "academic channels" due to concerns mentioned above in November 2024.[19] In November 2024, research integrity experts expressed concerns that paper mills might have infiltrated editorial boards of some journals, including the Springer Nature journal *Scientific Reports*.[20]

Entities related to paper mills also hijack authentic journals by creating clone websites.[21,22] Innocent researchers may become victims of hijacked journals by submitting authentic papers to fake journals. For example, the now defunct "Springer Global Publication," which is not affiliated with Springer Nature, has been reported to have hijacked journals from Elsevier, Springer Nature, and other major publishers.[23]

Common Features of Fake Papers and the Involvement of Gen AI

Over the years, scientific publishers and journal editors have identified several recurring features of fake papers from paper mills. Some of these 'tells' are unfortunately only visible during the peer review process, and not useful for the general readership. These features are summarized in Table 1.[3,8,24] This table could be used as a checklist to screen for manuscript submissions, although it is by no means exhaustive. Some of these features are specific to certain types of data and will not be present in all manuscripts. In the following section, we will discuss a few in detail.

Fake papers may exhibit unusual co-author affiliations, as paper mills sometimes sell authorship of one manuscript to a group of academically unrelated individuals.[27,28] Authors requesting to add or change authors after submission is also a common feature of fake papers.

Another major feature of fake papers is the existence of method and citation inaccuracies.[3] Citations may also provide clues as to possible fake papers. Citations

1 Picture = 1,000 Words

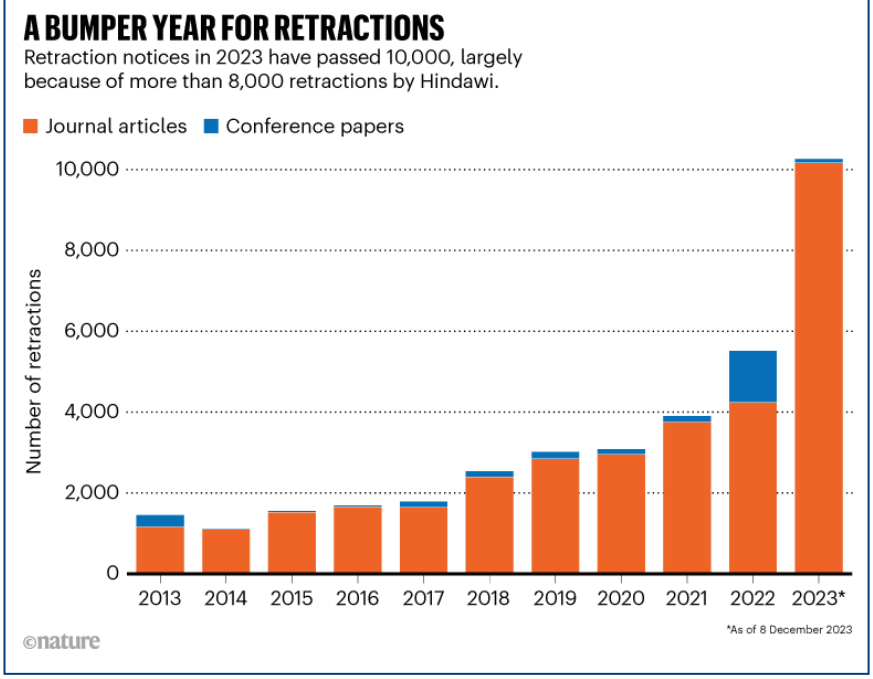


Table 1. Common Features of Fake Papers

Manuscript Submission Level Features

1. Absence of cover letters or generic cover letters.
2. Author affiliation irregularities non-institutional email addresses.
3. Suggesting unverifiable peer reviewers.
4. No funding acknowledged for extensive research projects.
5. Irregular grant numbers or ethical statements. 6. No offer to provide raw data upon request.

Content Level Features

1. Manuscript title not descriptive of the content.
2. Rationale for study design lacking in detail, or highly generic.
3. Missing links between different sections.
4. Plagiarized text.
5. "Tortured phrases."[25]
6. Irrelevant or non-existing citations.
7. Citations from predatory journals.[26]
8. Retracted citations.

Method Level Features

1. Non-existing or inconsistent cell lines.
2. Incompatible primary and secondary antibodies.
3. Inconsistent nucleotide sequences.
4. Wrongly identified reagents or instruments.
5. Questionable experimental parameters.

Image Level Features

1. Western blots with duplicated bands, absence of smears, clean or uniform background, n-shaped bands.
2. No molecular markers in raw Western blot images.
3. Cell staining with inconsistent cell shapes.
4. Fluorescent images with non-matching or empty channels.
5. Wound healing assay and trans-well assay with poor quality images.
6. Stretched tumor images sometimes with varying quality together.
7. Suspiciously smooth or clean flow cytometry graphs. 8. Images with inconsistent quantification data.

unrelated to the research, excessive self-citations, and multiple citations to the same journal, are examples of possible fake papers. Inconsistent methods are another hallmark of suspect papers such as using a rat cell line to study human genes, incorrect catalog numbers for reagents, incompatible primary and secondary antibodies, and so on. A investigation in 2024 reported that 235 cancer papers were based on data from seven non-existing cell lines.[29] Another recent investigation reported unusually large rodents as a common questionable experimental parameter in paper mills.[13]

Image fraud is also prevalent in fake papers (Table 1). Journal editors should ask authors to provide raw images, especially when they have identified problematic images in the submissions, especially Western blot images. For readers who are not familiar with the technique, please refer to a blog article about Western blot.[30]

Fake Papers and Gen AI

Gen AI refers to technology that creates content—including text, images, video, and computer code—by identifying patterns in large quantities of training data and then creating original material that has similar characteristics.[31] Gen AI tools are a growing trend in scientific publishing. Paper mills use Gen AI tools to help with content and image creation, with publishers also using Gen AI tools to identify potential fake papers or papers with plagiarized content.

AI-powered tools have been developed to detect replicated and altered images by human manipulation, including FigCheck (https://www.figcheck.com/imagecheck/), ImaCheck (https://www.imachek.com), ImageTwin (https://imagetwin.ai), and Proofig AI (https://www.proofig.com). These tools are gradually outperforming humans in finding manipulated images in papers.[32] Unlike human-manipulated images, images

generated by Gen AI have become so professional looking that they pose major challenges for detection. A recent news article in *Nature* reported that Proofig's AI-image-detection tool achieved excellent results in detecting AI-generated images.[33] Science-family journals started using Proofig AI to scan revised manuscripts at the beginning of 2024.[34] During the 2025 Medical Library Association's conference, the developers of Proofig AI reported that the software had achieved over less than 1% false negative rate identifying AI-generated cellular images, although it was not as good on AI-generated Western blotting images.

In 2021, research integrity experts reported a series of strange phrases were detected in hundreds of questionable articles between 2018 and 2021.[35] These phrases were dubbed as "tortured phrases" and are suspected to be generated from automated software to disguise plagiarism. Examples of tortured phrases include: "top notch picture" instead of "high-resolution image," "tainted people" instead of "infected individuals," "blunder worth" instead of "error value."[25] The academic publishing sector quickly developed tools to detect AI-generated text, such as Turnitin's AI detector (https://www.turnitin.com/solutions/topics/ai-writing/ai-detector/) and Compilatio's AI Checker (https://www.compilatio.net/en/ai-detector-info/).[36] GPT-2 Output Detector (https://openai-openai-detector.hf.space) is an example of an open-source software to detect AI generated text.

"Watermarking" technologies implemented by Gen AI developers may become a major force to spot fake papers prepared by Gen AI. These technologies can subtly modify the output of Gen AI, so that while "maintaining its intended meaning and appearance," a watermark will "embed a hidden but consistent signal that serves as a verifiable marker of Gen AI origin."[37] For example, Google has implemented a watermarking theme, named "SynthID-Text" (https://huggingface.co/spaces/google/synthid-text/) in Gemini and Gemini Advanced chatbots.[38] Fake papers prepared by Google chatbots can potentially be identified by a "SynthID-Text" theme detection tool. Interested readers can refer to a preprint for in depth discussion about watermarking techniques.[39]

Gen AI is also likely behind the current flood of letters-to-editors and editorial comments in several journals.[40] More than half of the content published in 2024 by *Neurosurgical Review* were correspondence with more than 80% of the authors from a few countries. The Editor-in-Chief of Neurosurgical Review eventually decided to put a pause on letters-to-the-editor submissions, citing that most of them appeared to be "driven by" advances in Gen AI tools such as ChatGPT.[41] This development highlights the importance of developing automatic tools to detect text generated by Gen AI.

The widespread use of AI-assisted writing is posing a new challenge for detection of fake papers.[42] Academ-AI (https://www.academ-ai.info/) is a project tracking the undeclared use of AI in the academic literature, which reported more than seven hundreds cases as of May 2025.[43] Thus, it is vital for scientific journals to have clear guidelines to enforce disclosure of Gen AI usage. The AI Guidelines of the *Journal of the American Medical Association* is a good example, and is adopted by *Missouri Medicine*.[44]

Resources for Research Integrity

There are several major initiatives from stakeholders to combat paper mills. The resources and tools we complied with are listed in Table 2. We will briefly discuss them in the following section.

The International Association of Scientific, Technical & Medical Publishers (STM) has several resources (https://stm-assoc.org/what-we-do/strategic-areas/research-integrity/), including the STM Integrity Hub, the Image Integrity Working Group, Content-update Signaling and Alerting Protocol and AI Resources. Another group dedicated to fighting fake publications is the Committee on Publication Ethics (COPE), which has a special focus on paper mills (https://publicationethics.org/cope-focus/cope-focus-paper-mills/). In 2023, COPE and STM jointly launched the United2Act project (https://united2act.org) to educate stakeholders on acting against paper mills. This project is currently seeking feedback from stakeholders on the draft resources.[4]

Websites, blogs, and commercial services dedicated to detecting papermills and fake papers are available. Retraction Watch (https://retractionwatch.com) is a blog that reports on retractions of scientific papers and investigates paper mill activities. The Retraction Watch Data can be either downloaded (https://gitlab.com/crossref/retraction-watch-data/) or searched from the web (https://retractiondatabase.org/RetractionSearch.aspx?). Retraction Watch maintains a Hijacked

Table 2. Resources and Tools to Combat Fake Science

Websites and Blogs

1. Beall's List of Potential Predatory Journals and Publishers (https://beallslist.net/).
2. COPE (https://publicationethics.org/cope-focus/cope-focus-paper-mills/).
3. For Better Science (https://forbetterscience.com).
4. Hijacked Journal Checker (https://retractionwatch.com/the-retraction-watch-hijacked-journal-checker/).
5. Predatory Publishers and Predatory Journals Lists (predatoryjournals.org).
6. Problematic Paper Screener (https://www.irit.fr/~Guillaume.Cabanac/problematic-paper-screener/).
7. PubPeer (https://pubpeer.com).
8. Retraction Watch (https://retractionwatch.com).
9. Retraction Watch Database (https://gitlab.com/crossref/retraction-watch-data/).
10. Retraction Watch Search (https://retractiondatabase.org/RetractionSearch.aspx?).
11. Science Integrity Digest (https://scienceintegritydigest.com/).
12. STM (https://stm-assoc.org/what-we-do/strategic-areas/research-integrity/).
13. Think, Check, Submit (https://thinkchecksubmit.org).
14. United2Act (https://united2act.org).

Commercial Tools

1. Dimensions Research Integrity (https://www.dimensions.ai/products/research-integrity/).
2. Integrity Manager (https://www.morressier.com/products/research-integrity-manager/).
3. Papermill Alarm (https://clear-skies.co.uk).
4. Research Integrity Tool (https://rivervalley.io/products/research-integrity/).
5. Reviewer Zero AI (https://www.reviewerzero.ai).
6. SciScore (https://sciscore.com).
7. Signals (https://research-signals.com).
8. Veracity for Publishing (https://groundedai.company/veracity/publishing/).

Open-Source and Free-to-Use Tools

1. Argos (https://www.scitility.com/argos/).
2. Author Verification Tool (https://www.reviewerzero.ai/author-verification/).
3. BLAT Tool, Nucleotide Sequence Verification (https://genome.ucsc.edu/cgi-bin/hgBlat).
4. Connected Papers (https://www.connectedpapers.com/).
5. Inciteful (https://inciteful.xyz/).
6. Litmaps (https://www.litmaps.com/).
7. RedacTek (https://redactek.com).
8. Seek & Blastn Tool, Nucleotide Sequence Verification (https://scigendetection.imag.fr/TPD52/Vb/).

Gen AI Text Detection Tools

1. AI Checker from Compilatio (https://www.compilatio.net/en/ai-detector-info/).
2. AI Detector from Turnitin (https://www.turnitin.com/solutions/topics/ai-writing/ai-detector/).
3. GPT-2 Output Detector (https://openai-openai-detector.hf.space/).
4. Scribbr's Free AI Detector (https://www.scribbr.com/ai-detector/).

Image Integrity Tools

1. ExifTool, Image Metadata Extraction Tool (https://exiftool.org/).
2. FigCheck (https://www.figcheck.com/imagecheck/).
3. ImaCheck (https://www.imachek.com/).
4. ImageTwin (https://imagetwin.ai/).
5. Proofig AI (https://www.proofig.com/).

Other Resources

1. Academ-AI, Tracker of Undeclared Use of AI in the Academic Literature (https://www.academ-ai.info/).
2. iThenticate, Plagiarism Detection Software (https://www.ithenticate.com/).
3. SynthID Text, Watermarking Technology (https://huggingface.co/spaces/google/synthid-text/).

Journal Checker (https://retractionwatch.com/the-retraction-watch-hijacked-journal-checker/) as a database for hijacked journals. Lists of predatory publishers and journals can be found at the Predatory Journals website (predatoryjournals.org) and Beall's List of Potential Predatory Journals and Publishers (https://beallslist.net/).[45] Researchers can also use "Think, Check, Submit" (https://thinkchecksubmit.org) to review the quality of the journals they would like to submit to. PubPeer (https://pubpeer.com) is a website that allows users to discuss and review scientific research after publication. It serves as a whistleblowing platform for research integrity, as most comments are related to scientific misconduct, such as image manipulation, data manipulation and publishing fraud. The Problematic Paper Screener (https://www.irit.fr/~Guillaume.Cabanac/problematic-paper-screener/) reports papers with various issues related to fake science.[46] As of May 2025, it reported more than 20,000 papers with tortured phrases. Science Integrity Digest (https://scienceintegritydigest.com) and For Better Science (https://forbetterscience.com) are blogs about scientific integrity, with many reports on paper mills.

Commercial services that track paper mills include: the Papermill Alarm from Clear Skies (https://clear-skies.co.uk), and Signals (https://research-signals.com). These groups utilize network-focused approaches to detect unusual patterns from authors, institutions, research topics, experimental design, and self-citation rates. Argos from Scitility (https://www.scitility.com/argos) provides a list of recent retractions, and analysis of authors, articles, and journals.

Commercial services that generate automatic research integrity reports for publishers and editors include the Integrity Manager from Morressier (https://www.morressier.com/products/research-integrity-manager/) and the Research Integrity Tool from River Valley Technology (https://rivervalley.io/products/research-integrity/). Dimensions Research Integrity (https://www.dimensions.ai/products/research-integrity/) claims to be the largest research integrity dataset and has developed "Trust Markers" at the individual level for each paper and the aggregated level for publishers and research institutions. Reviewer Zero AI (https://www.reviewerzero.ai/) is another commercial service in the developing phase to assist reviewers by checking manuscripts for features like missing citations, image manipulation and statistical inconsistencies. Reviewer Zero AI is also developing Author Verification Tool with a beta-version that is currently free to use (https://www.reviewerzero.ai/author-verification). RedacTek (https://redactek.com) is a free tool that identifies retracted, self-cited and PubPeer-flagged citations in an article to the third generation, which means the primary citations from the given article, the secondary citations in the primary citations, and the tertiary citations from the secondary citations.[47] Connect Papers (https://www.connectedpapers.com/), and Litmap (https://www.litmaps.com/) offer free AI-powered tools that provides instantly visualization of an article's references, and its relationship to related articles. Inciteful (https://inciteful.xyz/) is a similar free reference analysis tool without visualization.

Conclusion

Fake science produced by paper mills is evolving in the age of Gen AI and poses an increasing threat to research integrity and public trust in scientific information. While Gen AI allows paper mills to produce more sophisticated fake papers in larger quantities, the scientific community is also actively developing AI-based tools to detect fake science. Initiatives such as Black Spatula Project (https://the-black-spatula-project.github.io/) and YesNoError (https://yesnoerror.com/) are currently underway to develop AI tools to spot errors in research papers.[48] Identifying and eliminating fake science is the responsibility of the entire scientific community.[2,49] We hope that information presented in this article will equip researchers with knowledge, resources, and tools to identify fake papers, and combat fake science produced by paper mills in the age of Gen AI.

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How Physicians Might Get in Trouble Using AI (or Not Using AI)

by Kimberly Chew, JD, Kathleen Snyder, JD & Colleen Pert, JD

Introduction

As artificial intelligence (AI) continues to gain traction in the healthcare industry, physicians must navigate the potential benefits and risks of incorporating AI tools into their practices. These tools hold the promise of reducing administrative burdens, addressing provider burnout, and improving patient outcomes. There are many questions regarding how AI ought to be used by healthcare providers to achieve the benefits of AI while mitigating potential liability. Specifically, this article will: (1) explore the broad continuum of AI use cases in healthcare, (2) clarify how AI intersects with the standard of care, (3) discuss the current enforcement landscape, and (4) offer strategies to mitigate risks. By addressing these topics, we aim to equip physicians with the knowledge needed to make informed decisions about incorporating AI into their practices.

Broad Continuum of AI Use Cases in Healthcare

AI tools are typically created by training machine learning algorithms on large datasets.[1] These datasets are often derived from historical information, such as medical records, imaging studies, or other clinical data.[2] During this training process, the AI system learns to identify patterns and make predictions or decisions based on the data it has been exposed to. However, the quality and completeness of the training data are critical factors that can influence the performance of the AI system. If the data used to train the AI is incomplete or reflective of skewed sources, the resulting AI tool may produce inequitable outcomes.[3] Such results could lead to disparities in diagnosis, treatment, and potential negative patient outcomes.

The integration of AI tools in healthcare presents a spectrum of risks that vary depending on the tool's use case. Use cases can range from administrative applications to clinician administrative tools to AI embedded Software as a Medical Device (SaMD). The risks of SaMD are regulated by the Food and Drug Administration (FDA), but there are also risks implementing AI at the lower end of the risk continuum. Administrative tools such as billing and scheduling systems, which, while primarily operational, can still pose significant risks if AI errors lead to incorrect billing or scheduling conflicts. In more complex applications, AI communications and Natural Language Processing tools for scribes and notetaking may introduce the risk of AI hallucinations. For example, the tool may misinterpret or misrepresent spoken information or generate inaccurate content. This risk underscores the critical need for physician oversight, particularly in distinguishing between AI scribes and the physician's ultimate responsibility to verify and validate AI-generated outputs.

Standard of Care

In medical malpractice cases, liability often hinges on the standard of care, which measures a healthcare provider's actions. If a physician acts in line with this standard, they are typically not negligent. However, failing to meet the standard may result in liability for negligence. Determining the standard of care often



L to R: Kimberly Chew, JD, Senior Counsel, Kathleen Snyder, JD, Senior Counsel, and Colleen Pert, JD, Associate, work at Husch Blackwell which represents a full spectrum of healthcare providers and other businesses in developing compliance strategies, preliminary enforcement measures, employment concerns, and litigation matters. The information contained in this article should not be construed as legal advice or a legal opinion on any specific facts or circumstances. The contents are intended for general information purposes only, and readers are encouraged to consult their attorney concerning specific situations and specific legal questions. NOTE: The AI landscape is moving quickly. This content was correct and current as of April 25, 2025.

depends on the physician's clinical judgment.[4] The standard of care regarding AI is nascent but as AI is implemented more broadly across healthcare, the standard of care will evolve.

Industry groups, such as the Coalition for Health Artificial Intelligence (CHAI), are trying to build industry consensus and establish a standard for providers using AI.[5] For example, CHAI has published an Assurance Standards Guide which addresses areas like: (1) diagnostic imaging for a mammography with AI, (2) care management with claims-based outpatient use with AI, and (3) EHR query and extraction with generative AI.[6]

Additionally, CHAI has developed other tools such as the Responsible AI Guide, a "playbook for the development and deployment of AI in healthcare, providing actionable guidance on ethics and quality assurance"[7] and the Responsible AI Checklist (RAIC), to aid the "development and evaluation of a complete AI solution and system against CHAI standards for trustworthy AI."[8] RAIC translates best practice considerations that meet core ethical and quality principles into detailed yes/no questions, or evaluation criteria, to determine if best practice standards are met.[9] In the absence of a recognized standard of care, efforts by industry groups like CHAI, seek to establish standards and evaluation tools for AI-driven tools and will be important to monitor and consider adopting in order to mitigate liability risks.

Enforcement Landscape

Enforcement actions against healthcare providers using AI tools remain limited, and medical malpractice cases specifically tied to AI use (or non-use) are still in their infancy.[10] As AI adoption grows, questions about potential litigation and penalties continue to surface. Existing laws and doctrines will likely adapt to address the unique challenges AI presents in healthcare.[11] While AI tools are advancing in the clinical realm,[12] there is a lack of standardized guidance on "objectively evaluating AI systems with regards to clinically meaningful performance metrics."[13] Industry groups such as CHAI are working to fill this gap.[14] Meanwhile, regulators may need to re-define how medical errors such as diagnostic mistakes are classified and addressed in the context of AI-driven care.[15]

Generally, the healthcare industry relies on regulation, medical malpractice, and malpractice insurance mechanisms to facilitate remedies to resolve an adverse situation. However, AI presents some unique challenges in terms of enforcement and accountability. One major issue is that some AI tools present a "black box" where it is difficult for humans to understand the reasoning or processes behind the AI's decisions. Additionally, the algorithms underlying AI tools often function in ways that differ from traditional clinical reasoning, and their outcomes are not always the same, making it harder for users and regulators to assess their decision-making processes. These factors create significant barriers for both users and regulators in the AI space. As AI adoption continues to grow, these challenges will need to be addressed to ensure transparency, accountability, and equitable outcomes in healthcare.

Enforcement in the healthcare space has generally focused on AI suppliers and/or vendors. For example, the Texas Attorney General (AG) Ken Paxton reached a settlement with an AI healthcare technology company for a series of false and misleading statements about the accuracy and safety of its products.[16] The investigation found that the company's metrics were likely inaccurate and may have deceived hospitals about their accuracy and safety.[17] AG Paxton stated that "healthcare entities must consider whether AI products are appropriate and train their employees accordingly."[18]

Relatedly, an app where users talk to AI-generated chatbots is being sued by a variety of parents whose children use the app. [19] In a tragic example, after frequent conversations with a chatbot on the app, a 14-year-old boy killed himself.[20] In these lawsuits, the parents: (1) allege the company knowingly exposed minors to an unsafe product, and (2) demand that the app be taken offline until there are stronger guardrails to protect children.[21] Additionally, in some of these lawsuits, "generative AI chatbots have been labeled as psychotherapists, therapists, and psychologists."[22] These qualifications are false, deceptive, and could result in public harm.[23]

Notably, "[i]f a human were making such misrepresentations, the state of Texas, through the Texas Behavioral Health Council and the Texas State Board of Examiners of Psychology, would and should use its enforcement authority to enjoin the individual from unlicensed practice and fraudulent behavior."[24] However, because the chatbots are AI, this puts a unique spin on the typical course of action. Additionally, the American Psychological Association (APA) has asked the Federal Trade Commission (FTC) to investigate chatbots acting as mental health

professionals.[25] The FDA has also been called upon to "balance consumer safety and industry stability as it considers regulatory guardrails and the processes of machine learning and AI enabled device approval."[26]

AI tools used to process medical claims may carry the risk of False Claims Act liability. In a recent case, a company paid $145 million to settle allegations of receiving unlawful kickbacks for implementing clinical decision support alerts in its electronic health record (EHR) software, which ignored medical standards and increased drug prescriptions.[27] This situation highlights the potential for AI tools to improperly affect medical decisions.

The risks of using AI necessitate rigorous oversight and validation processes to: (1) ensure compliance, (2) underscore accuracy, and (3) guard against potential legal and financial repercussions. This is true across the healthcare use case continuum—from administrative support to patient care.

States have begun to enact legislation addressing the use of AI. For example, California has a law that addresses generative AI used by healthcare providers in rendering care to patients in the context of written or verbal patient communications.[28] If the California law is violated, it could lead to enforcement against providers.[29] Utah enacted the Artificial Intelligence Policy Act, which requires disclosures when consumers are interacting with AI systems in healthcare professions (and other regulated occupations).[30] Colorado was the first state to enact comprehensive AI legislation, although the law is not effective until February 1, 2026.[31] Many other states have proposed legislation. These legislative efforts reflect a growing recognition of the need to regulate the use of AI in sensitive industries, to ensure transparency, accountability, and the protection of consumer and patient rights.

Risk Mitigation Strategies

If a physician is considering utilizing AI in its practice, then she should consider the following three recommendations to mitigate her risks. Overall, a physician should: (1) understand how their AI tool(s) work, including appropriate use cases and the data that the tool was trained on, (2) examine their insurance policies regarding the extent of coverage for the use of AI tools, and (3) recognize that the AI tools require supervision and close monitoring to ensure that they are performing as expected, and proceed with caution accordingly.

First, to avoid being misled, a physician should learn about how an AI tool works in advance. There are many types of AI. Because AI scours the internet for information, it is a common mistake to consider AI an expert. However, language learning models (LLMs) are simply good at predicting what a user might say next (i.e., pattern recognition). Additionally, LLMs tend to both: (1) generate factually incorrect outputs, and (2) source information non-transparently.[32] To mitigate these issues a physician should receive training to better understand how AI tools operate to avoid being misled. For example, continuous education programs that "evolve with technological advancements," and emphasize "the development of diagnostic and decision-making skills" for physicians could be implemented by healthcare systems.[33]

Second, the physician (or someone on her behalf) should examine insurance policies to determine the extent of coverage for the use of the AI tools. Additionally, a physician should double check that her medical malpractice insurance carrier will cover the physician's use of a cutting-edge tool. Depending on the coverage, there may be an overlay of different policies at issue for AI devices including for example: medical device insurance, cyber insurance, and medical malpractice insurance. To grapple with insurance policies and discern the level(s) of risk, it may be wise to coordinate with an attorney and/or insurance broker.

Third, a physician should proceed with caution when using AI tools. There are both positives and negatives for a physician using AI. In the proper context, there can be positive outcomes in terms of improving patient care and reducing physician burnout. Specifically, AI tools offer promise in: (1) charting, (2) administrative functions, (3) diagnostics, (4) personalized medicine, (5) augmentation of clinical practice, and more.[34] However, AI may not always lead to benefits. For example, if a physician is not "adequately trained" to leverage AI tools, then the increased complexity in medical information and cases "could overwhelm providers," and increase physician burnout.[35] Even well-regarded health information technology using AI can create problems for physicians. An EHR vendor previously offered a new AI tool to help detect sepsis.[36] However, the tool "missed a higher share of true cases and was less timely than other sepsis tools."[37] It was hypothesized that the sepsis model relied on "perhaps unintentionally, clinician suspicion that the patient has sepsis."[38] This illustrates that there may be bias in AI and underscores that physicians should

not over rely upon AI. Ultimately, physicians must counter the "benefits of AI with vigilant oversight of its outputs," to foster "a culture of critical engagement to enhance capabilities without compromising care standards."[39] Additionally, AI lacks the nuanced clinical judgment and empathy that human practitioners bring to patient care. This makes it essential for physicians to critically evaluate AI-generated outputs rather than accepting them at face value. Over-reliance on AI could also inadvertently erode clinical skills and decision-making expertise over time. To ensure safe and effective care, AI should be seen as a complementary tool rather than a replacement for the physician's expertise, intuition, and ethical responsibility.

Conclusion

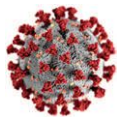
This article highlights the risks and benefits associated with AI in healthcare. Until there are more developments in this space, there is minimal risk from the legal repercussions of a physician's non-use of AI. However, AI tools are increasingly being integrated into healthcare systems to meet regulatory standards, enhance early detection and intervention for disease, and improve compliance. As these technologies become more widespread, physicians who do not adopt AI may face difficulties in meeting these emerging standards. Importantly, if the use of AI becomes part of the established standard of care, a physician's decision to avoid such tools could be viewed as a deviation from this standard, potentially raising concerns about their professional judgment.

AI has the potential to reduce administrative burdens and improve patient outcomes. However, before adopting AI tools, physicians must thoroughly understand their benefits and limitations to minimize risks and ensure patient safety. Given the rapidly evolving nature of AI and its associated standards, it is crucial for physicians to stay informed through industry organizations (e.g., CHAI) and consult regulatory professionals to remain aligned with best practices and legal requirements. Staying connected to these resources can help navigate the shifting landscape of AI in healthcare.

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COVID-19 Lessons: Finding the Right Balance Between Public Health and Individual Liberty Tensions

by Hilal Abdessamad, MD, Kristine Allen, BS, Wassim Jamaleddine, MD & Dima Dandachi, MD

Shedding light on how to better manage the next pandemic in the state of Missouri.

We read with great interest the two-part article series titled: "Optimizing Missouri's Preparation for the Next Pandemic: Lessons Learned from COVID-19: A Commentary and Discussion, Part 1 and Part 2" by David S. McKinsey at al., published in the *Journal of Missouri Medicine*. The articles provide excellent discussion, identifying critical gaps in Missouri's Public Health response and preparedness. While we appreciate the authors's insights, we would like to expand on several key points to further enrich the conversation and discuss actionable strategies that could strengthen our public health system.

During the Spanish flu pandemic, Missouri led a robust public health response that millions of lives. Yet, our state's response facing the Coronavirus Infectious Disease (COVID-19) pandemic was among the worst compared to other states.[1] This two-part series dives deeper into what changed between now and then, highlighting the logistical, political, social, and legal hurdles that we can learn from.

Part 1 of the series (*Missouri Medicine* November/December 2024) argues that despite the origin of the virus being undetermined, evidence supports the natural source theory rather than the manufactured one. It also discusses that, early in the pandemic, lockdowns and mask mandates were very successful in saving many American lives despite some disadvantages such as negative effects on the economy and education, its impact on emotional development of children, and psychological repercussions such as anxiety. The series also touched on the COVID-19 vaccines and their important role in death prevention despite considerable hesitancy from the Missouri public.[1] Part 2 (*Missouri Medicine* January/February 2025) dives into the hurdles faced as the pandemic intensified and the mortality spiked, discussing the decentralized public health system in United States (US) where local health departments have most, if not all, the responsibility despite their lack of funding and support.

Despite that, it is mentioned that their efforts, guided by the Center of Disease Prevention and Control (CDC), were impeded by government officials, counteractive judiciary actions, and retaliation from the public including personal threats towards public health workers and stalking. Part 2 discusses that this was driven by misinformation, lack of trust, and desire to prevent financial loss and personal freedom. The series concludes on the need for increased investment, better communication, and stronger support for public health bodies in the hope of better preparedness for future outbreaks. That being said, several vital issues were raised that deserve a closer look.



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Is There Any Update On the Origin of COVID-19?

There is very little new data that emerged regarding the origin of COVID-19. Crits-Cristoph et al. demonstrated that the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) shares common ancestry with known coronaviruses as well as samples found in wildlife mitochonrdrial DNA in the Wuhan stalls and nuclear DNA in many animal species.[2] Besides, the emerging data from the last quarter of 2024 further supports the animal market origin.[3] However, the alternative hypothesis, can be supported by the fact that viral gain-of-function research has been previously funded by the NIH.[4] Most recently, the US Office of the Director of National Intelligence released unclassified data that concluded a laboratory-associated incident cannot be ruled out yet despite evidence that COVID-19 was not being developed as a biological weapon.[5]

What Does It Take to Reach the Right Balance Between Public Health and Individual Liberty Tensions and What Are the Consequences of Prioritizing One Over the Other?

The tag battle between what's medically best and what's "against the constitution" is not new. In the early 1900s, smallpox was a major problem in the US.[6] However, vaccination campaigns faced massive opposition by the anti-vaccine movement. The US constitution clearly address this issue under the tenth amendment, which allows states to make their own public health laws, including quarantine laws and mandatory vaccinations.[7] As seen in the important historic case of *Jacobson v. Massachusetts*, 197 US 11 (1905), where the state's decision to mandate the smallpox vaccine was ultimately upheld by the supreme court. The Jacobson Court reasoned that restraints to individual freedom may sometimes be necessary "for the common good."[6] However, one of the concerns is exploiting these emergencies to harvest power and impose agendas that could ultimately harm the public health system.[8]

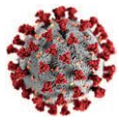
Mello and Gostin mention "Public Health Law 2.0," addressed several issues related to this topic. Since the current laws are made for short-term responses for bioterrorism, they need to be modified to fit long-term emergency pandemic planning. This involves needing legislatures to approve long-term lockdown extensions, requiring healthcare experts and officers to consult with the governors and public representors before extending any laws, defining who has a say in laws that affect sub-communities such as schools, allowing local governments to override state governors to enforce stricter rules if deemed needed and amending federal law to allow the CDC to have more authority over crucial issues like mask mandates, travel, and vaccination rules during emergencies.[9]



Efforts by public health departments, guided by the Center of Disease Prevention and Control, were impeded by government officials, counteractive judiciary actions, and retaliation from the public including personal threats towards public health workers and stalking.

Can the Government Play a Better Role in a Future Public Health Crisis?

Decades of underfunding prior to the pandemic made public health agencies vulnerable to the emerging pandemic across the US.[10] The US Government Accountability Office issued 400 recommendations to improve the government's response to future pandemics, where congress has acted upon almost half of them.[11] Accordingly, there were five areas of improvement, including establishing a bio-surveillance network for real-time data on infectious diseases, improving fraud detection to make sure the funds are well handled, acknowledging the disproportionate impact of outbreaks on populations and making sure such disparities are addressed in the pandemic taskforce, ensuring there is no logistical or retaliatory delay in funds delivery especially for unemployment assistance, and establishing measures to mitigate the impact of the pandemic on the economy and promote



faster recovery.[11,12] After the end of the pandemic, several states increased their public health funding to support their local health departments. Notably, Missouri's FY25 budget provides $3.5 million to help alleviate healthcare staffing shortages.[10]

While pushing for improved pandemic response, it is important to be cognizant of how increased government involvement often inadvertently increases agenda-based political involvement. The politicization of the COVID-19 pandemic induced a dramatic increase in healthcare worker harassment, leading to both increased COVID-19 burden and healthcare sector harm due to workforce turnover. Moving forward, de-politicization is crucial. It can start with encouraging healthcare colleague networks and support, especially in response to conflict.[13] One step further, violence reporting systems and offering legal support would provide help. Perhaps the most effective is supporting Public Health Departments (PHDs) and long-term plans to ensure proper staffing and infrastructure availability.[13] It is also important to acknowledge the role of social media in such crises, and using its data for surveillance of misinformation and public perception to know where the problem and how the politicization waves are spreading.[14]

What Is the Impact of Misinformation Amidst a Deadly Pandemic, and How to Improve Healthy Information Spread?

Misinformation is simply the spread of false information, while disinformation carries the intent to mislead or manipulate.[15] While misinformation can spread by fear or misled good intention, disinformation can have political agendas, such as blaming marginalized populations, exacerbating political turmoil, decreasing trust in the government, financial gain or others.[15] The American Hospital Association states that up to 80% of people heard some false statement about COVID-19 in 2021.[16] This "infodemic," especially on social media, while a major barrier, can be a rich resource to identify the community concerns and to offer a portal for professionals and community leaders to act as messengers. Positive experiences from vaccines or healthcare worker interaction can be spread by word of mouth. Therefore, intentional messaging via trusted messengers can be key.[16] Active intervention to combat disinformation has been implemented, such as working with social media platforms to intervene against their spread.[17]

Also, collaboration between these platforms with news agencies, governments, public health sectors, researchers, medical professionals, and the public would ensure a nationwide response against such spread.[17] The World Health Organization (WHO) created a seven-step plan for governments to combat this problem centered around raising awareness, promoting critical reasoning and digital literacy programs, promoting up-to-date information spread by trusted voices or figures, supporting fact-checking technologies, working with cyber agencies and law enforcement against disinformation and identifying drivers of mistrust in populations.[15] Mistrust in the healthcare sector is also a major issue when it comes to misinformation. In a survey of 1,100 Missourians, 57% of respondents reported some form of unjust treatment based on race or ethnicity, highlighting the prevalence of provider bias.[18] Additionally, in a study conducted by the University of Missouri-Columbia, African American individuals expressed that they still find it hard to trust the government given its long history of unethical research practices. They mention that they face many hurdles to healthcare, such as lack of finances and modern-day racism. These factors ultimately contributed to hesitancy towards receiving the COVID-19 vaccine.[19]

Does Missouri Have What It Takes to Face Upcoming Pandemics Better?

Historically speaking, Missouri has what it takes to be a great force against future pandemics, and there is active work being done in preparedness for upcoming pandemics with lessons learned from COVID-19.[20] Updated October 2024, the Missouri's Pandemic Influenza Response Plan is a comprehensive document that tackles all major aspects discussed earlier that are crucial in any outbreak. The plan focuses on isolation, social distancing, hand hygiene, and vaccination as soon as it becomes available. This would be coupled with prioritizing concise communication between partners in local PHDs, state partners, and the federal government along with the CDC, emphasizing involving the public in preparations and following the National Incident Management System plan.[20]

The state defines six framework intervals: investigation of a strain, recognition, initiation of an outbreak, acceleration, deceleration, and preparation

for newer waves, with clear plans of action at each stage. It gives local and state authorities the first response, assuming the outbreak can start anywhere. All legal roles are defined, including surveillance, counseling, and communication between bodies. The plan mentions strengthening PHDs and providing training and federal funds, and combating misinformation through partnerships with community leaders, regular timely information release, and transparent communication. It also has protective measures against healthcare worker abuse.[20] Moreover, the Missouri Department of Health and Senior Services is working on preparing 150 county jails for an outbreak response,[21] while Saint Louis University continues researching protocols for improving prison conditions, after learning from COVID-19.[22]

The "Optimizing Missouri's Preparation for the Next Pandemic: Lessons Learned from COVID-19" does an outstanding job in discussing the events that occurred during the COVID-19 pandemic in Missouri, and the challenges faced. This commentary serves as a discussion of the several extremely important points raised, showing that there is still a lot to achieve. We are hopeful that this article will help in shedding light on how to better manage the next pandemic in the state of Missouri.

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Editor's Note

Dr. McKinsey et al. agree with this critique and have no additional comments. **MM**

As WE See It

Challenges in Objectively Assessing Merit in the Modern World

by John B. Holds, MD

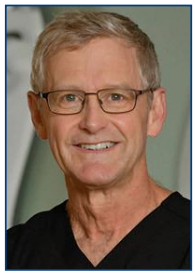
When I attended UT Southwestern Medical School in Dallas, Texas, (1979-1983), every class, rotation, and grade all four years was a numerical score. A 99 was better than a 98. Now the first three semesters are pass/fail, with the subsequent clinical rotations being graded on a five-point scale (fail to high honors). Speaking with a currently enrolled student, she notes that UTSW (unusually now) does maintain a numerical score for semesters two and three, along with the clerkship scores (only the first semester is a true pass/fail). Fortunately for this student who seeks to excel, UTSW also still has the Alpha Omega Alpha Honor Medical Society, which many schools have eliminated for equity reasons. A raft of presumably "elite" medical schools have chosen to not participate in AOA and/or not create a chapter because of racial equity concerns, and the perception that AOA status may benefit the chosen students in residency selection. There is a strong push from some academics to eliminate AOA from all schools, with calls to disaffiliate schools (see Mabeza and Isaacs online editorial).

UCLA school of medicine went hugely into a woke DEI approach in the student selection process, violating California law against such racial preferences, along with a revamped approach to medical education with a reduction in the preclinical curriculum from two years to one allowing time for research and community service (Siberarium). Student failures of shelf exams are 5% nationally but over ten times that for some subjects since 2020 at UCLA. Students are delaying taking their essential USMLE Step 2 exam with 20% of fourth year students not having taken Step 2 in January of their senior year, and 10% of students at that point not even having taken Step 1. From 2020-2023 UCLA's standing amongst US medical schools has plummeted from sixth to eighteenth position in the US News and World Reports rankings.

As a physician who is the program director for a competitive two-year fellowship training program in oculoplastic surgery, I find these efforts to remove objective criteria from the applications of physicians applying to my training program to be a vexing disservice to our program and the applicants. With a multitude of applicants with generally attractive applications, personal statements, curriculum vitae, and glowing recommendations, it is extremely challenging to find applicants who are most likely to excel.

More rather than less objective data is helpful in stratifying applicants. The paper by Catalano and Jenkins demonstrated that the USMLE Step 1 score was the only objective correlate with residency success in delivery of quality of care. In 2021 the decision was made to transition the result of the USMLE Step 1 examination from a granular score that precisely ranked students' performance to a pass/fail only exam beginning January 26, 2022. Our only objective correlate of success has been eliminated in the name of equity or some similar goal.

Likewise, Johnson and co-authors demonstrated the correlation between National Board Step 1 and ophthalmology in-service OKAP scores and pass rate on success in passing the ophthalmology board examination. Loss of objective numbers is a problem to me as a fellowship program director as I have lost a very important objective number with USMLE Step 1 going to pass/fail. I think it is also a problem



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As WE See It

I Have to Say Not Every Student Deserves an A

by Jonathan Tovey, MD

The excellent article about grade inflation (Missouri Medicine March/April 2025) and the failures of the current university education system is painfully insightful. It is fascinating and disturbing that many colleges presently do not require SAT or ACT scores as part of the application process. I am not alone in wondering how admission committees are able to ascertain the ability of an applicant to handle the rigors of college academics.

I feel that the field of medicine should attract the brightest, and most inquisitive minds in the hardest working, most compassionate individuals. Standardized competitive grading is essential to identify the most qualified aspiring physicians from the run-of-the-mill crowd who are less qualified and who have not demonstrated the superior scholarship so essential to physicians. This includes tasks like memorizing thousands of facts, multi-tasking, showing up daily with a positive attitude to round on patients at the crack of dawn, and a slew of other related activities.

With baseball season upon us, allow me to use an analogy from the baseball diamond. Imagine if each professional baseball player was awarded a .300 batting average regardless of their true batting average. It sounds preposterous to group players with a .168 batting average with the likes of Ty Cobb with a career batting average of .366. The same can be said of grades in college. As aspiring physicians, we worked our tails off in college to get into medical school, residency, and fellowship. It did not end there as we continue to work hard to stay up to date with the newest technologies and developments in our respective disciplines.

Higher education in the United States should retain objective metrics such as standardized testing, making the average grade a C and not a fluffy A- as it stands currently. **MM**



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for the medical system with the consistent efforts to delegitimize and minimize merit from medical education, training, and practice. Historical and common-sense support for these efforts to deobjectify and remove academic merit from training selection is lacking, and a truly beneficent approach to healthcare requires us to do our best to do good. In that regards, doing everything we can to encourage training excellence for physicians seems like an obvious goal.

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Disclosure

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My Professional Journey

by Richard Hellman, MD

At the end of the day, it is not the public adulation that matters, it is the private satisfaction of knowing of the lives you have affected in a positive way.

I was born in January 1943 in the Bronx. I spent my first 12 years in the South Bronx, not the worst section, but hardly the safest. My parents both were working full-time. I changed schools, and after testing, was placed in the third grade at age six. Later, I skipped another grade and entered ninth grade at age 11. This was both good and bad. I was an omnivorous reader from a very early age and school became more interesting. On the other hand, always being the youngest in your class often meant you were the smallest and the easiest target. I quickly learned how to duck, pivot, and run for my life.

I was accepted into the Bronx High School of Science and was looking forward to starting tenth grade there, but my father got a promotion. We moved to a nearby suburb and I attended high school there.

Later that year, I saw a dermatologist for a minor problem, who told me about his love of the practice of medicine. Even at age 81 he still hoped to continue at his craft, and would gladly do it for free if he thought people would still value his work. I never forgot our conversation.



Richard Hellman, MD, is a retired endocrinologist. He has held many leadership positions including President of the Kansas City Medical Society and the American Association of Clinical Endocrinologists.

My parents expected me to become a mathematician. However, medicine began to intrigue me. I wanted to learn how the body worked or why it failed. I became interested in why people did what they did, and how the mind worked.

With the financial aid of two scholarships, I began at New York University. My parents did not want me to leave home (age 15), and so I commuted to the NYU campus in the Bronx. I became a math major.

In my junior year, my math professors enrolled me in the Courant Institute, arguably the best graduate school for applied mathematics in the US. The math was presented in a very dry, fast paced manner. Many of the attendees were much older and distant. As a 17-year-old, I had little in common with them. I saw the life of a mathematician as solitary and isolated.

What I enjoyed most was being with people, helping others, and doing something based in good science. I was fascinated by biochemistry and neuroscience. I thought that I would be happier and feel more fulfilled as a physician. I told my parents that I decided to go to medical school. My father was shocked, my mother was elated. I would be the first doctor in the family. Fortunately for me, the lack of pre-requisites such as biology or biochemistry was offset by my MCAT scores. An early acceptance to Chicago Medical School started me on my journey. Medical school in Chicago passed quickly.

My first two years post-graduate at the University of Kansas were excellent. I decided to specialize in endocrinology and diabetes. In 1968, the mortality statistics were grim, particularly for type 1 diabetes.

In August 1968 I went on active duty in the Air Force and was sent to Texas. Five months later, I was reassigned to an isolated duty base in northernmost Japan, on Wakkanai Air Station, 26 miles from the Russian island of Sakhalin.

It was an adventure—300 inches of snow fell the first winter. The base had no aircraft. Some of our personnel spoke fluent Russian. I was given a high-level security clearance so that our personnel could speak to me. The city of Wakkanai had a short, unlit airstrip, in which our civilian (Air America) contract pilots flew planes in three times weekly. The landings were often perilous.



Dr. Hellman was stationed on an isolated duty base in northernmost Japan—Wakkanai Air Station—26 miles from the Russian island of Sakhalin.

My two years on this base, often the only physician for over 800 people including dependents, passed quickly. Emergencies were common. I learned skills that I would never use again. I learned to take responsibility for life and death decisions, to be careful, analytical and thorough, while timely. On an isolated base, with frequently hazardous weather conditions, calling in an air evacuation plane was far from routine. When the flight officer tells you their odds of crashing the rescue aircraft is greater than 30%, there is no room for error.



During his years at the UMKC School of Medicine, Dr. Hellman particpated as a docent.

During my stay overseas, I was offered a promotion to Major. I had already decided to return to the University of Kansas for endocrinology. With some regrets, I declined the promotion and received an honorable discharge in December 1970.

Both the rest of the residency training at Kansas and the fellowship that followed were excellent. I was anxious to pursue a career in academic medicine and accepted a position at UMKC School of Medicine and spent the next eight years there.

In 1972, still in my fellowship, I volunteered at the Westport Free Health Clinic, a fledgling clinic, six months in existence. I volunteered weekly over the next decade. The clinic is known today as KC-Care.

The best part of my experience at the UMKC School of Medicine was the interaction with the students. As their youngest docent, I shared in the vision of mentoring students during the last four years of their six-year curriculum while teaching and counseling them.

By 1978 diabetes care in Europe was yielding much better outcomes than in the US. UMKC was not interested in a new comprehensive diabetes program. With the support of my Chairman, Robert Conn, MD, I decided to leave UMKC, and start a new diabetes program elsewhere. In October 1981, I founded and directed the Midwest Diabetes Referral Center at Baptist Memorial Hospital.

The initial faculty included me, a clinical nurse and a masters level nurse, a dietician, and a clinical psychologist. We had a dedicated inpatient unit of eight beds, and within a year, it became very successful. I planned to provide meaningful data to document the outcomes we had achieved.

When I began our independent practice I was referred many patients who, I was warned, were "difficult," or "non-compliant," or simply "bad patients." I understood the frustration of the referring physicians, and I thought a more indirect approach might be useful. In the initial visit, I listened to the patient's point of view, their history, even their origins. They told me of lost jobs, lost love, lost homes, of chaos, betrayal, violence, and of severe abuse. Many patients had depression, anxiety, and diabetes-related distress. PTSD was all too common. I was very glad that an experienced clinical psychologist was part of our team. Very often, over time, the patients became much better in their self-care behaviors.

For the first seven years, I was the only endocrinologist, with frequent 16-hour days, and

constant call. In 1989, Howard Rosen, MD, joined the practice. He had just finished his fellowship at University of Michigan and I became his mentor. He was wonderful to work with, very smart, kind, intellectually honest, and became my colleague, my partner, an outstanding endocrinologist, and a dear friend.

We had moved the practice to Trinity Lutheran Hospital in 1986. In 1993 we moved our practice to the North Kansas City Hospital campus. Since we provided both inpatient and outpatient care, we chose practice locations at our preferred hospital. We stayed on the NKC hospital campus until 2022.

In June 1993, the results of the Diabetes Control and Complications Trial (DCCT) were reported at the American Diabetes Association (ADA) Annual Scientific Sessions. The DCCT trial was a multi-center trial which proved that intensive glycemic control lowered microvascular complications in Type I diabetes. As we sat in the great hall in Las Vegas, the chief scientific officer of the ADA opined that these results could not possibly be duplicated outside of a university setting and was unlikely to apply to type 2 diabetes. He was wrong! We knew because we had the data. We decided to publish our findings as soon as possible. It took us much of our free time in the next three years, working from 8:00 p.m. to 2:00 a.m. many nights after a long day of patient care. I could not have finished our work without the help and support of my life partner and wife, Julie, who was also our head nurse and lead research assistant.

Our study, a prospective cohort study with co-morbidity stratification, was the first to show that, over a 15-year period, intensive glycemic control, when combined with a focus on cholesterol reduction, blood pressure control, and error reduction, resulted in a 22% overall reduction in mortality in both Type 1 and Type 2 diabetes and in those with baseline mortality risk of 20% over 15 years, a 45% reduction in mortality as well as a significant reduction in renal failure.

In 1996, we presented our work at the International Congress of Endocrinology and the ADA. Our work was published as the lead cover article of the flagship ADA journal, *Diabetes Care*, in March 1997. It received international attention. I was invited to Australia to present our data there, and in June, at the national conference of the ADA at their first ever symposium on diabetes outcomes, and also, in a plenary lecture at the American Association of Clinical Endocrinologists (AACE). The American Medical Association (AMA) was developing a national program to help improve the quality of medical care, the Performance Measure Advisory Committee (PMAC). Their co-chair, Josie Williams, MD, had read our paper and wanted me to be a part of their effort. I quickly accepted their offer.



Dr. Hellman worked 16 years for the AMA's Physicians Consortium for Performance Improvement.

Although our practice was busy, I began doing more in the few hours left in the day. We participated in several research studies involving implantable insulin pumps and glucose sensors among others.

In 1999, I was nominated for a leadership position at AACE. Then, in 2000, the AMA convened the Physicians Consortium for Performance Improvement (PCPI), an organization that ultimately involved 74 national medical specialty societies and 14 medical boards focused on the development of performance measures for physicians. I was nominated by both AACE and the Endocrine Society for an at-large position and re-elected multiple times. I became the Vice-Chair of the organization in 2013. The PCPI created two-thirds of the performance measures used by Medicare. I enjoyed working on projects with physicians from many specialties during the 16 years with PCPI.

In the earlier years of the PCPI, the enthusiasm and camaraderie was widespread. There was much to be gained by working together on a project that

could improve the care of patients throughout the US. Unfortunately, in later years, the power of the organizations that wanted to bend health care to their will greatly limited the value of the measures to practicing physicians.

The year 2000 was a very busy year for me. I was President of the Metropolitan Medical Society of Greater Kansas City. We crossed swords with Blue Cross of Kansas City, who had sent a contract to physicians that was grossly unfair. I led a very successful effort to improve the contract. Our success was highlighted by the AMA. I was asked to speak at their national leadership conference soon thereafter.



In 2017, when the Kansas and Missouri metropolitan medical societies merged, Dr. Hellman received their first joint award for Lifetime Achievement Award.

I was then invited to write scientific articles based on our outcomes studies and our work on patient safety.

The head of the WHO section on psychiatry soon asked me to join an international panel on depression and diabetes. I continued to work with them over six years. In 2009, I gave a talk on diabetes and depression at the Chinese Society of Endocrinology. Two years later, I gave a similar talk at the Research Society for the Study of Diabetes in India as the Chief Guest.

The practice of medicine is a high risk, high reward endeavor, in large part because we humans are a remarkable, but fallible species. We all are capable of making mistakes, and I have certainly made my share. We need to make systems that keep us from inadvertently injuring others while delivering health care, and keeping patients from self-injury. The keys are education, system design, and checking our own work.

I first presented our analysis of the disproportionate role medical errors made in worsening diabetes outcomes at the President's Poster Session at the American Diabetes Association in 1997. I hope that my contributions to the literature on patient safety and diabetes care have been useful. My own work was influenced greatly by the works of both Professor James Reason, a British psychologist, and the Nobel Laureate, Daniel Kahneman, MD, whose ingenious experiments delineated how we make decisions, and why they are so often off the mark.

In our practice, we encouraged our staff to tell us if they thought an error in care was either occurring or imminent. Our practice was multidisciplinary with clinical endocrinologists, nurse practitioners, physician assistants, certified diabetes educators, nurses, medical assistants and a clinical psychologist. Team work was essential. Creating a "culture of safety" made our practice more cohesive.

A once weekly lecture that I gave in our classroom was part of our education plan for the entire clinical team. Working with my good friend, Dean Betty Drees, MD, we began the UMKC Endocrine Fellowship Program. In the first two years of the program 30% of the education was in our practice setting. We also provided a one-month rotation for the pediatric year three fellows in endocrinology at Children's Mercy Hospital.

During the time I was president-elect and president of my national specialty society. I traveled 275,000 miles over a 24-month period. It was grueling.

However, nearly every time I have accepted an offer to do something new, I have found it both educational and enjoyable. In 2013 an associate editor of *Diabetes Care* sent me a manuscript to review concerning diabetes and neuroscience. I was surprised that I, a clinician in private practice, was asked to do this review. Soon I received more manuscripts of the same genre. The following year, I received a notice from the ADA that out of more than a thousand reviewers, each year they select 12 to be distinguished reviewers, and I was one. The

letter stated that they would be happy to inform my dean or tenure committee of this honor so they would consider that for my promotion. The list was rank ordered and I was third. During the next two years I wrote many reviews. I also received Distinguished Reviewer awards in 2015 (fifth) and in 2016 (first). People often underestimate those of us who are non-academic clinicians. There are many gifted physicians everywhere I look, and no area of medicine has a lack of talent.

A word about awards. Along the way I have received a number of awards, all of which I cherish, but each have touched me in very different ways. The three awards from ADA, were for performance only. They were only interested in how well I reviewed manuscripts. Being elected to memberships in AOA, the medical honor society, and Sigma Xi, the scientific research honor society, were very meaningful to me since I was joining societies which included many people who I admired and whose accomplishments dwarfed what little I had done. I felt part of a moving stream of physicians and scientists, always striving to improve the world.

Although I also appreciated my medical school awarding me a Distinguished Alumnus Award, and the Outstanding Clinical Endocrinologist Award from AACE, the most meaningful awards to me were two others. One was from the students of the first graduating class at UMKC. The other, in 2017, when the Kansas and Missouri metropolitan medical societies merged, I received their first joint award for Lifetime Achievement. Their meeting was held at Kansas University Medical Center. As I looked out at the audience and I saw my colleagues, former students, mentors and so many other good friends, I knew that what I had accomplished would not have been possible without the help and support not just of those I worked closely with, but many others.

The last years of practice, before I retired, were in many ways the most difficult. Between March of 2020 and the end of our practice, COVID-19 dominated the world's health. Humankind was the worse for it. When COVID-19 became a pandemic, I was determined not to close the practice or abandon our patients.

During the pandemic, complicating everything was the polarization created by anti-science groups. Several patients with diabetes whom I had cared for many years reviled masking, refused vaccination, caught COVID-19 and died. A few patients asked why I was not on board treating COVID-19 with either ivermectin or hydroxychloroquine. In their eyes, Dr. Fauci was the devil.

By 2022 the pandemic had taken 1.3 million Americans. Social media has enormous power to mislead and confuse a less sophisticated and frequently gullible public.

Closing our practice was difficult. Ending a practice of 41 years, leaving thousands of loyal patients, and ending enjoyable and fulfilling work was painful. The power of the insurance companies was growing, costs of running an independent practice were rising, reimbursement was shrinking, and the care for our patients was being interfered with. It was the right decision at the right time.

As I look back at my career, I am happy with the path I took. I am most grateful to the many patients, both those with diabetes and those with other endocrine disorders, who have put their trust in me all those years. I value long relationships, both in my personal life, and in my practice. One of the hardest moments came in saying goodbye to those patients with whom I have shared many years together. Some of those have been patients of mine since the beginning of the practice 41 years ago, still functionally intact after many years with Type 1 diabetes.

An advantage of independent practice is that giving care to those who cannot pay is your decision alone. I think often of one such patient, who I first met when he was 10 years old, living with his mother and sister in a car, homeless, and with Type 1 diabetes. We have cared for him since then, for decades without any payment. Today he is a father, employed, married, in his early 50s with good vision, no significant cardiac or renal disease, and excellent glycemic control.

Memories such as this give me great pleasure. At the end of the day, it is not the public adulation that matters, it is the private satisfaction of knowing of the lives you have affected in a positive way. In that, I can share that feeling with all of my colleagues. I am immensely grateful to all who have helped me throughout my career, too many, really to thank publicly but all deeply appreciated. **MM**

CORRESPONDENCE

Whooping Cough: A Rising Risk for All Ages

As a physician who grew up in Bangladesh, I have witnessed firsthand the devastating impact of pertussis, commonly known as whooping cough, a highly contagious respiratory illness. In my childhood, I witnessed many relatives endure relentless coughing fits, with several young children succumbing due to a lack of access to vaccination and health literacy on the critical role of vaccines in preventing pertussis.

Pertussis, or whooping cough, is a highly contagious respiratory disease caused by the bacterium *Bordetella pertussis*. The large-scale outbreaks seen across continents over the past two years serve as a reminder that pertussis remains one of the least well-controlled vaccine-preventable diseases, despite extensive immunization efforts.[1,2] Recent epidemiological data indicate a troubling resurgence of cases among adolescents and adults, who now act as key reservoirs for *Bordetella pertussis* transmission.[1,2]

An insightful editorial by John Hagan, III, MD, in the *Missouri Medicine* January/February 2025 issue highlights the alarming resurgence of pertussis, particularly in adults.[3] This trend increases the risk of infection among unimmunized or partially protected infants, a particularly vulnerable group facing an elevated likelihood of severe illness, life-threatening complications, and mortality.

The emergence of *Bordetella pertussis* resistance to macrolides, the first-line treatment for pertussis, has raised concerns.[2] While macrolides like azithromycin are effective when administered early, their primary role later in infection is reducing transmission. This resistance, likely linked to local antibiotic use, does not affect vaccine efficacy but hampers infection control, particularly in the absence of booster vaccinations and persistent reservoirs of infection.[2]

School-age children and adolescents have the highest pertussis circulation and act as key transmitters to unvaccinated infants despite their lower risk of severe disease.[1,2] Vaccine-induced immunity wanes after four to12 years, requiring a Tdap booster every 10 years per CDC guidelines.[4] Early infant protection, booster doses in preschoolers and adolescents, and maternal vaccination have been shown to reduce morbidity and mortality in young infants.[1,2] However, vaccination coverage among US kindergartners declined for all reported vaccines during the 2023-2024 school year, compared to the previous year, with rates ranging from 92.3% for diphtheria, tetanus, and acellular pertussis (DTaP) to 92.7% for measles, mumps, and rubella (MMR).[5] Coverage for MMR, DTaP, poliovirus (polio), and varicella (VAR) vaccines decreased in more than 30 states, reflecting a concerning trend in declining immunization rates.[5]

As highlighted in the editorial by Dr. Hagan, the increasing number of adult pertussis cases underscores the urgent need for booster vaccinations to maintain immunity.[3] To effectively prevent pertussis, an evidence-based approach is needed to strengthen timely maternal and infant vaccinations, enhance public education, and advance research for vaccines with longer-lasting immunity.

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Howard A. Rusk, MD: The Missouri Physician Who Is Considered the Father of Rehabilitative Medicine

by Arthur H. Gale, MD

Howard Rusk, MD, considered the father of rehabilitative medicine, was born, raised, educated, and practiced in Missouri.

Rusk was born in Brookfield, Missouri in 1901, which Rusk wrote is a town "which is half way between Hannibal and St. Joseph- or half way between the worlds of Mark Twain and Jesse James." Rusk earned his bachelor's degree from the University of Missouri in 1923. He put himself through the University of Pennsylvania School of Medicine by working various jobs, including washing dishes in the laboratory, serving as a night orderly at a county hospital and assisting in a colony for mentally and physically disabled patients. He also gave blood for transfusions every six weeks.[1]



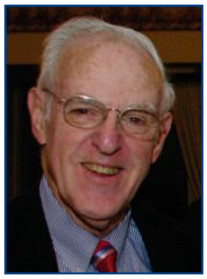
Rusk lived his life by the motto with which he ended his 1972 autobiography: "To believe in rehabilitation is to believe in humanity."

Rusk interned at St. Luke's Hospital in St. Louis where his salary was $25.00 per month. He spent his early years practicing internal medicine in St. Louis and teaching at Washington University School of Medicine.

During World War II Rusk was too old to be drafted but he nevertheless felt he should do his duty and he volunteered for the US Army Air Force, now called the US Air Force. He was appointed chief of medical services at the 1,000-bed hospital at Jefferson Barracks in St. Louis. It was at Jefferson Barracks that Rusk developed an interest in rehabilitation. He noted that wounded and disabled servicemen were left to "simply lie around, getting custodial care, with nothing to do, bored to distraction, helpless, hopeless, waiting for some infectious disease to carry them off."[2]

Rusk believed these soldiers could be rehabilitated. He developed programs consisting not only of physical therapy but improvement in mental health and also vocational training. Rusk's program was quickly adopted by each branch of the military. When the war ended Rusk wanted to continue to help the disabled. There were members of the medical community who thought he was wasting his time and called Rusk's work "a social service boondoggle."[3]

Rusk then practiced on the East Coast. He received support from a few wealthy and influential individuals. They established the Institute of Physical Medicine and Rehabilitation at New York University, now known as the Howard A. Rusk Institute of Rehabilitative



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Medicine. Rusk also established the first medical training program for medical professionals who wanted to go into rehabilitative work. He also wrote a weekly medical column in the New York Times that dealt with health, medical and rehabilitation issues.

Rusk headed a group of physicians who were sent to Vietnam by President Lyndon Johnson. He concluded that napalm caused only a negligible number of civilian casualties. Most burns were caused by improper use of gasoline use for cooking or illumination.[4]

He served as president of the World Rehabilitation Fund from 1955 until 1982. Through the fund, the Institute has drawn up programs for professionals in 150 countries and has trained more than 6,000 doctors, psychologists, and other specialists in advanced rehabilitation techniques. In addition, as a result of the fund's efforts, millions of people have been fitted with artificial limbs and braces.

Rusk received many honorary degrees including from the University of Missouri and in 1974 the University of Missouri named its rehabilitation institute after Rusk. Rusk was honored in a score of other institutions in the US and abroad. He won three Albert Lasker Awards for his work in the public health field, the Distinguished Service Medal, the French Legion of Honor, and numerous other awards.

The Howard A. Rusk Respiratory Center at Goldwater Memorial Hospital on Roosevelt Island in New York was named in his honor as was a professorship at New York University, the Howard A. Rusk Chair in Rehabilitative Research.[5]

Rusk died from complications of a stroke in New York in 1989. He is buried in Rose Hill Cemetery in Brookfield, Missouri. As a result of his work amputees, paraplegics, stroke patients, and others found hope in rehabilitation medicine. Rusk lived by the credo in which he ended his 1972 autobiography: "To believe in rehabilitation is to believe in humanity."

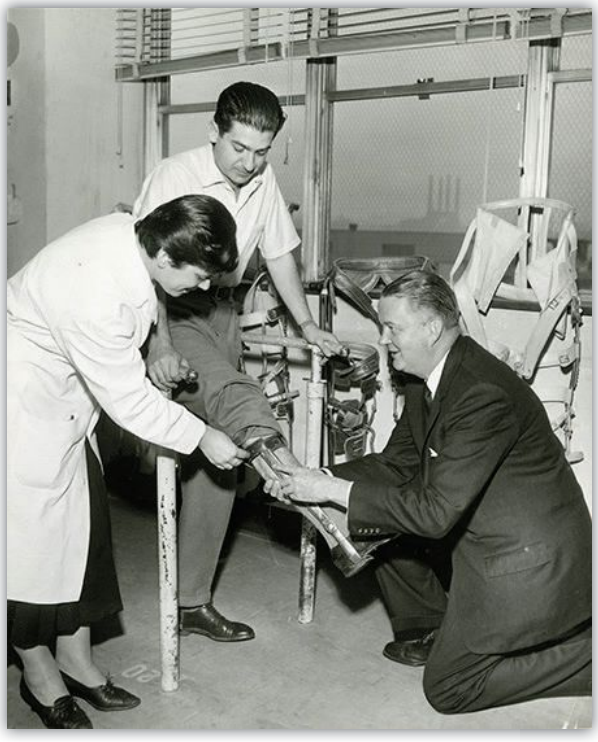
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Photo source: State Historical Society of Missouri **MM**



Dr. Rusk oversees a military rehabilitation program during World War II. He wanted patients to recover physically and mentally from their wounds and be well prepared to return to military duty and civilian life.

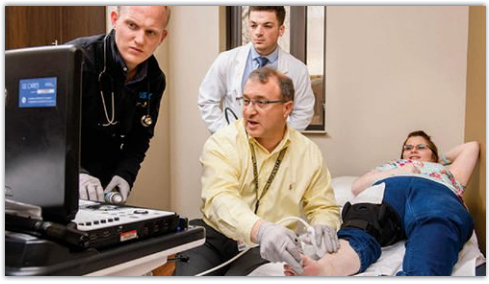


Dr. Rusk and a colleague examine a patient and his leg braces.

School of Medicine
University of Missouri

Physical Medicine and Rehabilitation Collaborates with All Disciplines

by Joseph E. Burris, MD





Greetings from the Department of Physical Medicine & Rehabilitation (PM&R) at the University of Missouri!

We continue to grow in our dynamic health system at MU Health Care with the pursuit of academic excellence in the University of Missouri School of Medicine. PM&R clinical care is advancing, growing programs with inpatient rehabilitation at Rusk Rehabilitation Hospital in our joint venture with Encompass Health, and extending our medical rehabilitation services to Capital Region Medical Center in Jefferson City.

Our PM&R physicians work in collaboration with physicians from all disciplines, particularly the Neurology and Neurosurgery teams with the level 1 Missouri Stroke Program, and the orthopedic and trauma teams with the level 1 Trauma Center.

At the Missouri Orthopedic Institute, our PM&R physicians work side by side with the Orthopedic specialists, particularly with spine and other musculoskeletal care.

Our Neuromuscular specialists provide care with multidisciplinary providers for the challenge of treatment of patients with neuromuscular diseases. We have incorporated our teams at the NextGen Precision Health Institute to develop world class translational research associated treatments for these patients with neuromuscular diseases.

Our roles as teachers for the MU School of Medicine helps produce tomorrow's physicians with a greater understanding of treatment for people with rehabilitation needs, and our residency program is recognized as a top tier training program for future physiatrists. Our faculty have taken system leadership roles including the MU School of Medicine in Columbia and Springfield campuses.

Thank you for the opportunity to share some of our knowledge with you from our faculty and resident physicians in this issue of *Missouri Medicine.*

Visit our website at https://medicine.missouri.edu/departments/physical-medicine-and-rehabilitation. **MM**



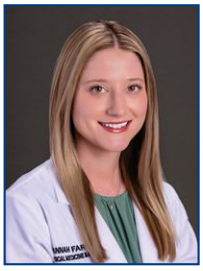
Joseph E. Burris, MD, is Professor and Chair of Physical Medicine and Rehabilitation; Encompass Health Chair in Physical Medicine and Rehabilitation, University of Missouri-Columbia School of Medicine, University of Missouri Health Care; Medical Director, Rusk Rehabilitation Hospital, an affiliation of Encompass Health and MU Health Care, Columbia, Missouri, USA.

Stroke and Spasticity: Identifying Risk Factors and Optimizing Patient Function

by Bryan Wacker, DO & Hannah Farmer, DO

School of Medicine
University of Missouri

Overall, one out of five people living in Missouri have at least one major risk factor for stroke.



Bryan Wacker, DO, is a Resident Physician in the Department of Physical Medicine and Rehabilitation at the University of Missouri-Columbia, Columbia, Missouri, USA. Hannah Farmer, DO, (pictured), is an Assistant Professor of Physical Medicine and Rehabilitation at the University of Missouri-Columbia, Columbia, Missouri, USA.

Abstract

In the United States, there are almost one million strokes per year creating a significant burden on the healthcare system. With risk factors and complications of strokes being numerous, it is no surprise it takes a multidisciplinary team to treat and manage this mosaic disease process. Physical Medicine and Rehabilitation physicians (physiatrists) play a large role in management of post-stroke complications and aim to optimize and return the patients to their functional baseline. One specific complication well known to physiatrists is post-stroke spasticity. This article looks to shed light on the stroke burden in Missouri and how physiatrists contribute to post-stroke care with a highlight on spasticity management.

Stroke Epidemiology

In the United States, there are on average 800,000 strokes every year with 600,000 of them being first-time strokes. The remaining 200,000 are classified as strokes occurring in patients with a prior history. Of these, 87% are ischemic, 10% are hemorrhagic, and 3% are subarachnoid hemorrhage. Globally, 62% are classified as ischemic, 28% hemorrhagic, and 10% classified as subarachnoid hemorrhages. Overall, stroke is the second most common cause of death and disability in the world.[1]

Risk Factors for Stroke

The average person has a 25% lifetime risk of stroke. Stroke risk factors can be categorized as modifiable and unmodifiable. The most important modifiable risk factor is high blood pressure. Studies have shown that people who are able to keep their systolic blood pressure less than 130mmHg can decrease their stroke risk by 20% and intracerebral hemorrhage risk by 67%. Other modifiable risk factors include high cholesterol, heart disease, diabetes, cigarette smoking, alcohol use, and atrial fibrillation. Patients with diabetes are twice as likely to have a stroke than nondiabetics. Cigarette smokers have two to four times higher risk of stroke than non-smokers. Finally, patients who consume greater than seven drinks a day are close to three times more likely to develop a stroke than non-drinkers. Nonmodifiable risk factors include older age, sex (with males more likely than females to have a stroke), race (African Americans are two times more likely to have a stroke than Caucasians and Asians), and family history of stroke.[2]

Missouri Stroke Statistics

So what about the Show Me State? According to the most recent Missouri Department of Health and Senior Services Public Health Information Management System (MOPHIMS) data, stroke was the sixth leading cause of death in Missouri in 2022. Compared to other states, Missouri ranked 26th with stroke deaths totaling 3,153 in 2022. In 2016, 33.8% of people living in Missouri had a diagnosis of high blood pressure, 35.3% had a diagnosis of high cholesterol, 11.1% were diabetic, and 22.0% reported being smokers. In 2020, 4.8% of Missourians had a diagnosis of heart disease with 8.6% being over the age 65. Overall, one out of five people living in Missouri have at least one major risk factor for stroke (Figure 1).[3]

Figure 1

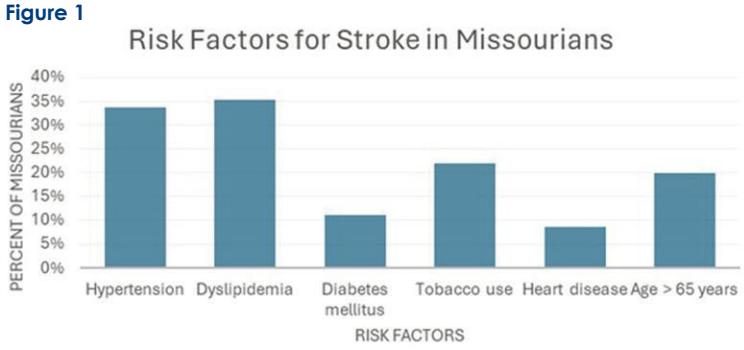


Figure 2

MAS Score	Description
0	No increase in muscle tone
1	Slight increase in muscle tone manifested by a catch and release or by minimal resistance at the end of the range of motion when the affected part(s) is moved in flexion or extension
1+	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance throughout the remainder (less than half) of the range of motion
2	More marked increase in muscle tone through most of the range of motion, but affected part(s) easily flexed
3	Considerable increase in tone, passive movement difficult
4	Affected part(s) rigid in flexion or extension

Impact of Stroke on Human Function

If these individuals suffer a stroke with impairments affecting activities of daily living (ADLs), many are referred to inpatient or outpatient physical medicine and rehabilitation (PM&R) physicians, also known as physiatrists.

In the realm of stroke rehabilitation, the specialty of PM&R is aimed towards improving the functional deficits triggered by the physical, medical, and cognitive impairments brought on by a patient's stroke. These impairments can involve anything from classic extremity weakness, gait abnormalities, and coordination issues, to visual impairments, sensory deficits, dysphagia, speech/language impairment, bladder or bowel dysfunction, and others. One impairment that is less well-known, but a cornerstone of our specialty, is the management of spasticity.

Spasticity can be simply described as the resistance of a muscle to stretch or passive elongation. Specifically, this resistance is what we call "velocity dependent" where exaggerated or increased stretch of the muscle leads to increased tone or tightness.[2] A commonly utilized scale to grade spasticity is the Modified Ashworth Scale (Figure 2).[4]

The prevalence of poststroke spasticity is still being debated with some studies reporting numbers as low as 19% and as high as 92% of stroke survivors. One study found a prevalence of spasticity in 25% of stroke survivors at six days, 27% at six weeks, and 22% at 16 weeks. There does seem to be a consensus that almost all patients who develop spasticity will have done so within the first six weeks of their stroke.[5]

It should be noted that spasticity is not

Figure 3

MODALITY	TYPE	ADVANTAGES	DISADVANTAGES	WHEN TO CONSIDER
Physical	• Stretching • Range of motion exercises • Bracing	• Low cost • Can be performed at home	• Must be performed frequently • Physical impairments may limit patient's ability to perform independently	• First line treatment • Ideally utilized early and throughout treatment course
Oral medications	• Baclofen • Tizanidine • Diazepam • Dantrolene • Cyproheptadine	• Low cost • Dose can be titrated	• CNS depression side effects (sedation, confusion, dizziness, lightheadedness, etc.) • Must consider drug-drug interactions • Lab monitoring (i.e. LFTs for dantrolene)	• First line treatment • Can be initiated in the acute or chronic setting • Widespread spasticity
Neurotoxins	• OnabotulinumtoxinA (Botox) • AbobotulinumtoxinA (Dysport) • IncobotulinumtoxinA (Xeomin)	• Targeted management of spastic muscles • Duration of effect 3-4 months • Does not cause CNS depression	• High cost • Associated injection risks (pain, bleeding, infection, etc.) • In office procedure every 3 months • Peak effect at 2-3 weeks • May take several cycles to identify most effective treatment strategy	• Can be first line treatment for focal spasticity • Spasticity interfering with function, ADLs, or causing pain • Failure to control spasticity with oral or physical agents
Chemical neurolysis	• Alcohol • Phenol	• Immediate effect • Duration of effect several months	• Can be technically challenging procedure • Can result in paresthesia if mixed or sensory nerve targeted	• Severe spasticity interfering with function, ADLs, and/or hygiene • Difficulty making frequent office visits
Intrathecal delivery	• Intrathecal baclofen	• Programmable delivery system • Significantly reduced systemic effects • Good effect on lower extremity spasticity • Can be utilized in conjunction with all therapies listed above	• Surgical procedure • Requires frequent office visits for adjustments and refills • Limited effect on upper extremity spasticity • Pump/catheter failure can result in life-threatening withdrawal	• Severe lower extremity spasticity interfering with function, ADLs, and/or hygiene • Patients requiring high dose of neurotoxin • Inability to tolerate CNS effects of oral medications

related solely to strokes. Patients with cerebral palsy, traumatic brain injury, anoxic brain injury, multiple sclerosis, neurodegenerative disease, and spinal cord injury can all suffer from a wide degree of spasticity.

How Does Spasticity Present After Stroke?

The classic example of spastic hemiparesis after stroke is one in which the upper extremity is in a flexed pattern and the lower extremity is in an extended pattern. This typically presents with shoulder adduction and internal rotation, elbow flexion, forearm pronation, wrist flexion, and finger flexion in the upper extremity and hip extension, knee extension, and ankle plantar flexion in the lower extremity. Specific patterns of spasticity include thumb in palm, clenched fist, and equinovarus (ankle plantarflexed and foot inverted).

Why Treat Spasticity?

For stroke survivors with spasticity, health care costs are four times higher than those without spasticity.[6] Physiatrists can help determine which patients with spasticity would benefit from intervention. Complications from spasticity include, but are not limited to, pain, decreased joint range of motion leading to joint stiffness and contracture (fixed position of a joint), and pressure injuries and wounds as a result of impaired hygiene. Spasticity can also interfere with one's ability to perform activities of daily living such as dressing, grooming, and bathing, which has implications on functional independence. When spasticity affects the lower extremity, such as in spastic hemiparesis, the ability to walk with a normal gait pattern is impaired, leading to increased risk for falls and increased energy expenditure.

How to Treat Spasticity

The foundation of treatment for post-stroke spasticity is therapy, which includes stretching, range of motion exercises, and strengthening. Building upon this foundation, we can utilize additional therapeutic interventions to improve a patient's function. Medications that help relax spastic muscles include baclofen, tizanidine, and diazepam. Patients affected by stroke may have poor tolerance to such medications, however, due to their central nervous system side effects.[6] Botulinum toxin injections can be performed to address specific muscles involved in spasticity and reduce unwanted systemic side

effects. The botulinum toxin molecule binds the presynaptic cholinergic nerve terminals and blocks the release of acetylcholine into the neuromuscular junction, preventing muscle contraction.[6] Patients may experience improvement in their spasticity for three to four months following botulinum toxin injections. Targeted chemical neurolysis with either alcohol or phenol can be performed on nerves innervating spastic muscles. With this procedure, the effect is usually fast acting and can last for several months.[6] Intrathecal baclofen therapy can be considered in stroke survivors whose spasticity has not responded adequately to the above-mentioned interventions.[6] A programmable pump infuses baclofen within the intrathecal space, allowing a small concentration of the drug to exert a therapeutic effect. If such therapy is considered, a multidisciplinary team including physiatry, neurosurgery, and primary care should be assembled to address risks and benefits for the patient (Figure 3).

Future of Spasticity Treatment in Missouri

While still in the trial phase, percutaneous cryoneurolysis with electrical stimulation and/or ultrasound guidance has been recently introduced for the management of spasticity. This procedure utilizes a specialized probe that produces an ice ball that freezes rapidly to temperatures ranging from minus 60 to minus 88 degrees Celsius.[7] This results in Wallerian degeneration of the target nerve but spares the surrounding tissues as these freeze at a lower temperature. Adverse events of this procedure are described as mild, with dysesthesia being the most commonly reported.[8] Although not widely available in our state, transcranial magnetic stimulation and transcranial direct current stimulation are potential treatments for spasticity to watch out for in the future.[9]

When to Refer to PM&R?

Identifying spasticity may not be straightforward, and physiatrists welcome an opportunity to help our referring colleagues. The following are questions you can ask your patients affected by stroke to determine if they are experiencing spasticity:

1. Do your muscles feel tight?
2. Do you have muscle spasms or cramps?
3. Have you noticed your arm (or hand, leg, foot, etc.) tends to prefer certain positions and, if so, is it hard to get out of these positions?

If your patient answers yes to these questions, a referral to PM&R might be helpful. Furthermore, if your patient or their therapists express that they are not experiencing expected functional gains with therapy, a physiatrist can help identify factors, such as spasticity, that may be contributing.

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Disclosure

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Navigating Low Back Pain: A Multidisciplinary Approach to Diagnosis, Management, and Education

by Zacharie Finneman, DO, Connor Swartz, DO & Mark Drymalski, MD

School of Medicine
University of Missouri

Non-operative spine clinics play a crucial role in providing coordinated, multidisciplinary care to improve outcomes and reduce unnecessary procedures for low back pain.



Zacharie Finneman, DO, and Connor Swartz, DO, are residents in the Department of Physical Medicine & Rehabilitation at the University of Missouri-Columbia, Columbia, Missouri, USA. Mark Drymalski, MD, (pictured), is an Associate Professor of Physical Medicine & Rehabilitation at the University of Missouri-Columbia, Columbia, Missouri, USA.

Abstract

Low back pain (LBP) is a leading cause of disability globally, with substantial socioeconomic impacts, including reduced productivity and increased healthcare costs. Most LBP cases are nonspecific and benign, but a thorough assessment is necessary to rule out serious underlying conditions such as infections, tumors, and fractures. This article reviews common etiologies, including mechanical back pain, degenerative disc disease, and spinal stenosis, and discusses both urgent and nonurgent spinal pathologies. Emphasis is placed on the role of non-operative spine clinics, which coordinate multidisciplinary care to improve outcomes and reduce unnecessary interventions and imaging. Conservative management for acute and chronic non-specific LBP focuses on patient education, exercise, and physical therapy. Evidence suggests that early education on spinal health and appropriate care pathways can significantly reduce surgery rates, enhance patient satisfaction, and improve long-term outcomes.

Introduction

Low back pain is one of the most common reasons for primary care and emergency department consultations. An estimated $200 billion is spent annually on managing low back pain. Work hours, productivity, and compensation are greatly reduced due to this condition.[1] Thus, low back pain has become a major target for quality improvement due to significant variations in clinicians' management, a high risk of chronicity, rising health care resource utilization, and its sizable socioeconomic burden.[2]

Most cases presenting with low back pain are benign, nonspecific back pain in which no specific cause or structure can be identified to account for the patient's perceived symptoms. Mechanical back pain, synonymous with nonspecific back pain, comprises 85-90% of cases, so healthcare providers can easily miss rare causes while focusing on common etiologies.[3,4] Focused assessment for red flag features (such as upper motor neuron signs and symptoms, unexplained weight loss, fevers, saddle anesthesia, bladder and bowel incontinence, and major motor weakness)[5] and a thorough

neurological examination is required in all patients presenting with low back pain.

Epidemiology

Two to three percent of visits to the ED in the United States (US) are for acute nontraumatic back pain.[6] Low back pain affects up to 85% of individuals in their lifetime in the US and is the leading cause of years lived with disability worldwide.[7,8,9] Studies show that up to 23% of adults worldwide suffer from chronic low back pain, with one-year recurrence rates reaching 24-80%.[10,11] The lifetime prevalence of back pain in adolescents increases steadily with age until it approximates adult levels by 18 years.[12]

Differential Diagnosis of Back Pain in Adults

The following list outlines common or serious conditions associated with back pain. It is not exhaustive.

Lumbosacral Muscle Strains and Sprains

Often due to a traumatic event or repetitive strain. Pain typically worsens with movement and improves with rest. Range of motion is limited, and muscles are tender upon palpation.[13]

Lumbar Spondylosis

Common even in asymptomatic individuals over 40 years of age. May present with back and/or hip pain, and discomfort is often exacerbated by extending or rotating the lower limbs. Neurological examination is generally normal.[13]

Disk Herniation

Frequently involves the L4 to S1 segments. Symptoms may include back pain, paresthesia, sensory changes, and alterations in strength or reflexes, depending on the severity and affected nerve root.[13]

Spondylolysis and Spondylolisthesis

Results from repetitive spinal trauma, disc and facet degeneration, or congenital defects. Patients may experience back pain alone or pain radiating to the gluteal region and posterior thighs, or radicular pain with neurological deficits.

Vertebral Compression Fracture

Characterized by localized back pain that typically worsens with flexion and is accompanied by point tenderness upon palpation or percussion. Risk factors include steroid use, vitamin D deficiency, and osteoporosis. The pain may be acute or chronic.[13]

Spinal Stenosis

Associated with back pain, leg pain, leg weakness, and sensory changes that worsen with upright position (standing and walking) and improve with sitting or leaning forward (neurologic claudication). Neurological examination may initially appear normal but may deteriorate as stenosis progresses.

Tumor

May be associated with unplanned weight loss, focal tenderness, or a history of malignancy risk factors. Most spinal tumors are metastatic though primary tumors such as multiple myeloma should be in the differential.[13]

Infection

Should be considered if a patient presents with progressive back pain and has a recent history of spinal surgery, intravenous drug use, or immunosuppression. Symptoms may include fever, localized pain and tenderness, and may involve conditions such as vertebral osteomyelitis, diskitis, septic sacroiliitis, epidural abscess, or paraspinal muscle abscess. Tuberculosis should be considered in patients from developing countries.[13]

Fracture

May result from trauma, prolonged corticosteroid use, or osteoporosis, particularly in patients over 70 years old. Associated signs include contusions, abrasions, and tenderness over spinous processes.[13]

Non-Urgent Spinal Conditions: Diagnosis and Management

Back Strain

The initial management includes over-the-counter analgesics such as ibuprofen or acetaminophen, with muscle relaxants considered

in refractory cases. Patients are advised to maintain their usual activities, including work and sports, while avoiding prolonged bed rest. Home exercises should be given in acute cases, focusing on gentle range of motion activities and light core strengthening exercises, and physical therapy should be utilized in recalcitrant cases.

Degenerative Disc Disease (Without Cord Compression):

Contributing factors include advanced age, tobacco use, obesity, physical inactivity, diabetes mellitus, and concurrent hip and knee osteoarthritis. Clinical presentation often involves lower back pain, with or without radiculopathy (e.g., sciatica). Symptoms may be exacerbated by coughing or sneezing, and a positive straight leg raise test may indicate intervertebral disc herniation with nerve root impingement. Management for isolated radiculopathy without progressive neurological deficits includes conservative approaches such as physical therapy, medications, and continuation of most regular activities (except activities that worsen radicular pain), minimizing bed rest. If conservative management fails to resolve symptoms, MRI of the spine without contrast is the preferred diagnostic modality, revealing potential intervertebral disc herniation or prolapse. CT myelography is used when MRI is contraindicated. Epidural injections may be considered in recalcitrant radiculopathies, and persistent or severe neurological deficits may necessitate surgical intervention, such as discectomy.[14]

Spinal Stenosis

The classic presentation of lumbar spinal stenosis is neurogenic claudication, characterized by bilateral or unilateral leg pain potentially accompanied by weakness or numbness. Symptoms are aggravated by walking, standing, or lumbar extension, and relieved by sitting, lying down, or lumbar flexion. The likelihood of spinal stenosis is reduced if gluteal or lower limb pain does not worsen with standing or walking. MRI of the spine without intravenous contrast typically reveals a narrowed spinal canal or foraminal narrowing. CT myelography is indicated if MRI is contraindicated. For mild to moderate symptoms, conservative management includes NSAIDs, physical therapy, and, if appropriate, epidural steroid injections. Severe persistent symptoms may require surgical intervention.[14]

Spondylolisthesis

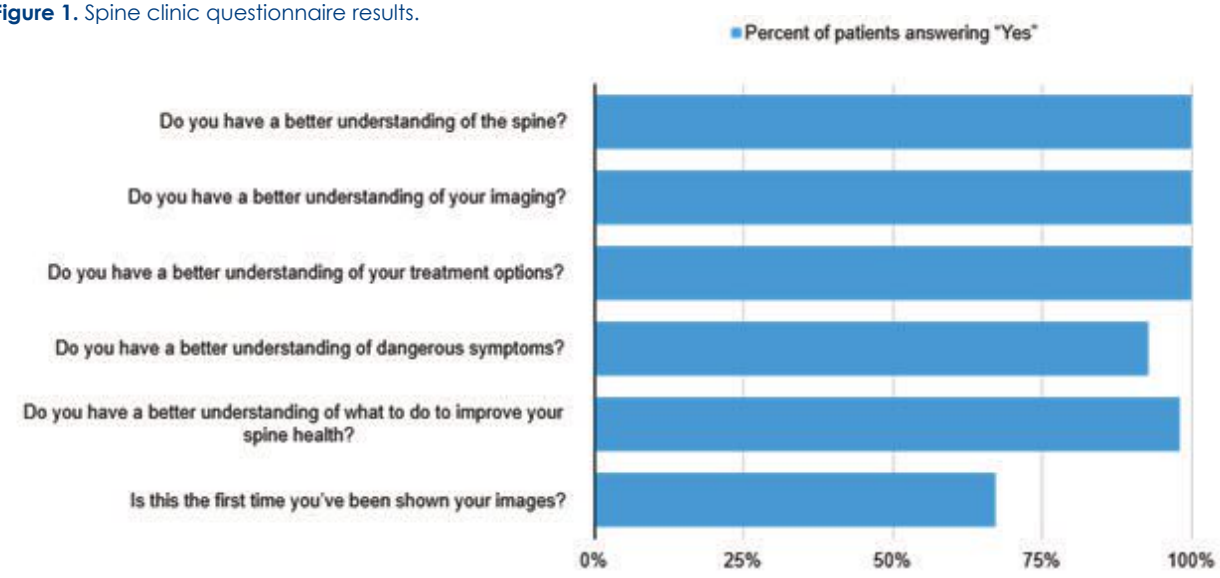
Risk factors include congenital lumbosacral malformations at L5-S1, repetitive extension activities (e.g., gymnastics, swimming, football, weightlifting), spondylosis, degenerative disc disease, trauma, and various local or systemic pathologies (e.g., tumors, Paget's disease, osteogenesis imperfecta, tuberculosis). Diagnostic imaging with lateral X-rays with flexion, extension, and oblique views of the spine assists with evaluating segmental motion and planning surgical interventions. Conservative management may include medication management, physical therapy, injections and bracing (Anti-lordotic Lumbar-Sacral Orthosis). Severe, persistent symptoms may warrant surgical intervention such as fusion.[14]

The Role of Non-Operative Spine Care Clinic

A non-operative spine clinic is a useful tool to distinguish between urgent and nonurgent spinal pathology. Patients typically face numerous health care and provider options, with little or no collaboration or coordination among providers, often leading to care that can be fragmented and episodic. The goal of a non-operative spine clinic is to introduce a coordinated, multidisciplinary, and stratified approach to the assessment and management of low back pain to improve the quality of care for the individual patient and reduce the overall healthcare burden regarding wait times, cost, and resources such as the overutilization of advance imaging.

An observational study involving 405,965 primary care patients examined the downstream effects of inappropriate lumbar spine MRI. The findings indicated that early MRI was linked to increased rates of back surgery (1.48% vs. 0.12% for cases without early MRI), higher prescription opioid use (35.1% vs. 28.6%), elevated final

Figure 1. Spine clinic questionnaire results.



pain scores (3.99 vs. 3.87), and greater acute care costs ($8,082 vs. $5,560), with all comparisons achieving statistical significance ($p < 0.001$).[15] Physical medicine and rehabilitation specialists offer an expert intermediate step that provides a balanced set of alternative choices and highlights the importance of shared decision-making.[16]

A visit to the non-operative spine clinic will typically begin with a thorough history, physical examination, and review of previous spine imaging. The patient is educated on their diagnosis, with the aid of their imaging if available, and further workup and treatment options including therapies, medications, and spinal injections. If indicated, such as in cases of recalcitrant or severe radiculopathies, spinal stenosis, or spondylolisthesis, a referral to a spine surgeon can be discussed and initiated. Referrals to non-operative spine clinics have shown reductions in rates of imaging, specialist referral, and spine surgery. A study by Fox et al. showed an almost 30% decrease in surgical rates while maintaining patient satisfaction by mandating the patient visit a physiatrist-led spine clinic for biopsychosocial evaluation and education before it would authorize a surgical consultation.[16] Furthermore, having patients see a nonsurgical spine specialist allows for a higher proportion of appropriate candidates for surgery than conventional physician referrals and allows surgeons to focus their practice more on patients who are more likely to benefit from their services, thereby reducing wait times.[17] The University of Missouri recently performed a quality improvement survey evaluating the efficacy of spinal education delivered in our non-operative spinal clinics (Figure 1). Surveys were distributed to 55 consecutive new spine patients in the MU Comprehensive Spine Center and results indicated that nearly all patients demonstrated enhanced comprehension of spinal anatomy, imaging techniques, treatment modalities, warning symptoms, and strategies for optimizing spinal health.

Management of Acute and Subacute Low Back Pain

Historically, low back pain chronicity has been divided into three categories: acute (less than four weeks), subacute (four to 12 weeks), and chronic (greater than 12 weeks).[6]

Acute and subacute non-specific low back pain, the most common type of low back pain encountered in clinical settings, is characterized by pain without a definitive underlying disease or structural abnormality after a comprehensive evaluation. Contributing factors include poor

posture, a sedentary lifestyle, low physical activity levels, heavy lifting, advancing age, psychological stress (e.g., stress, anxiety, depression), and a history of lumbar surgery. The typical presentation includes the absence of red flag symptoms, a normal neurological examination, and no indicators of specific back pain. Routine imaging is generally not recommended, as these cases tend to resolve spontaneously within six weeks.[6]

Initial management is predominantly conservative, focusing on therapeutic strategies that avoid invasive or high-risk interventions. It is crucial for patients to maintain their daily activities, including work and exercise, and to avoid prolonged bed rest. For severe pain, activity, particularly exercise, may be restricted for the first one to two days. Therapeutic approaches typically involve stretching, exercise, and ergonomics training, often provided by a healthcare provider or learned through a course of physical therapy (generally a four to six-week course). Regular exercise combined with patient education on posture, safe lifting techniques, and muscle strengthening can be effective in preventing future episodes of back pain. In fact, a systematic review of 14 studies (4,872 patients) from *The Journal of American Medical Association* in 2015 compared patient education focusing on the benign, self-limiting nature of low back pain and recommendation to stay active to usual care education resulted in fewer acute low back pain primary care visits and found patient education delivered by a physician, rather than a physical therapist or nurse, was more effective for patient education.[18]

Other conservative treatments that may be considered include superficial heat, massage, spinal manipulation (such as chiropractic care), and acupuncture. For acute or subacute pain, pain management may involve oral medications, including nonsteroidal anti-inflammatory drugs (NSAIDs) like ibuprofen and naproxen (available over the counter) or prescription NSAIDs such as nabumetone, diclofenac, and meloxicam. Acetaminophen and non-benzodiazepine muscle relaxants such as cyclobenzaprine, tizanidine, or methocarbamol can also be considered. Medications should be used on an as-needed basis and discussed with the provider, considering the risks and benefits of each.

Imaging is typically reserved for cases where symptoms worsen during conservative management or persist beyond six weeks.[6] Initial imaging often includes lumbosacral spine X-rays to identify bony abnormalities.[6] An MRI of the lumbar spine may be performed if there is diagnostic uncertainty, particularly in cases of radiculopathy or suspected spinal stenosis. CT of the lumbar spine is considered when MRI is contraindicated.[6] It is important to note that if further imaging is warranted the language used to explain advanced imaging to the patient should be mindful, strategic and tailored toward the individual patient's level of education. A study in 2013 explored the impact of changing MRI reports to use more common language (eighth grade reading level) with less negative emotion-inducing words (like "tear") and replacing them with more optimistic language. Patients rated the reworded reports higher from a satisfaction, usefulness, and understanding standpoint compared to the original imaging reports. In addition, a 2012 study demonstrated a decrease in opioid prescriptions by primary care physicians when epidemiological data was included in the imaging report. For instance, the report might detail the frequency of specific degenerative changes, such as disc degeneration, disc herniation, and spinal stenosis, in asymptomatic individuals.[19] This again demonstrates the importance of the specific words physicians use to educate patients regarding imaging findings and education.

Management of Chronic Low Back Pain

Approximately 30% of patients with acute low back pain may develop chronic pain and functional limitations. Tools such as the PICKUP (predicting the inception of chronic pain) questionnaire can aid in identifying individuals at risk for developing chronic back pain.[6]

For patients with chronic low back pain or those at high risk of chronicity, initial conservative management may include behavioral therapy. Cognitive behavioral therapy and nonoperative

conditioning therapy are recommended by the American College of Physicians (ACP), North American Spine Society, and World Health Organization (WHO). Structured exercise programs, mobility assistive devices if necessary, and adjunct therapies like therapeutic ultrasound, transcutaneous electrical nerve stimulation (TENS), local level laser therapy, and electromyography biofeedback may also be beneficial.[6]

Pain management typically involves non-selective NSAIDs (e.g., ibuprofen, naproxen, nabumetone, meloxicam). Routine use of adjunct analgesics such as skeletal muscle relaxants, antidepressants except for duloxetine, and opioids are generally discouraged due to limited evidence of benefit and potential adverse effects. Duloxetine is suggested as a second-line treatment for chronic low back pain according to ACP guidelines. Tramadol may be considered as a second-line option, and short-term use of opioids like buprenorphine (patch or sublingual) may be employed with caution according to the ACP guidelines.[6]

Interventional therapies are rarely required for non-specific low back pain but may be considered for patients with refractory, disabling symptoms. Referral to a specialist for potential interventional management might be warranted in such cases. Possible benefits from interventional options like radiofrequency ablation for zygapophyseal joint pain are noted, though evidence supporting the efficacy of epidural steroid injections, spinal cord stimulation, and surgical interventions (such as discectomy or SI joint fusion) is limited.

Summary

Low back pain is a common and costly condition affecting millions worldwide. Most cases are benign and self-limiting, but a thorough evaluation is necessary to identify and treat serious underlying conditions. Conservative management, including physical therapy, exercise, and medication, is often effective for acute and chronic LBP. Non-operative spine clinics play a crucial role in providing coordinated, multidisciplinary care to improve outcomes and reduce unnecessary procedures. Early patient education on spinal health and appropriate care pathways can significantly impact treatment outcomes and reduce healthcare costs.

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Innovations In Physical Medicine and Rehabilitation: Advances in the Diagnosis, Treatment, and Care of Amyotrophic Lateral Sclerosis

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Long-term goals remain focused on developing regenerative and neurorestorative therapies for ALS, which could potentially alter disease progression or restore function.



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Abstract

Amyotrophic lateral sclerosis (ALS) is a progressive motor neuron disease that causes loss of upper and lower motor neurons, leading to muscle weakness and ultimately death. This review highlights recent advancements in Neuromuscular Medicine and Physical Medicine and Rehabilitation (PM&R), emphasizing innovations in the diagnosis, treatment, and care delivery for ALS. The field of PM&R emphasizes a multidisciplinary, patient-centered approach, incorporating advanced diagnostic tools, therapeutic strategies, adaptive equipment, and telerehabilitation to optimize function. Neuromuscular PM&R physicians play a key role in managing symptoms and maximizing functional independence. Current disease-modifying therapies include riluzole and edaravone which provide only modest benefits, but emerging gene therapies like tofersen for SOD1-related ALS offer promise for targeted treatment for genetic forms of ALS. Future advancements in regenerative therapies, biotechnologies, and digital health integration hold the potential to improve care and enhance the quality of life and functional independence of individuals living with ALS.

Introduction

Physical Medicine and Rehabilitation (PM&R) emphasizes improving functional abilities rather than a specific disease or organ systems. Physiatrists (PM&R specialists) optimize function through a multidisciplinary approach, combining therapies, medical interventions, and adaptive solutions for comprehensive, patient-centered care. Neuromuscular medicine, a subspecialty of both PM&R and Neurology, focuses on hereditary and acquired disorders of the peripheral nervous system, including motor neuron diseases, peripheral neuropathies, neuromuscular junction disorders, and myopathies.

Motor neuron diseases include a diverse group of disorders that lead to the loss or

impairment of spinal and/or cortical motor neurons, resulting in compromised motor function. Neuromuscular physiatrists play a vital role in enhancing quality of life and functional independence by addressing complex physical, respiratory, and functional challenges through specialized rehabilitation strategies and multidisciplinary care. This role becomes especially critical in progressive motor neuron diseases, where physiatrists employ tailored rehabilitation approaches and collaborate with a multidisciplinary team to support patients' quality of life and maintain functional independence at each stage of disease progression.

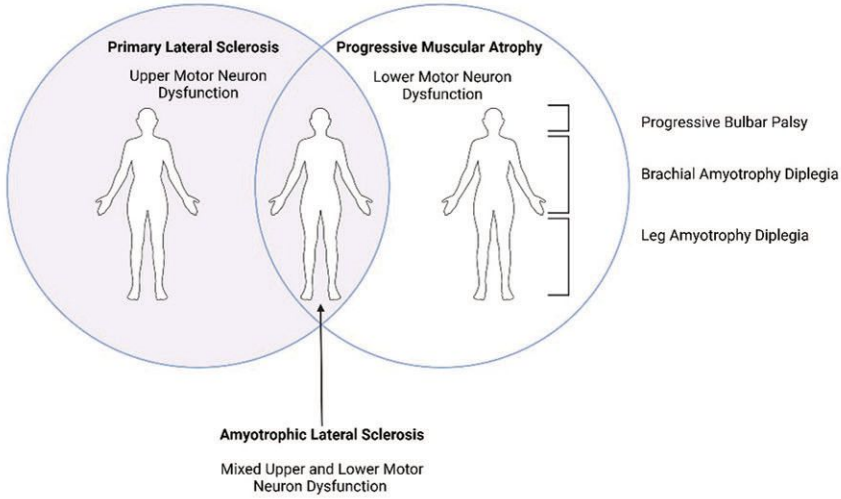


Figure 1. Variant Forms of Amyotrophic Lateral Sclerosis. Figure created using BioRender.

This review will examine advancements in Neuromuscular Medicine and PM&R, emphasizing diagnostic, therapeutic, and adaptive innovations in managing amyotrophic lateral sclerosis (ALS). It will explore current standards of care, recent innovations, and future advancements in diagnosis, treatment, and care delivery, including developments in diagnostic technologies, therapeutic strategies, adaptive equipment, and telerehabilitation. We will review the evolving therapeutic landscape, including disease-modifying therapies and emerging gene therapies that target specific genetic forms of ALS, highlighting the critical need for specialized clinical settings to deliver and monitor these treatments. Overall, this review aims to illustrate how these advancements collectively work toward enhancing quality of life and optimizing functional outcomes for individuals affected by ALS.

Advances in Diagnostic and Monitoring Technologies

ALS has an estimated incidence of 1.4/100,000 with an age of onset typically occurring in the sixth or seventh decade of life.[1] However, the incidence of ALS in the Midwest is higher than national average and has been estimated at 8.8 per 100,000.[2] ALS includes both hereditary (familial) and sporadic forms, with up to 10-20% of sporadic ALS patients (those with no apparent family history) also found to carry a mutation associated with familial ALS (fALS). The PM&R neuromuscular specialist plays a crucial role in the diagnosis and management of a diverse range of disorders that impair function. The diagnosis of a motor neuron disease, specifically ALS, is achieved through a combination of history and physical examination, and diagnostic testing.

A distinctive feature of ALS is the degeneration of both upper and lower motor neurons with relatively sparing of other neurons. ALS can present with a range of variant forms (Figure 1). For instance, primary lateral sclerosis (PLS) involves only upper motor neurons, while progressive muscular atrophy (PMA) affects only lower motor neurons. Regional ALS variants include progressive bulbar palsy (PBP), which impacts bulbar muscles; brachial amyotrophic diplegia (BAD), affecting proximal upper limbs; and leg amyotrophic diplegia (LAD), involving distal lower limbs.[3,4] Phenotypic variability in fALS, even among cases with the same genetic mutation, suggests that ALS variants are diverse manifestations of a common underlying pathology, though the basis of this phenotypic variability across patients remains unclear. Notably, some patients with ALS may also exhibit additional overt neurological features, such as frontotemporal dementia (Figure 1).

Diagnosis of ALS

Optimal treatment and rehabilitation for ALS relies on rapid and accurate diagnosis, as well as

assessment of disease impact. Unfortunately, ALS is often associated with diagnostic delays which can postpone the initiation of disease-modifying treatments, supportive care, and rehabilitation. ALS is diagnosed clinically based on findings of combined upper and lower motor neuron involvement, supported by diagnostic tests that confirm the diagnosis or exclude the diagnosis. Diagnostic approaches include electrodiagnostic testing (discussed in McClellan et al. in this issue), which assesses lower motor neuron involvement while ruling out mimicking disorders. While the diagnosis is usually straightforward in advanced cases, it can be more challenging early in the disease course or in patients with atypical ALS variants.

Advances in Diagnosis

To promote earlier diagnosis and improve outcomes in ALS, current research focuses on refining diagnostic criteria, and scoring systems, and developing emerging biomarkers, imaging techniques, and electrophysiological tools. Advances in understanding the genotype-phenotype relationship in fALS have aligned clinical, pathological, and genetic findings within families, revealing distinct patterns of disease presentation, predominantly linked to autosomal dominant (AD) inheritance.[5,6]

Patients with fALS associated with frontotemporal dementia (FTD) exhibit multisystem involvement, collectively termed ALS-plus syndromes.[7-9] These include cognitive and neurobehavioral impairments alongside motor symptoms. Such patients frequently present with bulbar-onset ALS and have a higher prevalence of pathogenic gene mutations or expansions, often leading to shorter survival compared to those without ALS-plus syndromes.

On average, diagnosis of ALS takes 10–16 months from symptom onset, primarily due to unfamiliarity with the disease, incomplete symptom recognition, and delayed specialist involvement.[10] Advances in ALS diagnostics focus on advanced imaging and neurophysiological techniques to assess upper motor neuron involvement, which traditional electrodiagnostic tests cannot, as well as developing blood and liquid biomarkers. Advanced magnetic resonance imaging (MRI) techniques, including diffusion tensor imaging (DTI) and functional MRI, may help detect white matter disruptions and cortical dysfunction associated with upper motor neuron impairment in ALS.[11,12] Ultrasound and fat fraction-based MRI techniques of the muscles have also been utilized to identify sub-clinical/early stages of muscle degeneration.[13,14] Additional imaging technologies, like positron emission tomography (PET) and single-photon emission computed tomography (SPECT), may provide improved insights in ALS patients.[15] These technologies have helped to identify and establish a series of degenerative events occurring in ALS before overt symptoms.[16] The first pattern is marked by a decline in motor function over five years, marked by anterior horn cell loss and corticospinal tract degeneration. A second pattern, clinically similar to the first, also shows postmortem involvement of the posterior columns, Clarke's column, and spinocerebellar tracts. The third pattern shares features with the second but includes a prolonged survival period exceeding 10–20 years.[16-18]

Moreover, artificial intelligence (AI) and machine learning (ML) are beginning to be utilized to analyze extensive datasets from electronic medical records, genetic profiles, and imaging studies.[11,19] These AI-driven approaches hold promise for enhancing diagnostic precision, identifying ALS sooner, and predicting disease progression, which could optimize treatment timing. For example, AI may help clinicians determine the optimal point to initiate supportive therapies, like non-invasive ventilation, facilitating personalized, timely interventions that match each patient's needs for optimized outcomes. Together, these diagnostic advancements are setting the stage for more effective and targeted ALS management strategies, improving both the timing and impact of therapeutic interventions.

Advances in Disease Tracking

Beyond early diagnosis, effective ALS management also requires reliable methods to track disease progression and assess responses to therapies. One of the most advanced biomarkers for this purpose is neurofilament light chain (NfL), a blood-based indicator of neuronal and axonal damage used across various neurological conditions.[20] Similar to how elevated creatine kinase (CK) signals muscle damage, increased NfL levels in the blood suggest neural injury. NfL lacks specificity as it rises in response to any neural injury and can be influenced by factors like age, limiting its utility as an early diagnostic marker.

However, NfL remains promising for monitoring disease progression and therapeutic effects in ALS. Additionally, emphasis has been on non-neuronal cells such as activated microglia and astrocytes which promote chitinase expression. Thompson et al. showed that chitotriosidase-1 (CHIT1) and chitinase-3-like protein 2 (CHI3L2/YKL39) could differentiate ALS from mimicking conditions, but their diagnostic performance was weaker than neurofilament. CHIT1 and CHI3L2 were correlated with the rate of disease progression, and CHIT1 was correlated with survival when included in a multivariate model.[21] A longitudinal study consistent with previous findings showed that CHIT1 and CHI3L1 were linked to the rate of disease progression.[21,22] Advancements in electrophysiological methods are also improving our ability to track ALS progression. High-density surface electrodes now enable non-invasive recording and analysis of individual motor units, allowing more sensitive detection of motor neuron health over time. Additionally, techniques like transcranial magnetic stimulation (TMS) offer non-invasive assessment of motor cortex function, providing insight into central nervous system and upper motor neuron integrity.

In approximately 97% of ALS cases, TAR DNA-binding protein 43 (TDP-43) mislocalizes from the nucleus to the cytoplasm in affected glial cells and neurons, disrupting critical RNA processing, splicing, and transport functions.[23,24] Recent research has identified promising cerebrospinal fluid and blood biomarkers associated with TDP-43 mislocalization, including altered splicing events and cryptic peptides, which show potential for both earlier diagnosis and tracking of disease progression[25]. Notably, the distribution of the pathological isoforms of TDP-43 has been well established from human postmortem tissue and biofluids. Studies employing enzyme-linked immunosorbent assay (ELISA) to quantify TDP-43 in the CSF, and plasma of different patient groups identified significant differences between sporadic ALS patients and a group of neurological and healthy control subjects.[26] Higher TDP-43 levels over the 95% CI to control subjects, correlated with ALS-specific early phase of the disease but did not correlate with the level of diagnostic certainty (applying the El Escorial criteria for ALS) nor with disease onset site (bulbar vs. limb).[26,27]

Overall, there is an urgent need for improved methods that allow earlier diagnosis. This is critical to reduce the diagnostic delay and to facilitate early treatment implementation. Together, these emerging biomarkers and advanced monitoring techniques are paving the way for earlier diagnosis and more precise, real-time tracking of ALS, which is crucial for timely interventions and evaluating therapeutic efficacy.

Advances in Treatment and Rehabilitation Interventions

The PM&R neuromuscular physician plays a critical role in managing symptoms, enhancing quality of life, and maximizing functional independence for ALS patients. Although there is no cure for ALS, the PM&R physician collaborates with a multidisciplinary team to address issues such as muscle weakness, spasticity, pain, and mobility through individualized rehabilitation programs. These programs often incorporate physical and occupational therapy, adaptive devices for mobility and communication, and strategies to maintain daily function as the disease advances. Additionally, the PM&R physician manages fatigue, respiratory difficulties, and nutritional needs, ensuring comprehensive care tailored to each patient's progression and specific challenges.

Disease-Modifying Therapies

Currently, two disease-modifying therapies, riluzole and edaravone, are approved for treating all patients with ALS, offering modest slowing of disease progression. Riluzole extends survival by an average of approximately four months, while edaravone, a free radical scavenger originally developed for stroke, slows disease progression by around 30%.[28,29] Most ALS cases are sporadic, but some patients, with or without a family history, have identifiable genetic mutations. For patients with genetic forms of ALS, treatment typically mirrors that of sporadic ALS. However, recent advances are beginning to differentiate treatment for genetic forms of ALS. Tofersen (Qalsody), an antisense oligonucleotide (ASO) therapy, was recently approved for SOD1-related familial ALS. Administered intrathecally, tofersen reduces SOD1 protein levels, which has been shown to lower neurofilament light chain (NfL) levels—a marker of neural injury—through clinical outcomes have varied. Current

research is exploring the impact of early or presymptomatic treatment, as these stages may yield the greatest therapeutic benefit. ASOs targeting various other fALS mutations are in clinical trials such as (FUSION; NCT04768972) to assess efficacy, safety, and pharmacology of FUS ASO; (jacifusen), or the recent FDA approval of (IND141673) for the testing of the mixed backbone ASO; afinersen in a single C9orf72-ALS participant hold great future promise.[30,31] However, specialized clinics are essential to deliver these emerging therapies effectively, allowing for precise monitoring of their therapeutic effects and potential side effects in real-time. Such clinics must be equipped with expertise in genetic counseling, advanced diagnostics, and intrathecal administration techniques, providing patients with comprehensive, tailored care that anticipates the complexities of gene therapies.

Table 1. Six Stages of ALS Progression and Common Rehabilitation Needs[32]

Stage	Patient Characteristics	Rehabilitation Needs
Stage 1	Fully ambulatory with mild weakness	Range of motion and strength exercises for unaffected muscles.
Stage 2	Ambulatory with moderate weakness	Orthotic devices for foot drop and hand support; assistance with daily tasks.
Stage 3	Severe weakness in specific muscle groups	Use of walkers, wheelchairs, and lift chairs for mobility and socialization support.
Stage 4	Non-ambulatory but independent	Powered wheelchairs, hospital beds; limited exercises for unaffected muscles.
Stage 5	Dependent for transfers and mobility	Family education on care; focus on pressure relief and maintaining comfort.
Stage 6	Complete immobility and dependence on skilled caregivers	Positioning strategies, palliative care for comfort, and skilled caregiver support.

Supportive Care and Rehabilitation

The mainstay of treatment for most patients impacted by ALS includes multidisciplinary supportive and rehabilitative care to mitigate the impact of the disease. Supportive care is delivered in a personalized manner to address the symptoms experienced by the patient. Patients with ALS generally progress through six stages (Table 1), each with common rehabilitation needs, although individual progression can vary.[32] In Stage 1, patients remain fully ambulatory with mild weakness, benefiting from a range of motion and strength exercises for unaffected muscles. Stage 2 patients are still ambulatory but experience moderate weakness, often requiring orthotic devices for foot drop, hand support, and assistance with daily tasks. Stage 3 involves severe weakness in specific muscle groups, with aids like walkers, wheelchairs, and lift chairs to support mobility and socialization. In Stage 4, patients are non-ambulatory but independent, using powered wheelchairs and hospital beds for support, with exercises limited to unaffected muscles. Stage 5 patients require assistance for transfers and mobility, with family education and pressure relief becoming key priorities. Stage 6 involves complete immobility and dependence on skilled caregivers, with an emphasis on positioning and palliative care to maximize comfort. Average survival from symptom onset is between two and three years, while survival after diagnosis averages 15 months, though this can vary widely among patients.[1,33,34] End-of-life discussions should begin early in ALS management with input from hospice and palliative medicine experts.

Advances in Care Delivery and Adaptive Equipment

Multidisciplinary Care

Effective management of motor neuron diseases like ALS relies on a robust multidisciplinary approach, where PM&R specialists, neurologists, physical therapists, and other healthcare providers collaborate to deliver comprehensive, patient-centered care. This team-based model is essential for addressing the full spectrum of ALS symptoms and ensuring that care remains holistic, adaptable, and supportive throughout the disease's progression.

Telerehabilitation

Access to care is a major barrier to optimal clinical outcomes across healthcare and including ALS. In particular, individuals who live in rural areas are impacted by health disparities as compared with individuals who live in urban areas.[35] Telehealth and remote monitoring are transforming rehabilitation for ALS by making care more accessible and responsive.[36] Using wearable devices, clinicians can continuously track muscle activity, mobility, and fine motor skills, allowing for real-time adjustments to rehabilitation programs.[37] These devices capture subtle changes in gait, strength, and dexterity, which enables clinicians to optimize functional outcomes and potentially slow functional decline. Data from wearable sensors on posture, balance, and physical activity support early detection of decline, enabling quick adaptation of therapies, better adherence to home exercises, and personalized care irrespective of location.

Precision Rehabilitation

ALS presents significant variability in the disease initial presentation and progression as well as treatment responses among individuals. In the future, precision medicine will address this variability by tailoring interventions specifically to each patient, moving beyond the current "one size fits all" approach. Emerging advancements in diagnostic tools, monitoring technologies, and therapeutic strategies are paving the way for precision rehabilitation, a customized treatment model that adapts to the unique needs of each patient. As AI and machine learning capabilities evolve, rehabilitation protocols will become increasingly data-driven, with algorithms adapting treatments based on clinical metrics and biomarkers like NfL. Looking ahead, AI algorithms are expected to allow analysis of patient data to predict treatment outcomes, enabling clinicians to prioritize therapies with the highest probability of success for each individual, ultimately transforming ALS care through personalized, precision-driven approaches.

Adaptive and Assistive Technologies

Innovations in adaptive and assistive technology are empowering ALS patients to maintain autonomy, communication, and mobility, even as motor functions decline. Exoskeletons, robotic-assisted therapy devices, and customized home modifications create supportive environments tailored to each patient's needs, enhancing safety and functionality. Integrated diagnostic monitoring tools, such as speech recognition software and swallowing sensors, track the progression of dysarthria and dysphagia in real-time, allowing for personalized speech and swallowing therapies. Advanced assistive technologies, including eye-tracking devices and brain-computer interfaces (BCI), further enable patients to interact with their environment and communicate effectively.[38,39] These tools may help sustain independence and improve quality of life by ensuring ALS patients can continue to engage with their surroundings as physical limitations increase.

Conclusion, Impact on Clinical Practice, and Future Directions

ALS is a life-altering diagnosis with limited treatment options, yet the neuromuscular PM&R specialist plays an essential role in achieving timely diagnosis and coordinating comprehensive, multidisciplinary care. New innovations in diagnostics, disease monitoring, treatment, rehabilitation, and assistive technology offer hope in reducing the disease's impact on patients' quality of life. Current efforts aim to improve early diagnosis, tailor disease monitoring to individual needs, enhance rehabilitation techniques, and integrate assistive devices that support mobility, communication, and daily function. Long-term goals remain focused on developing regenerative and neurorestorative therapies, which could potentially alter disease progression or restore function.

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Disclosure

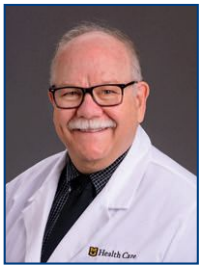
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Lower Extremity Orthotic Device Prescriptions: Basics of Evaluation and Management

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Understanding the principles, designs, indications, and limitations of orthotic devices is essential for providing effective patient care.



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Abstract

This paper provides a basic overview for the role of some lower extremity orthotic devices in the rehabilitation and support of the maximization of function for individuals with neuromusculoskeletal conditions. It provides a comprehensive overview of orthotic principles, designs, indications, and limitations, emphasizing the importance of thorough patient assessment in device prescription. Key terminology, including definitions of orthoses and the role of certified orthotists, is clarified. The paper discusses various types of orthotic devices, comparing custom-made to off-the-shelf options, and examines the materials used, such as leather, metal alloys, and thermoplastics, each with distinct characteristics. Additionally, this article highlights functional considerations, fitting protocols, and the need for ongoing follow-up care to prevent complications like pressure injuries. The conclusion underscores the necessity of individualized orthotic prescriptions, addressing specific patient needs to optimize rehabilitation outcomes and enhance mobility while acknowledging the trade-offs in energy expenditure and gait velocity associated with orthotic use.

Introduction

Orthotic devices serve as artificial supports or braces for the limbs or spine, playing a crucial role in rehabilitation and support for individuals with neuromusculoskeletal conditions. Understanding the principles, designs, indications, and limitations of orthotic devices is essential for effective patient care.

What is an Orthotic Device?

Orthotic devices are artificial supports or braces designed to assist, align, or protect weakened or injured limbs or the spine. These devices are fabricated and fitted by board-certified orthotists (CO) or certified prosthetist orthotists (CPO) with a master's degree in orthotics and/or prosthetics.[1,2]

Orthotic Terminology

Key terminology includes orthosis (singular), orthoses (plural), orthotic (adjective),

and orthotist (trained professional). An orthotist is a person who is trained to properly fit and fabricate orthoses. The orthotist is usually credentialed by the American Board for Certification (ABC) and common certifications include Certified Prosthetist/ Orthotist (CPO) and Certified Orthotist (CO).

Standard nomenclature for an orthotic device is based on the joint of which the device crosses, such as foot (F), ankle (A), knee (K), and hip (H). For example, a device that supports the distal lower extremity is referred to as an AFO because it crosses the ankle and foot.[1, 2,3]

Principles and Factors in Orthotic Design

An orthotic prescription is based on comprehensive patient assessment; this includes history, physical examination with considerations such as skin issues & texture, reliability of the patient to utilize the orthotic device, cognitive issues, ability to use the hands to don or doff the device, edema, contracture, or anatomical abnormalities. Orthotic devices can provide support, protection, and immobilization while correcting deformities or off-loading troublesome anatomy. However, they may have disadvantages such as discomfort, limited effectiveness in certain cases, nerve injury from pressure and muscle weakness after prolonged usage.[4,5]

Other factors influencing the design of an orthotic device include the weight of the device, the material strength, flexibility and durability of the device, the forces or loads that are going to be translated by the device, cosmetic appearance, cost, availability, ease of care, and adjustability of the device.[2,4]

Functionally, orthotics can be dynamic, static, or neurophysiological. A dynamic brace facilitates body motion to allow for optimal function and has moving parts. A static brace is rigid and does not have moving parts and is utilized to support weakened or paralyzed body parts and maintain a particular position. Neurophysiological orthotics are utilized to control neurologic tone. In an ideal world, an orthotic would be totally functional, fit well, be lightweight, be easy to don and doff, be easy to maintain, inexpensive, and locally manufactured. There are several comparable orthotic devices that achieve improved function for most patients, each with its own risks and benefits. It is best to collaborate with the certified orthotist to select the most appropriate device for the individual and problem.[4,5]

Types of Orthotic Devices and Functional Considerations

The choice between off-the-shelf and custom-made orthotic devices depends on patient needs, such as the amount of ankle control, obesity, or if specific needs are required. Functional considerations include factors like the weight and material of the orthotic, as well as patient-specific characteristics such as muscle strength, sensation and fluctuation in limb size. In general, customized orthoses will more effectively limit or control motion better than a prefabricated/off-the-shelf orthosis.[2,4]

For example, if the patient needs an ankle-foot orthosis (AFO) only because they have weakness in ankle dorsiflexion, it is likely that an off-the-shelf AFO would provide enough support for the patient. Conversely, if the patient lacks inversion/eversion ankle control, obese, or if needs custom plantarflexion or dorsiflexion stops, then it is likely that they would need a custom-made device.

Materials Used in Orthotic Devices

Orthotic devices can be made from various materials, each with their own characteristics and suitability for specific applications. Materials include leather, metal alloys (steel/aluminum), thermosets (carbon fiber composites), and thermoplastics. Each of which offers different levels of stiffness, durability, and adjustability.

Leather is an easily formed and manipulable material but is not durable over the long



Figure 1. Example of a metal double upright AFO with a leather calf band.



Figure 2. Example of a thermoset/ carbon fiber AFO.





Figure 3. Examples of thermoplastic AFOs include a hinged thermoplastic AFO with a pre-flexed articulated joint (left) and a solid ankle thermoplastic AFO (right).





Figure 4. Examples of other different orthoses: off-the-shelf composite KO (left) and custom thermoplastic KAFO (right).

term or as hygienic as other types of materials. Metal alloys, like steel and aluminum, are also easily formed by hand and are often used for heavy duty applications, though not necessarily. Metal AFOs can accommodate for much larger limb volume fluctuations and can be used in hotter climates since they have less total skin contact. These advantages come at the cost of the heavier total device weight (Figure 1).

Thermosets, also known as carbon fiber composites, are light, thin, and stiff. Their main drawback is that they are not as adjustable and cannot withstand very heavy loads. These AFOs are often pre-fabricated, off-the-shelf devices (Figure 2).

Thermoplastic built orthoses have variable stiffness and require vacuum forming for fit but can be modified by the use of heat. Thermoplastics are hygienic, easily cleaned, corrosion proof, are customizable in appearance, and are often lighter than leather or metal alloy braces (Figure 3).[4,5]

Lower extremity orthotic devices come in many different styles, shapes, and can be made up of a mixture of materials that best fit the needs of the patient (Figure 4).

Orthotic Fitting, Follow-up

Proper fitting and follow-up care are crucial in orthotic management to ensure effectiveness, patient comfort, and safety. A patient should have a set wearing schedule for each device that they have. Given the relationship between pressure magnitude and time with regards to pressure injury formation, the patient should slowly advance wearing time for a brace full-time to reduce risk of pressure injuries.

A sample wearing schedule is detailed in Table 1.[4]

Table 1. An example wearing schedule of an orthotic device.

Time Period	Weightbearing Status	Brace Wearing Schedule
Days 1–2	Nonweightbearing	15–30-minute intervals
Days 3–7	Intermittently bearing weight	15–30-minute intervals
Second Week	Weightbearing as tolerated	Gradual increase in brace-wearing time
After 2 Weeks	Full weightbearing	Brace worn full-time

Indications and Prescription of Orthotic Devices

Orthotic prescription is guided by functional considerations and aims to address specific patient needs. Custom orthoses offer better control and fit, while off-the-shelf options may be suitable for certain conditions and may be adjusted by the orthotist. Considerations include weight, material, cosmesis, patient comfort, and the functional role of the orthotic device.[5,6,7,8]

Additional considerations include:

- Will it hold up to the forces required to control the body part?
- Will it break abruptly?
- Will it fatigue easily?
- Does the patient need accommodation for swelling?
- Does this control the motion of the joint adequately?
- Will this device last 3-5 years (insurance requirements)?
- Is this device the most minimal weight and material as what is appropriate for the patient?
- Is the patient going to be a functional utilizer of the device?

A prescription for lower extremity orthosis should include the following information:

- Patient's name, age, gender, current date
- Patient's diagnosis
- Patient's functional goals
- Description of the orthotic:
  - Area covered, flexible or rigid, custom or off-the-shelf, any needed extra components, biomechanical control desired, and any plane of motion restrictions
- Precautions
- Physician Information

Limitations and Concerns in Orthotic Use

Orthotic use may be associated with concerns such as pressure duration, skin issues, and loss of function. Strategies for mitigating limitations include setting wearing schedules to prevent pressure injuries and ensuring proper fitting and follow-up care.

Some other specific considerations to keep in mind when prescribing orthotic devices for ambulation include the significant changes to the energy cost for ambulation and ambulation velocity. Typically, the rate of oxygen consumption with normal ambulation is around 12 mL/kg/min. Figure 5 details how the rate of oxygen consumption, and therefore energy consumption, increase with different orthotic devices.[9,10,11]

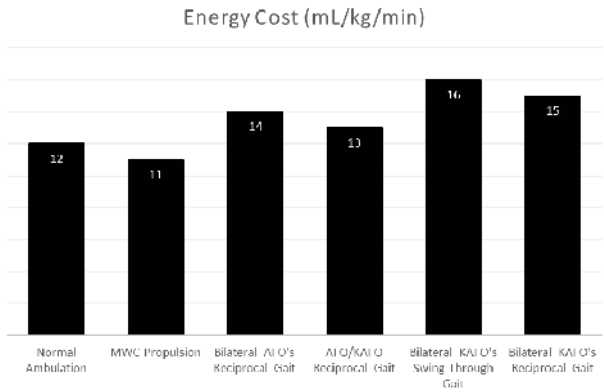


Figure 5. Rate of oxygen consumption in normal ambulation versus ambulation with various assistive devices including manual wheelchairs (MWC), ankle foot orthosis (AFO) and knee ankle foot orthosis (KAFO).[11]

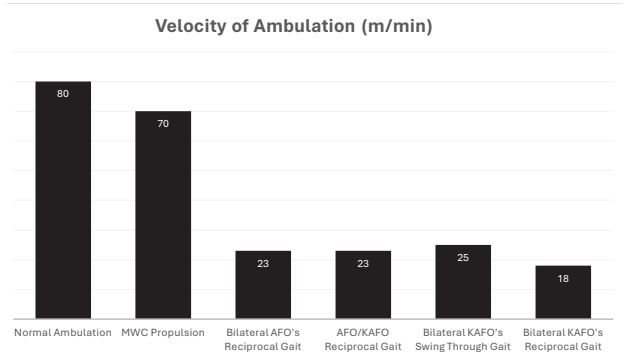


Figure 6. Average velocity of normal ambulation versus ambulation with various assistive devices including manual wheelchairs (MWC), ankle foot orthosis (AFO) and knee ankle foot orthosis (KAFO).[11]

Another important factor to consider when prescribing orthotic device is ambulation velocity. When adding an orthotic device (s) for patient to use, patients need to expect that their velocity of gait may decrease, and they may not walk within normal velocity or cadence that they are used to. Normally, a human will ambulate with a velocity of around 80 m/min. Figure 6 details how the velocity of ambulation changes with different orthotic devices.[6,9,10,12]

It is also important to consider patient's baseline strength with manual muscle testing to determine if they would benefit from utilizing an orthotic. For example, when looking at ambulation in the spinal cord injury population, the patient needs to have at least 3/5 strength (antigravity strength per the Medical Research Council scale) in one hip flexor and knee extensor with the maximum of one KAFO and AFO to be a community ambulator. This given that they have adequate truncal support to stand on their own lowering their risk of fall. It has been shown that impaired static postural control will reduce single support stance phase, inducing asymmetry of gait and thus increasing energy expenditure.[6,9,12]

Conclusion

Understanding the principles, designs, indications, and limitations of orthotic devices is essential for providing effective patient care. Orthotic devices play a vital role in rehabilitation and support for individuals with musculoskeletal conditions, and optimizing their use requires comprehensive assessment, individualized prescription, and ongoing follow-up care.

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Disclosure

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Making Waves: Improving Electrodiagnostics with Integration of Ultrasound for Entrapment and Traumatic Neuropathies

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Due to its accessibility and portability, ultrasound has been integrated into electrodiagnostic laboratories and equipment, allowing for additional structural information to be obtained, which can alter management and improve patient outcomes.



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Abstract

Electrodiagnostic studies (including nerve conduction studies and electromyography) are the most common diagnostic tests utilized in entrapment and traumatic neuropathies, including carpal tunnel and cubital tunnel syndromes. Electrodiagnostic studies evaluate the function of the nerves and give essential information about the location and severity of the lesion, but they provide little information about the structure of the nerve or any other structural abnormalities that may be contributing to the cause of the neuropathy. With improving technology, ultrasound has been increasingly used to image nerves and muscles. Due to its accessibility and portability, ultrasound has been integrated into electrodiagnostic laboratories and equipment, allowing for additional structural information to be obtained, which can alter management and improve patient outcomes.

Introduction

Basics of Electrodiagnostics

The field of electrodiagnostics has been evolving over quite some time. As early as 1771, Galvani showed that electrical stimulation of animal tissue showed muscular contraction; in 1929 Adrian recorded the first motor unit potential by connecting a concentric needle to an amplifier and loudspeaker; and near the end of World War II, Larrabee recorded the first compound motor action potential in healthy and injured nerves of war victims.[1] Electrodiagnostics technology has continued to improve with digital processing, filtering, and automation with the addition of computers in the late 1900s (Image 1).

Electrodiagnostic studies include nerve conduction studies (NCS) and electromyography (EMG). During NCS, a stimulator applies a small amount of current to the nerve to induce a depolarization of the sensory and motor fibers to create an action potential. These action potentials can be recorded over the skin (sensory nerve action potentials, or SNAPs) or over the muscle belly (for compound motor action potentials, or CMAPs), and various aspects of the action potential can be measured, such as latencies, amplitudes, and conduction velocities. EMG involves inserting a needle into the muscle to detect the electric potential generated by the motor unit (alpha motor neuron,

neuromuscular junction, and muscle fibers) at rest and during contraction (Image 2).

EMG evaluates four things: insertional activity (at rest), spontaneous activity (at rest), motor unit morphology (with contraction), and motor unit recruitment (with contraction). The goals of electrodiagnostic testing are to localize the pathology, provide severity and prognosis of the pathology, describe the chronicity of the pathology, and to guide additional work-up if necessary (e.g. imaging or biopsy). In the instances of entrapment and traumatic neuropathy, such as carpal tunnel syndrome, mild to moderate lesions will show slowing of latencies and conduction velocities across the lesions, indicating demyelination. More severe lesions show a reduction in amplitudes of the SNAP/CMAPs on NCS and abnormal spontaneous activity on EMG, indicating axon loss.

There are benefits and limitations of electrodiagnostic studies. Electrodiagnostic studies can reliably detect severity of nerve lesions, have been correlated with clinical symptoms and surgical outcomes in certain entrapments, can show re-innervation of nerves (healing), and can easily screen for other causes (e.g. radiculopathy). However, electrodiagnostic studies are painful, operator dependent, cannot give structural information about the nerve, and occasionally fail to localize the lesion.

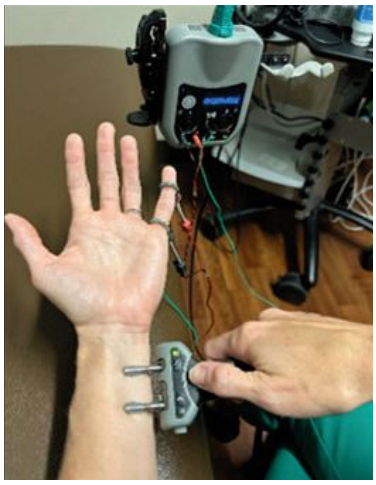


Image 1: Sensory nerve conduction study setup.

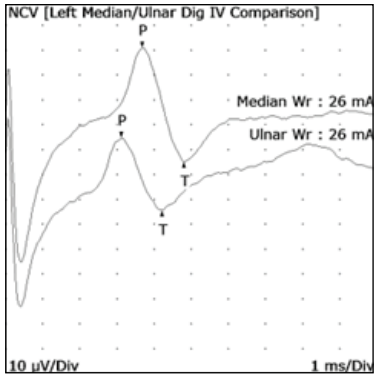


Image 2: Sensory nerve action potential (SNAP) tracing.

Basics of Ultrasound

Ultrasound transducers use piezoelectric crystals to convert electrical energy into sound waves of varying frequencies, which are transmitted through the skin and into tissues. The sounds waves reflect and refract back to the transducer where they are interpreted by a computer to produce an image. Various tissue types will interact and interfere with sound waves differently, resulting in unique characteristic appearances. For example, bone reflects a majority of the sound waves creating a bright or 'hyperechoic' image, while fluid allows sound waves to pass through creating a dark or 'hypoechoic' image. Nerves show a typical 'honeycomb' appearance when viewed in short axis, with the hyperechoic areas indicating epineurium and perineurium (the connective tissue surrounding nerve fascicles) and the hypoechoic areas representing axons. Muscles viewed in short axis show a typical 'starry night sky' appearance, where hyperechoic tissue represents epimysium and perimysium (the connective tissue surrounding muscle fibers), and hypoechoic tissue represents muscle fibers.

Integration of Ultrasound with Electrodiagnostics

Electrodiagnostic studies, although the preferred method for detecting entrapment and traumatic neuropathies, fail to define structural abnormalities that may be causing the pathology. Ultrasound is unreliable in defining severity in nerve entrapments but complements functional electrodiagnostic data with anatomic information. The goals of neuromuscular ultrasound are to provide structural data about nerve, muscle, and pertinent adjacent tissues (e.g., a cyst compressing a nearby nerve), provide dynamic information that can't be obtained with other static imaging modalities (e.g., visualizing ulnar nerve subluxation at the elbow), and provide additional confirmation in the localization of a lesion if electrodiagnostics alone are unable.

As ultrasound technology has advanced, with smaller, more portable instruments and improved image resolution, ultrasound has become increasingly suited to integration with electrodiagnostic studies. Other imaging modalities, such as MRI, are impractical for use in electrodiagnostic laboratories due to limitations including size, cost, time required, and inability to perform dynamic imaging techniques.[2] Electrodiagnostic machine manufactures have thus integrated ultrasound machines directly in with electrodiagnostic equipment, allowing NCS/EMG and ultrasound data to be gathered in the same study and generated into the same report, simplifying the logistics of performing and reporting the studies.

Research supporting the usefulness of the integration of ultrasound with electrodiagnostic studies is increasing.

In cases of fibular neuropathy, ulnar neuropathy, and median neuropathy identified on electrodiagnostic studies, ultrasound identified additional structural causes that changed surgical approaches (cysts, fibrosis, anomalous muscles, vascular conflicts, bursitis).[3] Ultrasound identified intraneural cysts compressing the fibular nerve at the fibular head, leading to a change in surgical approach.[3] In cases of tibial neuropathy, radial neuropathy, sural neuropathy, and median neuropathy identified on electrodiagnostic studies, ultrasound identified unusual neurofibromas confirmed by surgical exploration that changed the management in these cases.[3] Ultrasound was also useful in cases where nerve conduction studies and EMG had difficulty localizing lesions.[3]

Case Studies

Case 1

A 15-year-old female presented to the electrodiagnostic lab for intermittent numbness and tingling in the right-hand digits 4-5 for one year. The patient had been pitching in competitive softball since age six. She admitted to elbow pain but denied any popping sensation at the elbow, and no ulnar nerve subluxation was noted in the referring physician's physical exam. Electrodiagnostic studies revealed decreased conduction velocity across the elbow of the ulnar CMAP (40 meters per second), with otherwise normal studies. Ultrasound of the ulnar nerve was performed from the axilla to the wrist, and the cross-sectional area of the nerve was normal in the forearm and arm (7mm^2) but enlarged in the ulnar groove (15mm^2), confirming the diagnosis of cubital tunnel syndrome. During dynamic ultrasound examination, the patient's elbow was ranged into flexion revealing the ulnar nerve to completely dislocate over the medial epicondyle (Images 3 and 4). Research suggests there is increased sensitivity of detecting ulnar nerve instability on dynamic ultrasound compared to physical examination.[4] Detecting ulnar nerve instability is important in determining treatment options and/or surgical approaches.[5]

Case 2

A 24-year-old otherwise healthy patient presented to the electrodiagnostic laboratory with a one-year history of left-hand numbness and tingling digits 1-4, worse at night and with driving. Electrodiagnostic studies revealed increased SNAP peak latencies across the wrist with preserved amplitudes, increased CMAP distal latencies across the wrist with preserved

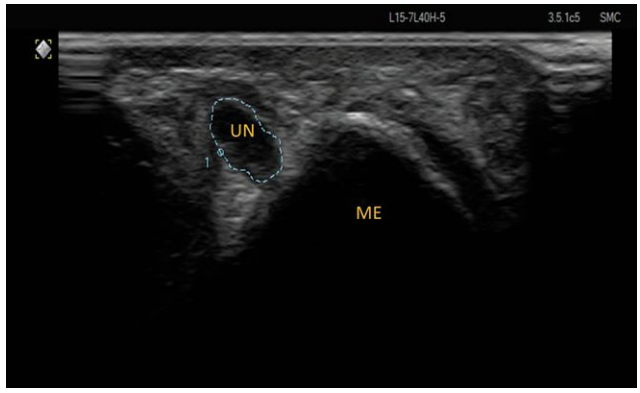


Image 3: Normal ultrsound of ulnar nerve (UN) in medial epicondyle (ME) at the elbow in short axis view.

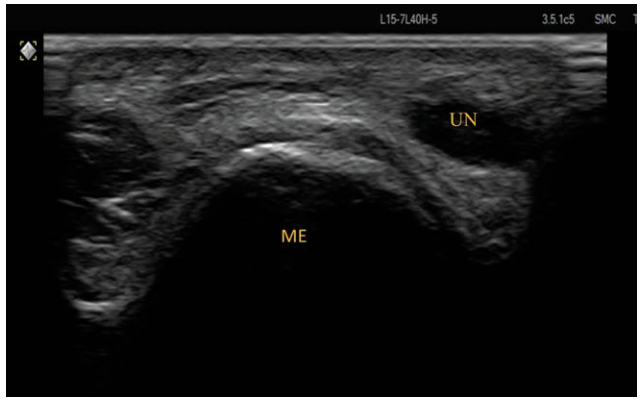


Image 4: Ultrsound of ulnar nerve (UN) dislocation over the medial epicondyle (ME) in short axis view.

amplitudes, and a normal EMG, consistent with a moderate left carpal tunnel syndrome. Ultrasound was performed of the median nerve to look for structural abnormalities, particularly since this patient was young and had no significant medical co-morbidities that would predispose her to carpal tunnel syndrome. The median nerve cross sectional area was obtained in the forearm (6mm^2) and in the carpal tunnel (15mm^2), which confirmed the presence of carpal tunnel syndrome on electrodiagnostic studies. In the forearm, an anechoic pulsatile mass with Doppler flow was present and accompanied the median nerve into the carpal tunnel, consistent with a large persistent median artery (PMA) (Images 5 and 6).

A PMA generally becomes atretic before birth but can persist and be present in up to 26% of asymptomatic individuals.[6] In cases where it is large, it can contribute an important extent to the hand; an enlarged, thrombosed, aneurysmatic, or calcified median artery may contribute to median neuropathy at the carpal tunnel. Thrombosis of the PMA may cause acute median neuropathy in the carpal tunnel, sometimes requiring surgical excision of the

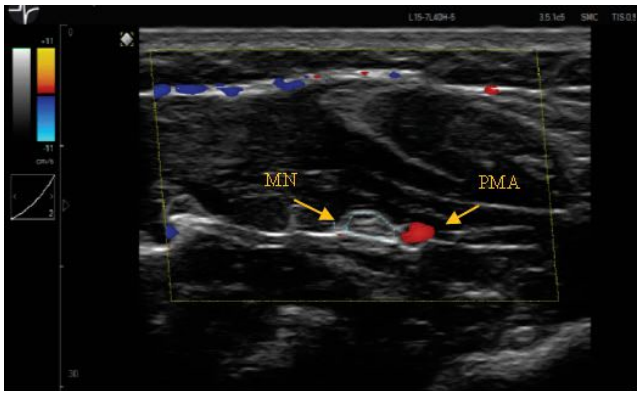


Image 5: Ultrasound of median nerve (MN) in the forearm with persistent median artery (PMA) in short axis view.

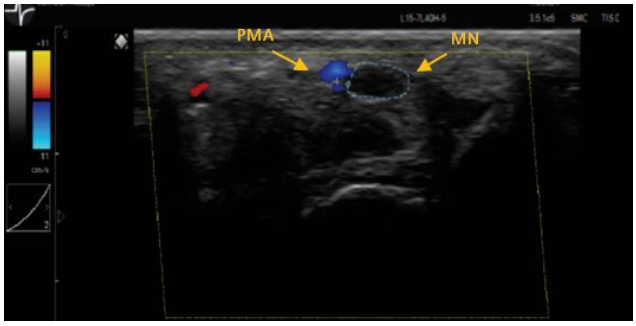


Image 6: Ultrasound of the median nerve (MN) and persistent median artery (PMA) in the carpal runnel in short axis view.

thrombosed segment.[7] Ultrasound allows physicians to assess for anatomical variants that may have been otherwise unknown if relying only on a functional physiologic test like an electrodiagnostic exam to diagnose a condition like carpal tunnel syndrome. Prior cadaveric dissections have demonstrated a multitude of anatomical variants that exist inside of the carpal tunnel with some individuals having anywhere from two to five concomitant anatomical variants in a single carpal tunnel.[8]

Case 3

A 67-year-old female presented to the electrodiagnostic lab with left wrist drop and numbness over the posterior forearm and hand following a left mid-shaft humerus fracture status post internal fixation four months prior. Electrodiagnostic studies demonstrated absent radial CMAP and SNAP studies. EMG showed muscle membrane instability in a left radial nerve distribution with no motor units present, consistent with severe radial neuropathy in the arm. Ultrasound of the radial nerve showed it to be enlarged at the spiral groove of the humerus (but in-continuity) with adjacent bony fragments (Image 7). In this case, electrodiagnostic studies failed to fully localize the lesion and could not discern if

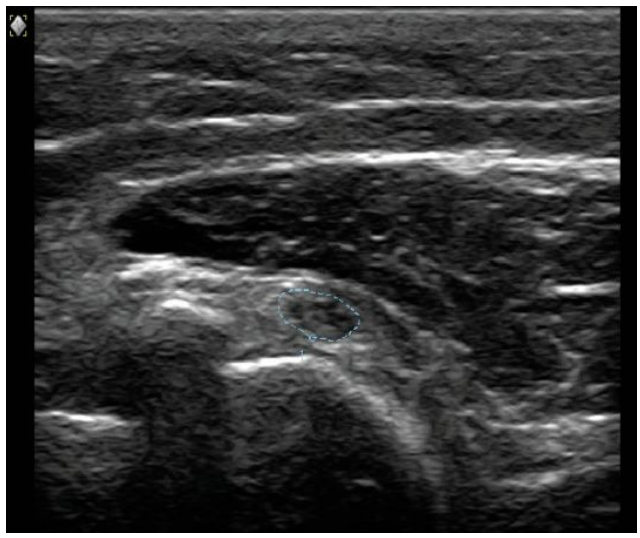


Image 7: Ultrasound of the radial nerve (RN) at the spiral groove in short axis view.

the nerve lesion was complete due to a loss of nerve continuity (i.e., complete transection) or not. The use of ultrasound can demonstrate an intact radial nerve after a traumatic humeral injury which may alter the course of management from being a surgical exploration vs conservative management.[9]

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Disclosure

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Physicians and Disabilities

by Vovanti Jones, MD & Blake Dryer, MD

School of Medicine
University of Missouri

Enhancing medical education regarding disability and ableism can improve care for patients with a diverse array of impairments.



Vovanti Jones, MD, (pictured) is an Associate Professor in the Department of Physical Medicine and Rehabilitation at the University of Missouri-Columbia School of Medicine, Columbia, Missouri, USA. Blake Dryer, MD, is a Resident, at the University of Missouri-Columbia School of Medicine, Columbia, Missouri, USA.

Abstract

The care of patients with disabilities remains a significant challenge for the healthcare system. This challenge is made worse by gaps in education and awareness among medical providers. Despite the passage of the Americans with Disabilities Act (ADA), which seeks to protect the rights of individuals with disabilities, healthcare providers often struggle to deliver comprehensive patient centered care to this diverse population. This article explores the relationship between medical providers and patients with disabilities, highlighting the importance of individualized care and recommending strategies to improve healthcare delivery for these patients.

Introduction

Many health care providers can give a general definition for the word "disability," however, that definition often fails to cover the diverse range of impairments and needs of individuals living with a disability. In the United States (US), medical education is often inadequate when it comes to preparing students to deal with the complexities of treating patients with disabilities.[1] As such, medical providers need additional education to ensure their patients with disabilities receive quality and comprehensive care.

The Americans with Disabilities Act (ADA) defines a disabled individual as a person who has a physical or mental impairment that substantially limits one or more major life activities.[2] The ADA covers such a wide range of disabilities that each person requires individualized attention. For instance, an individual may have a visual or mobility impairment that can be effectively managed with durable medical equipment (DME) and therapy. However, another individual may have suffered a traumatic brain injury with cognition, communication, visual, and physical impairments requiring comprehensive medical care, home health services, and frequent follow up. These examples illustrate the wide range of disabilities seen in our communities. According to the CDC, 31% of Missouri adults live with a disability. This accounts for 17.8 billion dollars per year in healthcare spending equating to 39% of Missouri's healthcare spending.[3] As the population continues to age more people will be diagnosed with disabilities leading to a rise in and healthcare costs. Better understanding of this disabled patient population is essential for improving patient functions and quality of life.

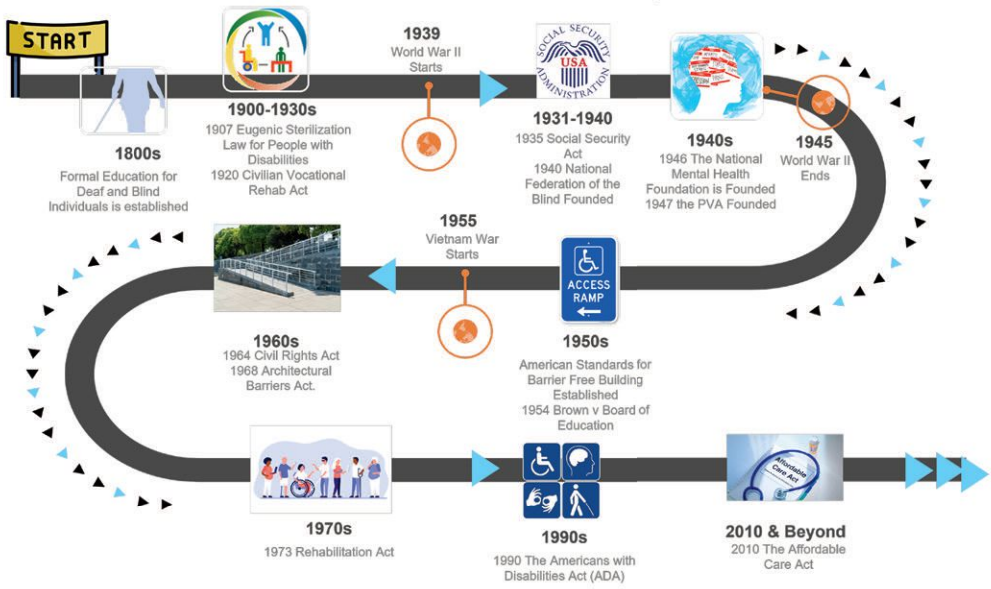


Figure 1. Timeline of Historical Milestones in Disability Health

Understanding the History of Disability in America

The fight for disability rights has been a long journey throughout American history. Members of the disabled community have challenged discrimination and pushed for the removal of barriers preventing access to all aspects of society.

Starting in the late 1800s the deaf and blind communities pushed to participate in formal education.[4] The creation of state residential schools for deaf students brought together a previously disadvantaged community resulting in the invention of Braille which helped to further opportunities for this population. Despite this progress, by the early 1900s, the Eugenic Sterilization Laws were enacted in more than 20 states to allow individuals with disabilities to be sterilized. In 1920 the Smith-Fess Act (also known as the Civilian Vocational Rehabilitation Act) established a vocational program that helped people with physical disabilities find work. Born from the need to rehabilitate soldiers returning from World War I, this act built upon earlier laws to assist disabled veterans. The National Federation of the Blind was founded in 1940 and fought to end discrimination against blind men in the workforce.

World War II created an explosion of the physically-disabled community. Due to advances in medicine, a much larger population of disabled soldiers were returning home than from previous wars. As the war efforts needed more products and manpower, previously established discrimination practices were temporarily placed aside. These changes led to the birth of the specialty of Physical Medicine & Rehabilitation and laid the foundation for the deinstitutionalization of people with a variety of disabilities.

Postwar veterans organized to call attention to the inadequacies of government programs including rehabilitation, medical benefits, and pensions. The Disabled American Veterans association and the Paralyzed Veterans of American (PVA) organization were formed during this time.[4]

Before the mid-twentieth century, people with disabilities were most often segregated from the rest of society due to the barriers of an inaccessible environment.[6] In the late 1950s/early 1960s, after lobbying by disabled veterans, the American Standards for Barrier Free Buildings were developed to improve access for individuals with mobility challenges. The Architectural Barriers Act (ABA) of 1968 addressed the physical design barriers or inaccessible buildings. It required that all federally funded buildings be designed with ramps, elevators, and other access features to allow individuals with physical disabilities to have unrestricted access to these facilities. The ABA was the first federal law in the mold to mandate physical access.

In 1954 *Brown vs. Board of Education* abolished school segregation, allowing students with disabilities

to be educated in public schools. The Civil Rights Act was passed in 1964. It prohibited discrimination based on race, sex, religion, and country of origin; however, people with disabilities were left out of its framework. Discrimination against people with disabilities was still rampant in the 1960s, especially in the workforce. It wasn't until the Rehabilitation Act of 1973 that provisions were put in place to prohibit discrimination in the workplace based upon disability.

On July 26, 1990, the American with Disabilities Act (ADA) was passed. This Act is the most comprehensive disability rights legislation in American history. The ADA created protections for people with disabilities in the areas of 1) barrier free access to public buildings; 2) equal employment opportunities; and 3) equal access to government services. The ADA extended the reach of anti-discrimination legislation to include private facilities and for public services. Over the years there have been some changes to the ADA including the ADA Amendment Act of 2008 which established a broader definition of disability to allow more access to members of the disability community. In 2010 the Affordable Care Act was signed into law. It is the first law to provide protection against discrimination for people with preexisting conditions for health insurance.

The disability rights movement has made huge strides in changing the way disabled people perceive disability and gaining civil rights protections under the law. Despite this, there are still gains to be made (Figure 1).

The Relationship Between Physicians and Patients with Disabilities

Medicine has always been intricately intertwined with the disabled population. Historically, medicine has taken an approach that prioritizes the authority of healthcare providers in decisions regarding patient care. This is especially noticeable in the disabled and chronic illness populations who often have the highest rates of interactions with medical professionals. Clinicians have substantial influence over the care and treatment of people with disabilities. It is important for the clinician to have the knowledge of what constitutes a disability, as this information is vital for providing appropriate patient care and benefiting the wider community. Lack of this knowledge can result in negative health outcomes of patients and lead to further discrimination.[5] In a 2019 Survey of physicians' perceptions of people with disability and their healthcare, only 40.7% of physicians were very confident about their ability to provide the same quality of care to patients with disability. Just 56.5% strongly agreed that they welcomed patients with disabilities into their practices. Almost one-fifth of physicians (18.1%) strongly agreed that the healthcare system often treated persons with disabilities unfairly.[6] In a different study focused on routinely identifying patients with disabilities in primary care, it was observed that directly asking patients about their disabilities can be difficult. This is often due to misunderstandings about what defines a disability, and the stigma related to specific disabilities.[7] Disability scholars often note several key areas for clinicians to address to expand their understanding of disability: 1) assumptions regarding quality of life; 2) ableism; 3) the differentiation between disability and disease; and 4) medical cost of managing a disability.

Clinicians have proven time and time again that they are poor predictors of quality of life.[8] In a 2019 survey of 714 practicing US physicians, 82.4% reported that people with significant disability have worse quality of life than nondisabled people.[9] Contact bias and limited perspectives may account for these results. Additional research shows that patients and clinicians view experiences differently, with patients generally more inclined to focus on positive aspects of their care. For example, a person with a spinal cord injury may view their identity across multiple factors while a physician might only see the patient during challenging moments holding their own preconceptions about the patient's abilities. This results in the "Disability Paradox" where people with severe disabilities report good or excellent quality of life when external observers would report poor quality of life.[10]

Ableism, the system of discrimination and societal prejudice against people with mental and physical disabilities based on the belief that typical (a.k.a. "normal") abilities are superior, is still prominent in healthcare.[16] Ableism is rooted in the idea that disabled people are broken and need to be fixed instead of accepted as a normal occurrence within society. Its application often relies on harmful stereotypes based on generalizations of people with disabilities that classify



Figure 2. Universal Design kitchen with a roll under electric stovetop and lowered microwave.



Figure 3. Accessible Adjustable height medical exam table.[19]

this population as "less than" the able population.[16] Disability ethicist James Cherney notes that "what makes medical ableism so dangerous and so insidious is that it often presents as 'common sense." For the physician, ableism can actively, and often unknowingly, undermine best practices resulting in negatively impacting healthcare outcomes. Ableist thoughts can hinder physician-patient communication and can increase the chances of harm. Physicians must be aware of this bias when treating patients.[17]

Disability does not always mean disease, illness, pain, and suffering. Physicians and society as a whole, will often conflate disability and disease under the shroud of internalized ableism. Many people with disabilities do not experience the suffering component that physicians often seek to prevent. You can be disabled and "healthy." It is essential for clinicians to recognize these differences and acknowledge that each patient's experience with their disability is unique. Care can vary significantly, even among individuals with the same disability.[17]

Accommodation for those with disabilities doesn't always entail higher costs. The concept of Universal Design in hospitals and clinics can ease the burden. "Universal Design is a concept in which products and environments are designed to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design."[18] A 2013 Stanford survey showed that 91.4% of the outpatient clinics surveyed did not have a height adjustable table or lift equipment. Twenty-six percent of clinics couldn't accommodate patients who couldn't self-transfer.[11] In a survey of 714 physicians with outpatient practices 35.8% of them reported knowing little or nothing about their legal responsibilities under the ADA and 20.5% could not correctly identify who pays for these accommodations.[12] Medical providers should educate themselves on accommodating patients, challenging the misconception that such adjustments always incur high costs. Embracing strategies like Universal Design can enhance accessibility and improve patient care (Figures 2 and 3).

Assessing Mobility, Disability, and Functional Changes

As adults age, their physical function—encompassing mobility tasks, activities of daily living (ADLs), and instrumental activities of daily living (IADLs)—, often declines, leading to a decrease in overall physical activity. This decline often results in negative outcomes such as depression, cardiovascular diseases and dementia.[13] This gradual but often unnoticed decline that can indicate the onset of clinically detectable physical function decline is referred to as "preclinical disability." People with "preclinical disability" are at a higher risk for progression to severe disability. Physicians need a basic understanding of durable medical equipment (DME) orders, assistive devices, and therapy services to support an aging patient population and ensure that declines in function are not overlooked.

Table 1. Adapted from PM&R Knowledge Now Non-prescription DME and Adaptive Devices[15]



Cane
- Inexpensive
- Portable
- Beneficial in space-limited settings
- Limited stability





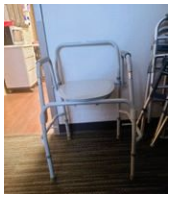
Walker (Standard or Hemi)
- Greater stability
- Seat and storage area allows for use outside home
- Reverse walkers can promote extended posture
- Standard and Reverse Walkers require bilateral upper body strength
- Hemi-walker for people that have hemiplegia



Manual Wheelchair
- Allows for independent living for those that can self-propel
- Requires significant upper body strength to steer and propel
- Difficult to use in space-limited settings
- Can be used by caregivers



Scooter
- Ability to travel longer distances faster
- More expensive
- Requires access to electricity to recharge
- Less portable depending on the type
- User must have good seated/truncal balance



Bedside Commode
- Can maintain independence
- Increases safety for toileting needs at night
- Can be stationary, wheeled, or with adjustable height
- Need to empty out if used at bedside



Toilet Frame
- Simple to install
- Provides increased stability to get on/off the toilet
- Can be used alongside raised toilet seat to decrease strength required to get on/off
- Not compatible with all types of toilets
- Can be unstable of not secured properly



Universal Cuff
- Inexpensive
- Allows patients with decreased grip strength to hold on to toothbrush, spoon, etc.
- Aid in grooming and eating independently



Reacher
- Come in varying handle grips and length
- Useful for individuals with limited upper and lower extremity mobility

Durable medical equipment is defined by Medicare as equipment that can: 1) withstand repeated use; 2) is used for medical reasons; 3) is used at home; and 4) is typically only useful to those with a disability or injury. For a device to be considered as DME, the equipment must improve the function of the patient, be deemed medically necessary, be safe to use in the appropriate environment, and be reasonably priced if not covered by insurance.[14] The most common DME orders written are for mobility purposes. These devices include walkers, canes, and wheelchairs. With an aging population in the United States, the number of falls can be expected to increase each year leading to more individuals with mobility disability. This will lead to an increased demand for mobility-related durable medical equipment.

Assistive devices differ slightly from DME in that they are not always medically necessary but have the primary focus on improving a patient's quality of life. An example of a simple assistive device is a rocker knife which can be placed in the food and rocked back and forth until the food is cut. This device can be used with one hand and assists individuals with hemiplegia or hemiparesis. Assistive devices are less likely to be covered by insurance but still equally as important in improving a patient's quality of life. Table 1 demonstrates some examples of DME and assistive devices.[15]

Physiatrists are in a unique position to help with proper DME and assistive devices given the comprehensive care they provide. They collaborate closely with physical, occupational, and speech therapists to address patients' needs effectively. These therapy professionals play a crucial role in the patient care team and should be utilized by all medical providers in every specialty when ordering DME/ assistive devices or when needing evaluations regarding a patient's functional ability.

Further research and education are needed to better understand the importance of prescribing proper DME and assistive devices to patients with disabilities. Improved communication among physicians, therapists, and patients can enhance function and quality of life for individuals with disabilities by ensuring they receive proper equipment.

Conclusion

Nearly all medical providers care for patients with disabilities. Enhancing medical education regarding disability and ableism can improve care for patients with a diverse array of impairments. As the aging population continues to increase, it is essential for medical providers to understand the complexities of disability and the importance of individualized care. By raising awareness and utilizing the right accommodations, healthcare providers can improve the quality of life for individuals living with disabilities.

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Disclosure

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Missouri State Medical Association
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OFFICIAL MINUTES & REPORTS

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Meet MSMA's 2025-2026 President

Brian D. Biggers, MD, FACS
Springfield, Missouri

Brian D. Biggers, MD, FACS, will serve as the President of the Missouri State Medical Association (MSMA) for the 2025-2026 term. He was formally installed on April 5, 2025, during the MSMA's 175th Anniversary and its 167th Annual Convention in Springfield, Missouri.

Dr. Biggers was born in Springfield, Missouri, and raised in the nearby town of Marshfield, Missouri, as the son of Kenneth and Sondra Biggers. He earned his bachelor's degree in biology from Southwest Missouri State University (now Missouri State University), where he received numerous accolades, including Outstanding Student in the College of Natural and Applied Sciences. He continued his education at the University of Missouri–Columbia, where he earned his medical degree and was honored as the Outstanding Student in General Surgery and Vascular Surgery. Dr. Biggers completed his surgical residency at the University of Missouri–Kansas City, where he was named Outstanding Chief Resident. He then pursued advanced training in Breast Surgical Oncology at Baylor University Medical Center in Dallas, Texas.

After completing his fellowship, Dr. Biggers returned to Springfield, Missouri, where he entered private practice with Crighton Olive Dunn Surgical Group for over 10 years. He then joined the Ferrell Duncan Clinic (now Cox Medical Group), where he has practiced for more than five years.

A committed advocate for organized medicine, Dr. Biggers has been a member of the Missouri State Medical Association since 2010 and served as president of the Greene County Medical Society. He is a Fellow of the American College of Surgeons and is also a member of several prestigious medical organizations, including the Society of Surgical Oncology, the American Society of Breast Surgeons, the American Medical Association, and the American Society of Clinical Oncology.

In addition to his clinical work, Dr. Biggers is dedicated to medical education. He serves as an Associate Professor at the University of Missouri and is the Clerkship Director for Surgery at the University of Missouri–Springfield Clinical Campus. Throughout his career, Dr. Biggers has served on numerous committees and boards and has been involved in church and community activities, including coaching youth baseball.

Dr. Biggers has been married to his wife, Abby, for nearly 25 years. Together they are the proud parents of three sons: Brayden, Grayson, and Kennon.

During his presidency of the MSMA, Dr. Biggers intends to focus on enhancing medical education, including funding and expansion for the state of Missouri. He is also committed to advocating for the protection of the scope of practice and improving access to quality healthcare for all Missourians. **MM**

Alliance Installs 2025-2026 President

Donna Corrado, RN
Mexico, Missouri



Without courage, wisdom bears no fruit."
- Baltasar Gracian

Donna Glasford Corrado, RN, Mexico, Missouri, was installed for a second term as the 2025-2026 Missouri State Medical Alliance President on April 5, 2025, in Springfield, Missouri, during the MSMA's Alliance Centennial year and its 101st Annual Meeting.

Born in Biloxi, Mississippi, and raised in Vandalia, Missouri, Donna graduated Deaconess Hospital School of Nursing in St. Louis. She married Joseph Corrado, MD, in 1976, and moved to New York, where he pursued residency in general and vascular surgery, and she worked on the medical-surgical floor of Albany Medical Center.

An opportunity arose to return to Missouri and fill a surgical gap in Mexico in 1982. With a family of six, Donna began volunteering in the community. She also began as president of the Audrain Medical Society (Auxiliary), chartering bylaws with the help of the MSMA Auxiliary leadership.

Donna continues to assist in her husband's busy practice. When the Audrain Auxiliary dissolved, Donna continued with the MSMA Alliance, contributing time and talents on standing committees or an elected office, culminating in the Presidency from 2006-2007. Attending and participating in the American Medical Alliance through the years and appointed to various committees, Donna has never sought an office at the national level, preferring to stay local, and continuing to help with MSMA and Alliance.

Donna is a recipient of the Sandy Mitchell Alliance Member of the Year award. Also, as the executive producer of "Code Blue" Resuscitating Rural Surgery, a documentary, she traveled the country with her daughter, Meredith, in a motorhome, minding the children, while the film was being shot and edited, and finally released and celebrated in 2014.

Accompanying her husband, the 2018-2019 President of MSMA, she traveled to most local and state meetings with him, carrying membership materials and promoting the Alliance for the state and the AMA.

The last few years have seen Donna working diligently to restore a full-service healthcare facility to her home town of Mexico. Currently, she is on the Healthcare Leadership committee and President of the Board of the Audrain Regional Medical Center.

Presiding as the MSMA Alliance president is a joy and a challenge. She wants to encourage the Direct Members (those without a county Alliance) to continue at the state level and contribute to their counties using simple, ready-made projects (like "Stop the Bleed," "Smoking Is NOT for Me," "Physician Family Day," or "National Doctor's Day") and giving recognition to the county medical societies.

"Cento Anni" a toast to 101 years! **MM**

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State of the Association: Presidential Address

by David L Pohl, MD
2024-2025 MSMA President

Welcome to all. I would like to present the status of the MSMA. There have been several milestones in the past year, not the least of which is an overall growth in membership numbers for the first time in over a decade of gradual decline. This is due in large part to the work of our office staff who have come up with plans and programs which have generated interest and support from the medical community, but also importantly from those of you who have energized involvement from the previous non-member segment of our profession. Many thanks to those who have stressed the importance of membership in organized medicine. Our increasing numbers give an added strength to our lobbying efforts.

A second item which advances our strength is our increasing ties with the Missouri Association of Osteopathic Physicians and Surgeons (MAOPS). Over the past year we have entered into a contractual agreement with MAOPS to lobby on their behalf. We have a strong mutual relationship of interests at the legislative level. Due to this agreement, in addition to our two "in-house" lobbyists (Rachel Bauer and Jacob Scott), we have been able to hire three contracted lobbyists (Rich AuBuchon, Trent Watson and Deanna Hemphill) which will vastly increase our ability to meet with legislators and attend multiple committee hearings (many of which are occurring simultaneously). This should further improve our ability to inform and educate legislators of our positions; and will exert a greater influence due to the larger group that we now represent.

Similarly, we are also now representing several specialty societies within the state regarding issues specific to their needs. Again, this will leverage our influence in the legislative process on multiple fronts. Our increasing influence, due to formal ties with the numerous facets of medicine on multiple fronts, means we will be able to have an even greater impact on specific items of interest to our membership. Additionally, since we will be able to lobby for these groups, this may free up many



Incoming MSMA President Brian Biggers, MD, presents outgoing MSMA President David Pohl, MD, with an award of appreciation for his service.

of the specialty societies from funding those efforts individually, thus allowing them to allocate their funds in other areas of specific interest to the members of their groups. As the back of the Jefferson Nickel and the Dollar Bill state, "E Pluribus Unum" (out of many, one), recognizing that we represent the "House of Medicine" in all its various facets. The corollary statement "United We Stand, Divided We Fall" emphasizes the importance of unity and collaboration.

A "non-medical" area of change (of which many may not know), is the renovation of our MSMA office headquarters in Jefferson City which is located across the street from the Governor's Mansion. As a result of several grants, we have been able to restore the office to much of its historically original appearance (including much appreciated updates to the modern conveniences of electricity, telecommunications, HVAC, and so forth). Thanks to the MSMA staff for their efforts, and to their tolerance of the disruptions, while this culturally important and functionally critical work was undertaken.

In conclusion, it is a pleasure to acknowledge the increasing vitality and influence of our Missouri State Medical Association.

Thanks to our members and to the staff of the MSMA for everything you do. **MM**

167th House of Delegates Resolution Actions & Decisions

Below are the resolutions and actions taken at MSMA's 167th (2025) House of Delegates. For more information, email advocacy@msma.org.

Resolution 1 - Bylaws Change - House of Delegates

Action: Amended Resolution Adopted

RESOLVED, that the MSMA Bylaws, Chapter III, be amended as follows:

Chapter III. House of Delegates

Section 16. Beginning in April 2025 and ending in May 2028, the Association's leadership may initiate and operate a pilot project to streamline and modernize Association governance. This may include, but is not limited to, the formulation of a new policy adoption process, evaluation of Association officers, sections, committees, and commissions, and other governance issues. During this three-year period, relevant bylaws addressing the House of Delegates, committees, sections, and other Association governance structures may be suspended. Association's leadership will periodically report changes to the leadership. This Section shall sunset on May 1, 2028.

Resolution 2 - Consent to Patient Recordings

Action: Referred to MSMA Council

RESOLVED, that MSMA support enacting legislation for Missouri to be an all-party jurisdiction requiring agreements of both parties before recordings can occur.

Resolution 3 - Interstate Sharing of PDMP Data

Action: Referred to MSMA Council

RESOLVED, that the Missouri State Medical Association works to have Missouri's PDMP participate in interstate data sharing and expedites this change as soon as possible.

Resolution 4 - PDMP Delegates

Action: Referred to MSMA Council

RESOLVED, that the Missouri State Medical Association works to quickly change the Missouri PDMP delegate status license requirement to be consistent with neighboring states' requirements or to a system of delegation that does not burden the providers in order to comply; similar to the process adopted in the previous Missouri voluntary PDMP.



MSMA thanks the members of the Reference Committee who provides the final report to the House of Delegates. Front row, L to R: Stephen Slocum, MD, Joe Corrado, MD, Betty Drees, MD, Hailey Van Ronzelen, and John Harger, MD.

Resolution 5 - Prohibiting Due Process Waivers

Action: Resolution Adopted

RESOLVED, that the MSMA draft a bill based on the American Medical Association's waiver of due process model legislation to be considered for the 2026 legislative session.

Resollution 6 - Prohibiting Private Equity Ownership of Health Care Entities

Action: Referred to MSMA Council

RESOLVED, that our Missouri State Medical Association create draft legislation that would proscribe future acquisition of healthcare entities by private equity firms in Missouri; and be it further,

RESOLVED, That the MSMA introduce a resolution proposing a national ban on the further acquisition of healthcare entities by private equity firms, and of divestment in those that currently exist, for consideration at the AMA House of Delegates.

Resolution 7 - Prohibiting the Corporate Practice of Medicine

Action: Referred to MSMA Council

RESOLVED, that our Missouri State Medical Association create draft legislation that would prohibit the corporate practice of medicine in Missouri.

Resolution 8 - Bylaws Change - AMA Delegation Term Limits

Action: Amended Resolution Adopted

RESOLVED, that the MSMA Bylaws, Chapter III, Section 11, be amended as follows:

Section 11. The House of Delegates shall elect Delegates and Alternate Delegates to the House of Delegates of the American Medical Association in accordance with the Constitution and Bylaws of that body. MSMA members may serve a maximum of eight years as an AMA Delegate; however, time served on an AMA House of Delegates Council, the AMA Board of Trustees, or the AMPAC Board of Directors will not count toward a Delegate's term limit. If the AMA Bylaws require the number of MSMA delegates and/or alternate delegates to be reduced, and if there is no delegate or alternate delegate who agrees to voluntarily withdraw, then the most recently elected delegate and/or alternate delegate who is not a medical student shall withdraw from the delegation.

Resolution 9 - Improving Epinephrine Access

Action: Amended Resolution Adopted

RESOLVED, that the MSMA support legislative and community efforts to diversify the available stock of epinephrine that can be administered in Missouri; and be it further,

RESOLVED, that the MSMA support legislation permitting any individual to administer epinephrine to a person experiencing anaphylaxis.

Resolution 10 - Improving Access to Sexual Assault Forensic Examiner Services

Action: Referred to MSMA Council

RESOLVED, that our MSMA advocate for expanded government funding to ensure sufficient sexual assault nurse examiners or otherwise qualified sexual assault forensic examiners; and be it further,

RESOLVED, that our MSMA advocate for the expansion of SANE training programs in Missouri through increased funding, promotion, and availability.

Resolution 11 - Supporting Syringe Service Programs

Action: Amended Resolution Adopted

RESOLVED, that the MSMA support legislation that legalizes the operation of syringe service programs in the state of Missouri.

Resolution 12 - Protections for Victims of Intimate Partner Violence

Action: Amended Resolution Adopted

RESOLVED, that our MSMA support legislation that prohibits mandatory disclosure of pregnancy status when filing for divorce.

Resolution 13 - Supporting IMG Parity

Action: Referred to MSMA Council

RESOLVED, that our Missouri State Medical Association adopt a policy supporting parity in the number of years of GME training required for IMGs and USMGs to obtain state medical licensure, and be it further,

RESOLVED, that our Missouri State Medical Association aggressively pursue, including by legislative means, parity in the number of years of GME training requirement for IMGs and USMGs for licensure, and report back the progress in one year.

Resolution 14 - Prenatal and Postpartum Care for Incarcerated Women

Action: Referred to MSMA Council

RESOLVED, that our MSMA recognize the benefit of consistent prenatal and postnatal care of incarcerated persons; and be it further,

RESOLVED, that our MSMA support community partnerships and state insurance programs to provide access to comprehensive medical care for incarcerated populations, including reproductive health care; and be it further,

RESOLVED, that our MSMA support bills that restrict shackling during prenatal care, labor and delivery, and the postpartum period; and be it further,

RESOLVED, that our MSMA support programs and training certificates for staff to address the distinctive health care needs of incarcerated female populations, including access to gynecological care and obstetric care; and be it further,

RESOLVED, that our MSMA support legislation that creates pathways for standard mandates of comprehensive reproductive health care in Missouri as set by professional organizations such as ACOG.

Resolution 15 - Addressing Misinformation in Artificial Intelligence

Action: Referred to MSMA Council

RESOLVED, that our Missouri State Medical Association support methods of decreasing bias and

misinformation in AI used in healthcare such as, but not limited to, implementing user feedback mechanisms, increasing the diversity of datasets used in AI training, and establishing departments for verifying AI quality control; and be it further,
RESOLVED, that our Missouri State Medical Association support policies outlining requirements for AI used in healthcare to disclose their capabilities and limitations.

Resolution 16 - Opposition to Insurance Caps on Anesthesia Coverage

Action: Resolution Adopted

RESOLVED, that the MSMA supports legislation prohibiting health carriers from denying coverage to patients for medically necessary anesthesia care rendered beyond an arbitrary predetermined time limit; and be it further,
RESOLVED, that our MSMA supports legislation prohibiting health carriers from denying physician reimbursement for medically necessary anesthesia care that exceeds an arbitrary predetermined time limit.

Resolution 17 - Creating an Opt-In System for the Paper Version of *Missouri Medicine*

Action: Referred to MSMA Council

RESOLVED, that our MSMA create an opt-in system for *Missouri Medicine*, through which MSMA members would only receive the electronic version of Missouri Medicine but would still have the option to opt-in to receiving a paper copy, beginning with the Jan/Feb 2026 issue.

Resolution 18 - Establishing a Task Force on Physician Collective Bargaining

Action: Resolution Adopted

RESOLVED, that MSMA establish a Task Force on Physician Collective Bargaining Movements to:
1. Study current trends in physician unionization and collective bargaining in the U.S., including emerging movements among employed physicians, residents, and fellows.
2. Assess legal, ethical, and professional implications of physician collective bargaining, including National Labor Relations Board (NLRB) policies, state laws, and employer responses.
3. Evaluate potential impacts on physician working conditions, job satisfaction, burnout, and the physician-patient relationship.
4. Identify lessons learned from existing physician unions and collective bargaining agreements to inform future discussions.
5. Provide recommendations on whether and how MSMA should engage in or support efforts related to physician collective bargaining and unionization advocacy; and be it further,
RESOLVED, that the Task Force shall report back its findings about physician collective bargaining by the July 2026 MSMA Council Meeting. **MM**

MSMA House of Delegates Votes on New Policies

The policies below were developed out of resolutions submitted by MSMA members to the House of Delegates. For the complete list of policies and the year adopted, please visit the MSMA member-only area at msma.org/governance. Log-in required.

Epinephrine Access

MSMA supports efforts to diversify the available stock of epinephrine and supports legislation allowing anyone to administer epinephrine to a person experiencing anaphylaxis. (2025)

Insurance, Anesthesia Coverage

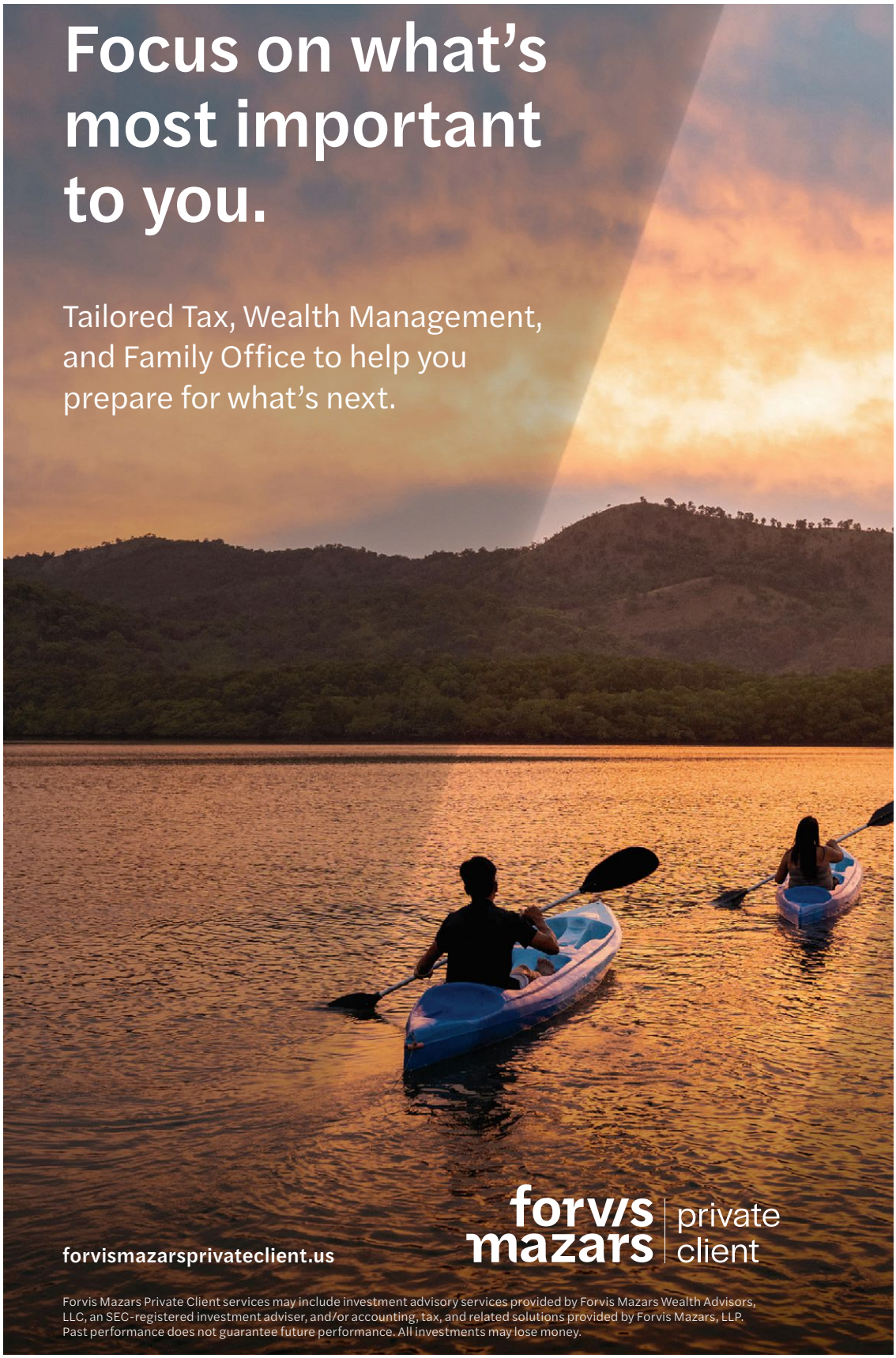
MSMA supports legislation prohibiting insurers from denying coverage and reimbursing physicians for anesthesia based on predetermined time limits. (2025)

Pregnancy in Divorce Proceedings

MSMA supports legislation prohibiting mandatory disclose of pregnancy during divorce proceedings. (2025)

Syringe Service Programs (Needle Exchange)

MSMA supports legislation that legalizes the operation of syringe service programs in Missouri. (2025) **MM**


Focus on what's most important to you.
Tailored Tax, Wealth Management, and Family Office to help you prepare for what's next.
forvismazarsprivateclient.us
forvis mazars | private client
Forvis Mazars Private Client services may include investment advisory services provided by Forvis Mazars Wealth Advisors, LLC, an SEC-registered investment adviser, and/or accounting, tax, and related solutions provided by Forvis Mazars, LLP. Past performance does not guarantee future performance. All investments may lose money.

Presidential Inauguration Address

by Brian D. Biggers MD, 2025-2026 MSMA President

Good evening! I would like my wife, children, family, and friends for being here tonight. I hope you understand why I went to Jefferson City so many times and that I inspire you to work hard advocating for what you believe in. I would like to recognize Representative Brian Seitz and his wife Vale. Thank you for being here tonight.

Thank you to the University of Missouri for my training and for allowing me to teach to our next generation of physicians with our medical students. I will always bleed black and gold. I want to acknowledge Dr. Charles Van Way, for choosing me as a resident at the University of Missouri – Kansas City all those years ago. I doubt Dr. Van Way ever thought he would have two of his former residents be MSMA President and Speaker of the MSMA House of Delegates at the same time. I want to acknowledge my original partners, Drs. John Crighton, Chapman Olive, and Charles Dunn, who provided the opportunity for my family to come back home and for me to practice in the community I grew up in and love. Thank you also to the Greene County Medical Society who jumped started this journey for me. Finally, but certainly not last, thank you to the leadership team at Cox Health for believing in physician leadership and empowering us to have a voice to elicit change.

There are many other friends and colleagues who have made it tonight but in respect to time I am unable to acknowledge everyone, but thank you.

Believe it or not, standing here today wasn't on my radar when I started my career. We can blame Jim Blaine for his persistent recruitment. I remember him talking to me about the Vice Councilor role many years ago. Honestly, I didn't know what I was getting myself into, but he thought that I would do well in organized medicine. Many years later here we are reminded that others often see potential in that we can't see ourselves.

One year, 365 days…together, what can we as an organization accomplish together during this time? A year seems long, but reality it goes by faster than we would like. Where do we start? In my opinion, it comes down to your priorities and where can we elicit the most change and impact.

First, let's first talk about the overall health of our state which affects both physicians and patients. Where do we rank? Here are the facts for Missouri from 2023 data. Missouri:

- 38th in healthcare in comparison to other states
- 40th when looking at healthy lifestyles
- 15th among the most uninsured
- Lowest tax on cigarettes in the United States. At the end of June 2024, the tax on cigarettes in Missouri was $0.17 per pack of 20
- One of the highest rates of tobacco usage in the nation
- One of the lowest retail sales taxes on marijuana in the nation

These last two are examples of products which negatively affect Missouri patients. It is also a potential source of revenue to put into the health of our state.

Second, many of us deal with challenges with the scope of practice. We continue to oppose nurse practitioners and CRNAs who want independent practice; optometrists who want to perform surgery; and pharmacists want to dispense vaccines and give modified prescriptions. One would think if someone wanted to do any of this, they would simply have gone to medical school.

As physicians, we have the experience of oversight and experience. We hold ourselves to ambitious standards and continue our medical education. We do not just worry about the minimum number of hours we need to fill a requirement, but the acquisition of knowledge. Don't get me wrong, these members of the healthcare team are essential to the entire healthcare team delivering care to patients, but



Dr. Pohl (R), applauds Dr. Biggers as incoming MSMA President.



Dr. Biggers and his family at the Presidential Reception.



MSMA members enjoying a reception sponsored by University of Missouri - Columbia School of Medicine Alumni Association.

they still need our oversight and leadership. What Patrick Mahomes is to the Chiefs, MSMA should be for the healthcare of this state.

Finally, I am very enthusiastic about medical education. I sincerely enjoy being the clerkship director for our third-year medical students. As an alum of the University of Missouri School of Medicine, I do not take this responsibility lightly. I view our medical students as an investment for the future of medicine, especially for Missouri. These students leave medical school with an average $170,000 in debt. The amount of debt is even greater for other medical schools. The system places students significantly behind financially. What can we do to decrease this burden?

We need more physicians in the state. We need to invest in training programs to train these students and to stay in Missouri after graduation. The legislature has already started to support the expansion of graduate medical education residency positions, and I hope to see this trend continue as well as continued medical school expansion.

I recall my first third-year student from our program here in Springfield, and what an impact we can make. Early in her third year when she started surgery, she said she would never go into surgery. She recently finished her surgical residency at Wichita and then her Breast Surgical Oncology fellowship at Washington University. She now practices in Missouri. She told me that I may have had some impact on this path. We need to remember the influence we can have on these students but also our state if they choose to practice medicine here.

If one is not part of the solution, then he or she is part of the problem. As physicians we must be engaged. We must be the leaders to drive healthcare not only for our facilities, but for our state.

In life we can be one of three things: inactive, reactive, or proactive. As physicians, now is the time to be proactive by taking the initiative to create change. Together we can move toward improvement and excellence in the health of our state. **MM**

Recipients of the 50-Year Physician Pin

Twenty-six physicians were recognized with their 50-Year Physician pin award during MSMA's Presidential Inauguration. Congratulations to all our 50-Year Pin recipients!

- Robert A. Brennan, Jr., MD – St. Louis
- James E. Bright, MD – Springfield
- David A. Caplin, MD – St. Louis
- Marco A. Castaneda, MD – Chesterfield
- Milamari A. Cunningham, MD – Columbia
- R. Steve Foster, MD – Sedalia
- Victoria Gunn, MD – Jefferson City
- Talia E. Haiderzad, MD – Poplar Bluff
- Marilyn F. Johnston, MD – Kirkwood
- Norman P. Knowlton III, MD – Springfield
- Shannon M. Kraft, MD – Kansas City, KS
- Richard Levine, MD – San Antonio, TX
- Robert D. Lewis, MD – St. Louis
- Patrick F. Majors, MD – St. Louis
- William G. Marietta, MD – Cape Girardeau
- Emily Militzer, MD – Benton
- Joseph J. Muscato, MD – Columbia



50-Year Recipients, L to R: Norman P. Knowlton III, MD, Milamari A. Cunningham, MD, MSMA President David Pohl, MD, Jo-Ellyn M. Ryall, MD, Stephen G. Slocum, MD, and Roger Schoenfeld, DO.

- Mary S. Muscato, MD – Columbia
- Edward A. Puro, MD – St. Louis
- Ronald L. Robinson, MD – Collierville, TN
- Lawrence A. Rues, MD – Leawood, KS
- Jo-Ellyn M. Ryall, MD – St. Louis
- Roger Schoenfeld, DO – Joplin
- Thomas E. Shine, MD – Florissant
- Stephen G. Slocum, MD – Chesterfield
- L. Paul Stewart, MD – St. Louis **MM**

Credentials and Appointments

The 167th Annual Convention of the Missouri State Medical Association was held April 4-6, 2025, at the University Plaza Hotel, Springfield, Missouri. M. Laurin Council, MD, St. Louis, presided as Speaker of the House of Delegates. Parliamentarian was Jo-Ellyn Ryall, MD, St. Louis.

The Committee on Credentials announced that there were 17 Officers, 23 Councilors, and 49 Delegates in attendance for the Opening Session of the House of Delegates.

This report and the minutes of the 166th Annual Convention as published in the May/June 2024 issue of *Missouri Medicine* were approved.

At the Second Session of the MSMA House of Delegates, the Committee on Credentials reported that there were 18 Officers, 24 Councilors, and 55 Delegates in attendance.

Reference Committee members were: Stephen Slocum, MD, 3rd District – Chair; Betty Drees, MD, 7th District, Joseph Corrado, MD, 5th District; John Harger, MD, 8th District; and Hailey VanRonzelen, Kansas City University.

The MSMA Nominating Committee members were: Edmond Cabbabe, MD, 3rd District – Chair; Barbara White, DO, 2nd District; Martin Willman, MD, 4th District; Jennifer Powell, MD, 5th District; David Barbe, MD, 6th District; George Saleh, MD, 7th District; James Rogers, MD, 8th District; David Chalk, MD, Organized Medical Staff Section; Sara Hawatmeh, MD, Young Physician Section; Deepu Sudhakaran, MD, International Medical Graduate Section; Carlin Ridpath, MD, Women Physicians Section; Kelly Schmidt, MD, Resident and Fellow Section; and Taylor LaValle, Medical Student Section. **MM**

MSMA Elects Leadership: 2025-2026

OFFICERS

President
Brian Biggers, MD, Springfield

President Elect
Kevin Weikart, MD, Lake St. Louis

Secretary
Ellen Nichols, MD, Joplin

Treasurer
Christopher Swingle, DO, St. Louis

Immediate Past President
David Pohl, MD, St. Louis

1st Vice President
David Haustein, MD, Springfield

Honorary Vice President
Milamari Cunningham, MD, Columbia

Honorary Vice President
Norman Knowlton, III, MD, Springfield

Speaker
Laurin Council, MD, St. Louis

Vice Speaker
George Mansour, MD, St. Louis

COUNCILORS

Council Chair (7th District)
Joanne Loethen, MD, Kansas City

Council Vice Chair, (3rd District)
Elie Azrak, MD, St. Louis

1st District
Chakshu Gupta, MD, St. Joseph

2nd District
Hossein Behniaye, MD, Hannibal

3rd District
Erin Gardner, MD, St. Louis
Jenny Page, MD, St. Louis
Inderjit Singh, MD, St. Louis

4th District
Keith Ratcliff, MD, Washington

5th District
Lisa Thomas, MD, Columbia
Amy Zguta, MD, Columbia

6th District
Dorothy Munch, DO, Poplar Bluff
Lirong Zhu, MD, Clayton

7th District
Amy Patel, MD, Kansas City
Fariha Shafi, MD, Overland Park, KS

8th District
David Kuhlmann, MD, Sedalia
Timothy Swearengin, DO, Springfield

Organized Medical Staff Section
Peggy Barjenbruch, MD, Mexico

International Medical Graduate Section
Louis DelCampo, MD, Springfield

Young Physician Section
Rachel Kyllo, MD, Arnold

Women Physicians Section
Adriana Canas-Polesel, MD, St. Louis

Resident & Fellow Section
Jay Devineni, MD, Columbia

Medical Student Section
Taylor La Valle
University of Missouri - Springfield

VICE COUNCILORS

2nd District
Barbara White, DO, Hannibal

3rd District
Ramona Behshad, MD, St. Louis

4th District
Matthew Meier, DO, Lake St. Louis

5th District
Jennifer Powell, MD, Osage Beach

7th District
Sarah Florio, MD, Lee's Summit

8th District
John Harger, MD, Clever

International Medical Graduate Section
Deepu Sudhakaran, MD, Chesterfield

Young Physician Section
Sara Hawatmeh, MD, St. Louis

Women Physicians Section
Carlin Ridpath, MD, Springfield

Medical Student Section
Bethany Baumgartner
Kansas City University

AMA DELEGATES & *ALTERNATE DELEGATES

Elie Azrak, MD, St. Louis
Peggy Barjenbruch, MD, Mexico
Edmond Cabbabe, MD, St. Louis
Joseph Corrado, MD, Mexico
Betty Drees, MD, Kansas City
Charles Van Way, III, MD, Kansas City

*George Hruza, MD, Chesterfield
*Ravi Johar, MD, Chesterfield
*Joanne Loethen, MD, Kansas City
*Lacey Raper, University of Missouri-Columbia

AMA PAST PRESIDENT

David Barbe, MD, Mountain Grove

ALLIANCE

President
Donna Corrado, Mexico

President Elect
Gill Waltman, St. Louis

MM

Summary of Council Actions: 2024-2025

Meeting of April 7, 2024 – Renaissance St. Louis Airport Hotel

Kevin Weikart, MD, Lake Saint Louis, was elected Chair of Council; Joanne Loethen, MD, was elected Vice Chair of Council; M. Ellen Nichols, MD, Joplin, was elected Secretary; Elie Azrak, MD, St. Louis, was elected Treasurer.

Meeting of July 14, 2024 – Courtyard by Marriott, Jefferson City, Missouri

Encouraging young physicians to join their voices in organized medicine, MSMA announced a new membership dues schedule at its July meeting in Jefferson City. Second- and third-year practice physicians will see a dues decrease and first-year practice and new license physicians are free.

In other membership news, MSMA urges physicians to talk to a non-member colleague and invite them to use the Summer Special rate to join MSMA. For a recruitment tool, use the recent Legislative Review that was mailed to all members and can be found at www.msma.org/advocacy. Or you can get paper copies by emailing advocacy@msma.org. Recruit now! The Summer Special ends August 31; some restrictions apply. MSMA also invites all members and non-members to join in for the bi-monthly "MSMA Presents" on Sunday evenings. In July, we hosted a discussion with Heidi Miller, MD, CMO, of the Department of Health and Senior Services regarding residency slots and GME funding.

Another useful gizmo is the SMS texting service available through our member management software that allows members to sign up for text alerts.

Advocacy

David Pohl, MD, MSMA President, reported that the advocacy team has been traveling throughout the state, meeting with legislators in their home districts, and that MMPAC will be sponsoring fundraisers throughout the summer. Watch your ePN emails for details. He encouraged everyone to join in on their local legislator's visit.

MSMA member physician **Lisa Thomas, MD**, District 5 Councilor, serves in the House of Representatives and will face a primary opponent in August, as well as a general election opponent in November. **George Hruza, MD**, is also running for the House, and everyone is encouraged to support their campaigns.

The annual Healthcare Advocacy Workshop on October 12 will be held in conjunction with the Council Meeting in Jefferson City and co-sponsored by MAOPS. Registration and details can be found in this issue of *Progress Notes*. MMPAC will also sponsor a fundraiser dinner that evening for Cindy O'Laughlin of northeast Missouri, the incoming presumptive President Pro Tem of the Senate. And save the date: Physician Advocacy Day at the Capitol will be held on March 4, 2025, in Jefferson City.

The Council acted on Resolutions 7, 15, 19 and 21 from the House of Delegates based on recommendations from the Legislative Committee. The Legislative Committee also discussed a policy proposal related to radon inspectors, SAFE CARE APRNs and office-based surgical procedures.

Annual Convention

Please join us for MSMA's 175th Annual Convention to be held April 4-6, 2025, at the University Plaza Hotel in Springfield, Missouri, inaugurating **Brian Biggers, MD**, a general surgeon from Springfield. The CME Committee is working on topics for the four general sessions. Registration, hotel reservations, and the preliminary schedule can be found online.A House of Delegates Governance Committee is investigating ways to streamline the Convention to allow for more participation. MSMA's 2026 Convention will be at the Hilton Doubletree in Chesterfield, Missouri, on April 10-12, and Kansas City will host in 2027.

Education

MSMA thanked its CME providers for 30-plus years of high-quality continuing education for Missouri physicians throughout the state and

your community. MSMA made the difficult decision to discontinue its accreditation program and will no longer accredit state providers of CME. While MSMA is withdrawing as a recognized state medical society and will no longer be an accreditor, providers and organizations will have the opportunity to continue to offer accredited CME through the ACCME.

Foundation

For the 2025 cycle, MSMA is reaching out to our medical schools to identify qualifying students to receive Foundation scholarships. Those scholarships, which total $330,000 this year, will be awarded this month.

Alliance

Alliance President Donna Corrado highlighted awards and honors from both the Annual Meetings of the MSMA and AMA Alliance. She and MSMAA President Elect Gill Waltman ceremonially presented a check to the Missouri State Medical Foundation for $7,675, representing funds raised by the Alliance in the past year.

Physicians Health Program

Missouri Physicians Health Program has begun to expand its services to non-physician healthcare professionals. Donations to MPHP can be made via the donation box on the next dues invoice.

Medical Student Section

The Medical Student Section is working on a system for reviewing students' resolutions before they are formally submitted and would like physicians to be involved in the process in a mentorship role.

Appointments

- The Council accepted the following Councilor appointments:
- Commission on Medical Economics: **David Kuhlmann, MD**
- Commission on Continuing Education: **Louis DelCampo, MD**
- Commission on Public Health: **Lirong Zhu, MD**
- Physicians Health Committee: **Lisa Thomas, MD**

AMA

Elie Azrak, MD, who offered an overview of the activities of the Missouri delegation to the American Medical Association, thanked **Charles Van Way III, MD**, for his report on the proceedings of the AMA Annual Meeting, which appears in the July/August issue of *Missouri Medicine*.

Meeting of October 13, 2024 – Courtyard by Marriott, Jefferson City, Missouri

President **David Pohl, MD**, welcomed everyone. He spoke about the virtual series, "MSMA Presents," which has been moved back to Wednesday evenings. His recent travels have included a visit to Kansas City University's Joplin Campus, where he participated in their medical school's White Coat ceremony. He also traveled to Springfield to celebrate Physician Family Day with members of the Greene County Medical Society at Dickerson Park Zoo.

Advocacy

With the 2025 legislative session coming soon, Rachel Bauer and Jacob Scott have been traveling around the state, visiting legislators in their hometowns. Everyone was encouraged to sign up for the Doctor of the Day program, as well as Physician Advocacy Day, which MSMA will once again co-host with MAOPS on Tuesday, March 4, 2025.

The Committee discussed combining Resolutions 19 and 21, and recommends adoption of an amended resolution.

The Committee discussed Constitutional Amendment No. 3 that will appear on Missouri's November ballot; no position was taken.

Membership

Member recruitment and retention efforts are ongoing. Physician-to-physician recruitment is best, and Dr. Pohl encouraged members to have a "two-minute speech" ready when an opportunity arises to engage a non-member. Active member numbers are up for the first time in ten years. Dr.

Pohl urged all members to consider reactivating their component societies.

MSMA has an agreement with Resolve Physician Agency, in which members receive a discount on contract review. The Board of Healing Arts has asked that everyone update their contact information online when renewing their license. MSMA will work on providing a list of physicians for volunteer positions on the Board.

The Department of Health and Senior Services will provide MSMA with a preliminary presentation on solutions to the physician workforce issues. DHSS will also bring two legislative proposals to the governor: office-based surgery center language similar to that from the 2024 session and putting the new GME funding program in statute.

House of Delegates

The Committee has been meeting over the past two years to discuss ways to replace the current form of governance. After Council review, a bylaws change will be introduced at the 2025 House of Delegates that calls for a three-year pilot project that would eliminate the House of Delegates and make the MSMA Council the ultimate arbiter of policy. There was lengthy discussion of the merits of the proposal in terms of broadening representation in the policy-making process. Several questions and concerns were addressed.

Medical Economics

Medical student Lacey Raper informed the group about the resolution review process that the Medical Student Section has developed. This process will control the number and quality of student resolutions, as well as foster mentoring relationships between students and practicing physicians.

Consent Calendar

- Report of the Commission on Continuing Education
- Report of the MSMA Delegation to the AMA
- Report of the Missouri Physicians Health Program
- Report of the Membership Committee

Alliance

The MSMA Alliance will once again offer the Holiday Sharing Card program to collect contributions for the Missouri State Medical Foundation to fund medical student scholarships. **Gillian Waltman**, Alliance President, offered details of the many levels of participation available to Alliance members. She also spoke about the AMA Alliance annual meeting format, which entails having business meetings ahead of the meeting, allowing more time for socializing and interesting activities. **Betty Drees, MD**, emphasized the importance of the work that the Alliance does, and encouraged all spouses to join.

Meeting of January 25, 2025 – via Videoconference

David Pohl, MD, reported on his recent travels as MSMA President. He has visited the Boone County Medical Society meeting with Jacob Scott, and the Kansas City Medical Society meeting with Rachel Bauer. He plans to attend the St. Louis Metropolitan Medical Society meeting and gala on February 1 and the Bothwell Regional Medical Staff meeting on February 5.

The legislative session has begun, and MSMA lobbyists are actively involved in analysis of proposed legislation. MSMA is collaborating with MAOPS in our advocacy efforts, giving us strength in numbers, including the Doctor of the Day program as well as the Physician Advocacy Day scheduled for Tuesday, March 4, at the Capitol.

MSMA is working to build membership and has seen some increases. Please reach out to your colleagues and let them know of the many ways that they can be involved in MSMA – word of mouth is the best recruitment method.

Advocacy

The Committee approved a letter to be sent to the Rolla City Council in opposition to an ordinance that would allow criminal and civil penalties for physicians who provide otherwise

legal healthcare services to women.

The Council received an update on SB 83, relating to collaborative practice agreements for the Safe Care Act APRNs. The Safe Care APRNs want to eliminate collaborative practice agreements, but physicians are opposed to setting apart different groups of nurses or specialties. MSMA will direct oue lobbyists to protect collaborative practice agreements.

Alternate paths to licensure for international medical graduates were discussed. There is currently no legislation regarding this issue, but it is anticipated that legislation will be coming and MSMA wants to have a role in shaping it.

Sarah Wilson, a nurse formerly of the Missouri Hospital Association, has been named director of the Missouri Department of Health and Senior Services.

Resolution 7 – Unmatched Medical Graduates, which has now been discussed and evaluated at the AMA level, is not adopted.

MSMA Legislator of the Year award will be presented at the Physician Advocacy Day on March 4 to Senator Cindy O'Laughlin, the President Pro Tem of the Missouri Senate.

CME

The VOC online CME program will start in a few weeks. Other associations who offer the VOC program have received significant non-dues revenue from it. MSMA can receive non-dues revenue as well, for any physician who signs up.

House of Delegates

MSMA received an update on a pilot project to shorten the Annual Convention and increase member participation, which will be implemented at the conclusion of this year's meeting. **George Hruza, MD**, detailed the Committee's work on revamping the processes for resolutions and the House of Delegates, with the goal of streamlining and garnering greater participation. The Committee recommends a three-year pilot project, beginning at the conclusion of the Annual Convention in 2025 and ending in May 2028, to improve and modernize the process. Proceeding with the pilot project would require suspension of the bylaws, which would then be amended at the end of the three-year period if the new model is adopted.

Closings

The operations of the MSMA Insurance Agency and the Missouri Physicians Health Program will cease, with both being completed later this year. Beginning last October, participants in the MPHP program were being moved to the MU physicians health program. Some employees of the MPHP have since started a program on their own for participants in the St. Louis area.

The Physicians Health Foundation board still exists and will seek other opportunities to support physician wellness.

Consent Calendar

- Report of the Commission on Continuing Education
- Report of the Actions and Recommendations on Resolutions from the 2024 Annual Meeting
- Report of the Publication Committee and Editorial Board
- Report of the MSMA Delegation to the AMA

Alliance

Gill Waltman offered the report on behalf of Donna Corrado. The Alliance has added several new physician members. During her year as President, Donna Corrado has traveled to the county Alliances who are still active, including the women's shelter visit in St. Louis. The Alliance has raised $8,800 this year for the Missouri State Medical Foundation, mostly through the Holiday Sharing Card; Mrs. Waltman thanked all who contributed. She reported that Angela Zylka, a long-time Alliance member who was active at both the local and state levels, had passed. Several Alliance members plan to attend the meeting in Springfield in April. They are planning a fall conference for September. **MM**

Reports of the Delegate Handbook: 2024-2025

Report of the Secretary

The Missouri State Medical Association had 4,834 members at the end of the 2024 dues year (August 31, 2024). This was a net gain of 272 members from our membership of 4,562 as of August 31, 2023. Following is a breakdown according to classification.

Year	Students	Residents	Active	Honor	Total
2023	1,776	762	1,744	280	4,562
2024	1,893	597	2,037	307	4,8,34

The number of member deaths reported during 2024 totaled seven.

The Committee on Nominations, which is appointed by the President, from the House of Delegates, must submit nominations for the following offices:

Vice President to fill the expired term of Carlin Ridpath, MD, Springfield.

Speaker and Vice Speaker to fill the expired terms of Laurin Council, MD, St. Louis; and George Mansour, MD, St. Louis.

Four Delegates and one Alternate Delegate to the AMA to fill the vacancies created by the expiration at the conclusion of the 2025 Annual Convention of the terms of Delegates: Elie Azrak, MD, St. Louis; Betty Drees, MD, Kansas City; and Charles Van Way III, MD, Fairway, KS; and Alternate Delegate: Ashley Glass, Kansas City University (one-year term). An additional Delegate seat has been secured. The new two-year terms will begin at the conclusion of the 2025 MSMA Annual Convention and end at the conclusion of the 2027 MSMA Annual Convention.

The terms of the following Councilors will expire in 2025: 1st District – Chakshu Gupta, MD, St. Joseph; 2nd District – Hossein Behniaye, MD, Hannibal; 3rd District – Erin Gardner, MD, St. Louis; Jennifer Page, MD, St. Louis; 4th District – Kevin Weikart, MD, Lake St. Louis; 6th District – Dorothy Munch, DO, Poplar Bluff; 7th District – Amy Patel, MD, Kansas City; Organized Medical Staff Section – Peggy Barjenbruch, MD, Mexico; Young Physician Section – Rachel Kyllo, MD, St. Louis; Women Physicians Section – Adriana Canas-Polesel, MD, St. Louis; Resident and Fellow Section – Rachana Raghupathy, MD, St. Louis; Medical Student Section – Lacey Raper, University of Missouri-Columbia.

The terms of the following Vice Councilors will expire in 2025: 2nd District – Barbara White, DO, Hannibal; 4th District – Keith Ratcliff, MD, Washington; Women Physicians Section – Kelly Schmidt, MD, Columbia; Resident and Fellow Section – Julia Dmowska, MD, Columbia; Medical Student Section – Bethany Baumgartner, Kansas City University.

Members shall meet virtually or by email prior to the Annual Convention to elect the Councilors and Vice-Councilors for their respective districts and sections. The election shall be certified to the House of Delegates on the prescribed form which will be furnished.

The House of Delegates will hold its first session on Saturday, April 5, at 8:30 a.m., and its second session on Sunday, April 6, at 8:15 a.m.

Registration will take place online at https://www.msma.org/event-5797156 and in-person at the Annual Convention from 3:00-6:00 p.m. on Friday, April 4, and 7:00 a.m.-5:00 p.m. on Saturday, April 5.

Report of the Treasurer

The report of the Treasurer which includes the Financial Statements are published in this section of the Official Convention Minutes and Reports.

Report of the Executive Vice President

You should be proud that your Missouri State Medical Association is widely recognized as the voice of medicine in Missouri. Be it the Missouri General Assembly, the countless governmental bureaus and agencies, the business community, the insurance industry, hospitals, advocacy groups, or the media, MSMA is considered the leading advocate for your profession and your patients. Following is just a sample of the many things your MSMA did for you in 2024

State Legislative Activities

Your MSMA lobbying team enjoyed a very good year in the state Capitol in 2024. They are quick to credit you and your MSMA colleagues with much of that success, not only for your active involvement in the political process, but also for the respect you command in your community. MSMA's three registered lobbyists and three contract lobbyists are involved in more legislative healthcare issues than any other organization in the state: everything from scope of practice to tobacco, and tort reform to physician licensure. In October MSMA

entered an agreement to provide lobbying services to the Missouri Association of Osteopathic Physicians and Surgeons. Your lobbyists are among the first to arrive at the Capitol every morning, and among the last to leave at night. Their diligence and effectiveness is unsurpassed. Rather than overwhelm you with details on the myriad bills and issues they work on, I'll refer you to our weekly Legislative Report and 5 Things MSMA Members Need to Know About the State Legislature, which members receive during the legislative session. If you are not reading these e-publications, you're missing out.

Other Notable Activities

Despite only having the resources and numbers of a smaller-sized state medical association, your MSMA is one of the most diverse and active state organizations in the nation. Here are just a few of the activities undertaken on your behalf over the last year.

Your President and MSMA staff were able to attend a number of local society meetings across the state. From Cape Girardeau to Washington, and from St. Joseph to St. Charles, your leadership and staff continue to make themselves available to every local society and medical staff, no matter how large or small.

MSMA boasts an outstanding group of member physicians who give the better part of a week twice a year to represent you and your patients in the AMA House of Delegates. It is thankless work at times, but there is not a better AMA delegation than yours. Please thank them.

In addition to its regular duties, your MSMA staff also provides top-rate administrative services for other medical societies, and serves on or maintains liaisons with a large number of external governmental and private-sector committees, task forces, boards and commissions. In 2025, MSMA is providing administrative services to the Missouri State Orthopedic Association, the Missouri Society of Gastroenterology, and the St. Louis Metropolitan Medical Society.

Membership Services and Benefits

Your MSMA staff and leadership are constantly striving to bring even more value to your membership. One constant priority is to improve communications with our members and respond more quickly to answer questions and resolve issues. We encourage you to visit the MSMA website often. More content is constantly being added, with more timely information to help you and your office staff. Four years ago, MSMA migrated to a new and improved website, and a new user-friendly membership database. Also, you can now pay membership dues online and access our membership database to search for your physician colleagues. You can also make donations to MMPAC and MSMF.

Missouri Medicine, MSMA's outstanding award-winning scientific journal, is free to you with your membership. It is published in digital format as well as the traditional paper copy. The journal's scientific content is accessible in the renowned PubMed database. You can find current and archived electronic editions on our website.

Progress Notes, our quarterly newsletter (free to members), is chock-full of timely news items, tips, and information. An electronic version, e-Progress Notes, is distributed twice monthly by email.

MSMA also offers you free CME credits at the Annual Convention every year. MSMA has partnered with MAOPS to offer live CME through the VOC. The VOC launches during President's Day weekend, but enduring materials can be accessed through the spring. Enrollment fees for the VOC benefit MSMA.

I would ask you to also be mindful of the more direct benefits your MSMA membership offers. For example, we are partners with Moneta, an outstanding financial services firm that provides MSMA members with expert financial planning and investment services. SHINE is a health information exchange (HIE) which facilitates electronic medical records software sharing clinical information with other EMRs in addition to aiding with MIPS compliance. The Resolve Agency assists physicians and residents with employment contract review and modification.

MSMA's Affiliate Organizations

Your Missouri State Medical Foundation has loaned more than $12.1 million to Missouri medical students since its inception over 50 years ago. The Foundation board made the decision in 2017 to cease its loan program due to the number of private lenders in the market. The focus is now on scholarships for Missouri medical students. In 2024, MSMF awarded $330,000 in scholarships to 60 medical students at all six of the allopathic and osteopathic medical schools in the state. And the Foundation offers $5,000 matching funds to local medical societies to create scholarships for medical students. Physicians can donate to the Foundation on the MSMA website.

Your Missouri Physician Health Program was widely considered one of the most successful of its kind in the nation. Last year, the program served 71 physicians who are dealing with chemical, emotional, or behavioral issues. Unfortunately, the program suffered from a large decrease in donations post-pandemic and its

operations terminated in early 2025. All participants were successfully transferred to Missouri's other two physician health programs. The Missouri State Medical Association Physician Health Foundation, which oversaw the MPHP, remains active and will seek other opportunities to support physician mental health and well-being.

Your Missouri Medical Political Action Committee is one of the most respected and effective association PACs in the state. In the last election cycle, MMPAC contributed close to $100,000 to support physician-friendly candidates across the state. Membership begins at $50, but you can demonstrate your political savvy by upgrading to one of the advanced giving levels: MMPAC Ambassador ($200), Rotunda Club ($1,200), or the 1850 Society ($1,850). Members in these levels receive special privileges. Of course, any amount is appreciated. You can now donate to MMPAC through PayPal or the MSMA website. Your participation is essential to our political effectiveness.

Your MSMA Insurance Agency was formed by MSMA and was directed by physicians to serve you and your practice. In 2024, the Agency entered a co-marketing agreement with Wallstreet/Acrisure to expand its insurance product and services portfolio. This agreement provides some financial support for MSMA. The corporate structure of the Agency will terminate in 2025. Please contact rstaggs@wallstreetins.com for more information.

The MSMA Alliance has dedicated and enthusiastic physician spouses who work tirelessly to promote health education and support health-related charitable activities, all toward improving the health and welfare of all Missourians. And they are a force to be reckoned with when they march on the Capitol every year to advance medicine's legislative causes. They are also a great group of fundraisers for the MSMF.

Your Organization

It is nearly impossible to list all of the duties and services MSMA provides for the physicians of Missouri. The advocacy and representation, the publications, the CME, the Foundation, the Physicians Health Foundation, the Alliance, and your AMA Delegation all cumulate in an organization deeply rooted in service to its members and the patients they serve. The MSMA is YOUR organization, and your officers and staff welcome your thoughts on how best to serve you and your fellow members. Feel free to seek them out – at this convention or at any time – and share your ideas.

Heartfelt Thanks

On behalf of the staff and the entire MSMA membership, I want to express undying gratitude for your officers, councilors, committee members, and other leaders who give so much of their time and resources for the betterment of the Association and patient care in Missouri. They are nothing short of extraordinary.

I also want to express my appreciation for allowing me to work with talented and dedicated MSMA employees whose creativity and diligence are unmatched anywhere. Liz Fleenor, the Director of Communications, is the managing editor of your award-winning *Missouri Medicine* and *Progress Notes*, designs all the MSMA pamphlets and logos you see, and oversees MSMA's website. Benita Stennis, the Director of Operations and Education, does all of our meeting planning – including the Herculean task of organizing the Annual Convention – and also directs all aspects of CME programming. She also manages the Missouri Gastroenterology Society and SLMMS. Rachel Bauer, your Director of Government Relations, spends her springs in the Capitol advocating for your best interests. She also manages two sections and the MSMA Legislative Committee. She works closely with the Department of Health and the MO HealthNet Division. Our Executive Services Specialist, Cheri Martin, keeps the office running like a well-oiled machine, day in and day out. She also manages MMPAC's day-to-day activities, as well as MSMF and MSOA, and she serves as liaison to the WPS and IMG sections. Cassie Williams, the Membership Data & IT Specialist, tends to our complicated member database and coordinates all the membership billing and mailing for MSMA. She's the one you want if you need to know if someone has paid their dues. She spends a lot of time helping with the meeting planning and she's the go-to person when anybody on staff needs a little extra help. Jacob Scott is the Director of Legislative Affairs. He is an advocate for you in the Capitol and a well-regarded healthcare policy guru. He's the liaison to the Board of Healing Arts and Department of Insurance. And finally, please allow me to thank you, the physicians of Missouri, for the opportunity to serve you in this outstanding organization.

Report of the Alliance

Thank you for this opportunity to address your House of Delegates. Congratulations on your 175th year of service to the patients of the state of Missouri and allowing us to serve alongside you for the last 101 years.

My name is Donna Corrado, my husband, Dr. Joseph Corrado and I have been members here since the previous century. We have functioned in various capacities and duties throughout our tenure, but none are more arduous than that of President. As a recycled one, first serving in 2006, I have had the distinct pleasure of leading your Missouri State Medical Association Alliance for the past 12 months, traveling around the state and breaking bread with most of the Alliance members on their home turf.

We have tried to increase our membership by meeting at the same time as the Council this year, incorporating adventures in Jefferson City, like the tour of the Governor's Mansion and the Penitentiary. We have made advocacy our primary focus, and it paid off in small numbers and big interest, but we did not outgrow our attrition rate.

We honor immediate past President, Sana Saleh, who is completing her year as Director of Programing at the AMA Alliance. We love supporting and basking in the glow from this rising star!

She was also front and center, working with her husband, George, Lissa Young, and Diana Corzine at the KCU match day event, one of many hosted across the state by your MSMA Alliance and its local counties. Match Day continues to be an opportunity for us to join and congratulate, befriend and educate our medical students as to the community of their medical society and Alliance wherever they go. How do they say it? You don't know what you don't know. As we have begun to join forces with the Missouri Association of Osteopathic Physicians and Surgeons and its Auxiliary, I foresee this event taking center stage across Missouri's Physician population and their families and involving residents even more.

With Zoe Taylor and her "Moving Medicine" ensconcing firmly in the St. Louis Metropolitan Medical Society, and a group of physician spouses meeting virtually and growing in Columbia, it seems WE MUST be the conduit. We MUST establish ourselves as the go-to resource for medical students, residents, attendings and their families if we are to grow again. WE MUST be the Ernestine (Lily Tomlin switchboard operator) connecting interested, active residents, physicians and their families with one another across the state. We want to be their community.

Thank you, Greene County, and Particularly Barbara Hover for your wonderful hospitality this year. Hosting meetings and making phone calls has kept your group together and caused some pretty yummy consequences. You have embraced Physician Family Day as a way to successfully connect with your future members, continuing to change up what you are doing to encourage others to take the lead. You have always been on the forefront of the health scene, and I trust you will continue to be. You also have your not so silent partner, Jana Wolfe, keeping us present and accounted for on Facebook and other social media platforms. I "LIKE" this girl a LOT! Sadly, you lost Judy Corry, a past president of the MSMA Alliance, a good friend and mentor this year.

Thank you, Buchanan County for actively supporting the "Hands are NOT for Hitting" an initiative you started in the school system many years ago. Your members are steadfastly keeping the state organization alive and on track. Especially Allene Wright, financial guru and chair of the annual meeting committee. Diana Corzine, recording secretary, Kathy Weigand, Foundation co-chairman, and responsible for helping raise $8,800. For the Missouri State Medical Foundation this year. These folks know how to throw a Christmas party, too, barbershop quartet and all. trust me on that one!

Thank you, Kansas City Metropolitan Medical Society Alliance for consistently producing leaders for the State and National Alliance and staying very active on the local level with scholarships and pillowcase dress projects. As mentioned before, Sana Saleh, our Zoom Master, and Millie Bever, chair of the Match Day events throughout the state and Kirk Doan, our Legislative VP all hail from KC and are supported by an amazing group of women and men on the homefront.

Thank you, St. Louis Metropolitan Medical Society Alliance, for keeping up your charity support of the abuse centers and the society for the blind. You generally participate in the two medical schools in St, Louis for Match Day. You have had a rough year. One of your most active members, Sue Ann Greco, Past AMA President, is moving outside of our state, and Angela Zylka, a cornerstone of the Match Day, has passed away. You are such a consistent and loyal band, Gillian Waltman, proofer extraordinaire, Foundation co-chair, and president-elect, with Sandra Murdock, MMPAC chair. Your club's unwavering support of the MSMAA is evident year after year. You will be the host of the 2026 Annual meeting in St. Chesterfield!

Thank you Annie Ebert and Dr. Bavanni for restarting a group in Cape Girardeau. You have hit the nail on the head with your project of collecting and making sure that the emergency room has clean clothes

for patients who need them, it is the true spirit of the Alliance.

Thank you MSMA staff for being patient and helping me grow our organization by letting me try different ideas to invigorate our Alliance and come more in line with being a side by side partner.

Commission on Continuing Education

MSMA's Council approved the Executive Committee's recommendation to discontinue the MSMA's Recognition Program at its July 2024 meeting. MSMA worked closely with the ACCME to assist the MSMA accredited providers with the transition. Additionally, MSMA staff uploaded provider records to the ACCME's online portal. As of November 1, 2024, all providers had successfully transitioned to a new accreditor.

The MSMA Commission on Continuing Education approved the 2024 Annual Convention for 4.0 AMA PRA Category 1 Credits.

MSMA staff attended the ACCME's Spring Meeting in May 2024. Staff participated in educational sessions regarding the Standards for Independence and Integrity in Accredited Continuing Education, State Medical Society Collaborations, Planning and Evaluation Tips for Accredited CME, and Cultivating CME Leadership.

Additionally, staff and Commission members completed required education sessions at their leisure via the ACCME's online portal.

Commission on Medical Economics, Third Party Medicine, and Government Relations

The Commission on Medical Economics, Third Party Medicine, and Government Relations met by videoconference on June 18, 2024, to discuss one resolution referred to us by Council. We entertained lively discussion on it, and offered the following recommendation for Council, which was tabled:

Resolution #6 – Co-sponsoring of Resolutions

After discussion, the Commission agreed that requiring medical student members to receive an endorsement by an active or retired MSMA would foster communication and development mentoring. We made three changes to the original resolution: 1) included retired members in the resolution mentorship process; 2) removed resident members from the resolution, and; 3) removed the word "component" when describing a local medical society.

Therefore, we recommend Council adopt the following substitute resolution:

RESOLVED, that resolutions brought to the House of Delegates by medical students be co-sponsored by an active or retired member, or a local medical society.

In October, the MSMA Council adopted amended Resolution 6:

RESOLVED, that all resolutions submitted by medical students shall be reviewed by a committee of the Medical Student Section dedicated to assessing and providing feedback on student resolutions.

It is our understanding that the new student resolution review committee worked well in the lead up to the 2025 MSMA Annual Convention.

Committee on Membership

The 2024 MSMA membership year closed with 1,866 active members (a 7% increase from 2023), 653 residents, 1,674 students, and 278 retired members. Active membership has decreased 40% since the end of the 2014 dues year (August 2014). A large increase in resident and student members of the same time frame results in a 11% gain in total membership.

So far in the 2025 dues year, approximately 143 physicians have joined as new active members. On the other hand, 277 active members in 2024 have failed to renew. In addition to traditional recruiting methods, there was a positive response to MSMA phone calls to non-renewals. Peer-to-peer outreach is the most beneficial way to maintain and grow membership. Please ask MSMA staff for a list of non-members in your area and help us add physicians to the MSMA roster.

MSMA offered a "Summer Special" discounted membership rate in 2024 that attracted 100 new members. Over the past three summers, 212 physicians have joined at the discounted summer rate; 24 are now paying active dues.

MSMA staff was able to participate in several events across the state in 2024, including medical school recruitment events. In addition to our social media presence, MSMA hopes to attract more members through additional advocacy publications and events. We encourage all members to follow us on social media and share our posts. Please let MSMA staff know if you would like them to present to your local physicians.

MSMA increased its active membership dues for the 2024 dues year to $450. This was the first dues increase in over 10 years.

MSMA Insurance Agency

Your MSMA Insurance Agency underwent significant change at the end of 2023 and throughout

2024. After over 20 years as an independent insurance agency owned and directed by MSMA, the Agency entered into a co-marketing agreement with Wallstreet/Acrisure on January 1, 2024. This arrangement allows MSMA members to a much wider range of insurance products and services. Complete integration with Wallstreet/Acrisure is expected to occur sometime this spring.

MSMA benefits from the relationship with Acrisure and encourages members to engage them for all your insurance needs. Although the employees of the Agency have become full-time employees of Wallstreet/Acrisure, they are still available to discuss your needs and their larger portfolio of products. They can be reached at rstaggs@wallstreetins.com or 573-659-0571.

The Agency has begun the process of corporate termination, which is expected to be completed this summer. MSMA will continue to benefit from the Wallstreet/Acrisure co-marketing agreement through 2027.

Missouri Physicians Health Foundation

The MSMA Physician Health Foundation provides direction and oversight to the Missouri Physician Health Program (MPHP). After many years of service to the physicians of Missouri, MPHP began a winding up of corporate affairs in 2024. The reasons for this are complex, but post pandemic donations were not enough to allow MPHP to meet its expenses. After 18 months of attempting to right the ship, the Board was left with no choice other than to cease MPHP operations. All MPHP participants were successfully transferred to the MU Healthcare Professional Health Program and the new St. Louis Physician Health Program.

Despite the conclusion of the MPHP, the MSMA Physician Health Foundation will continue to support physician mental health and wellbeing. We look forward to this new chapter for the Foundation.

Missouri State Medical Foundation

The Missouri State Medical Foundation has made more than 3,000 medical school student loans over the past 52 years, totaling nearly $12 million. The loan program has been closed, and the Foundation now funds Missouri State Medical Association scholarships, which have been awarded over the past 18 years.

In 2024, the Foundation awarded $5,500 MSMA scholarships to a total of 60 medical students at the six Missouri medical schools. This totals $330,000 in scholarships, an increase of $30,000 in scholarship awards over the previous year. The Foundation has provided a cumulative total of $2.5 million scholarships awarded to Missouri natives who are attending a medical school in Missouri.

The Foundation also matches funding up to $5,000 for local medical society scholarships, and in 2024 partnered with the St. Louis Metropolitan Medical Society in a scholarship effort. The MSMA Alliance has been an important partner to the Foundation through generous fund-raising activities, contributing nearly $9,000 in 2024.

Committee on Publication

Volume 121 of Missouri Medicine published original research, up to date scholarly reviews, and analysis of important individual and public health matters. This volume published five issues featuring "theme" articles (Innovations in Pain Treatment, Neurosurgery, Pediatrics, Psychiatry, and Pulmonary), and one issue presenting an informative variety of scientific topics and micro-series. It contained 506 pages and 50 scientific articles. This included one First Literature Report.

A new international paradigm is developing on the treatment of acute migraine headaches. This innovative treatment involves the use of liquid beta blocker (Timolol 0.5%) topical to the eye, sublingual or best by nasal spray. Rapid therapeutic blood levels are attained, something that oral beta blockers do not do. At present researchers world-wide are using techniques first published in Missouri Medicine. Three world literature first reports have appeared in Missouri Medicine, more than any other medical journal. The first of these was in 2014 and the most recent in 2024. This research was summarized in a lecture at the 2025 MSMA Annual Meeting by Editor John C. Hagan III, MD.

Additional Perspectives included continued coverage of reimbursement of non-physician clinical services, private equity harm to healthcare, military medicine, pediatric palliative care, eating disorders, artificial intelligence, pornography effects on youth, and cannabis and psychosis. Medical-Legal articles covered physician organizing, copyright law, and malpractice and criminality.

Missouri Medicine continued a new series of Perspectives: Inspiring Lives & Careers, highlighting physicians around the state and how they are an inspiration to others. In addition to publishing numerous articles on COVID, we completed a four-article historical series begun in 2022 on the COVID-19 pandemic and finished with a Retrospective Analysis in 2024, authored by MSMA members David McKinsey, MD, and Joel P. McKinsey, Kansas City.

In 2024, Missouri Medicine received a record number of unsolicited manuscripts. About one in 10 was accepted for publication. The Journal has an international footprint and manuscripts were submitted from several foreign countries. Our theme issues are fully subscribed through September/October 2026. Theme issues have regular contributions from faculty at the four allopathic and two osteopathic medical schools in Missouri on eight campuses.

Charles Van Way, III, MD, Missouri Medicine Publication Committee member and Contributing Editor presented the Missouri Medicine Distinguished Editorial Service Award to Managing Editor

Lizabeth Fleenor during the MSMA House of Delegates in April.

Missouri Medicine would like to publicly thank the following invited non–Editorial Board experts who have done peer–review of submitted manuscripts in 2024: Stephen B Carr, MD, Charles Lederer, MD, Bhanu Telugu, PhD, Elizabeth Bryda, PhD, David G. Ingram MD, Joseph Brunworth, MD, Amit Mathur, MD, Kevin Black MD, Abid M. Bhat, MD, Rajeev Aurora, PhD, Manjamalai Sivaraman, MD, Matthew Lindquist, DO, Romayne L. Kurukulasuriya MD, Shannon McGuire, MD, Sarah Eddington, MD, Kaushik Ravipati MD, Eric J. Lenze, MD, Vrinda Trivedi MD, David McKinsey, MD, John Vukich, MD, and Vance Thompson, MD.

Here are the updates to the Missouri Medicine Editorial Board:

Emily A. Hillman, MD, has completed her three-year term as Young Physician Contributing Editor. Dr. Hillman has done a great job, and we thank her.

The next Young Physician Editor is Nicholas N. Gier, MD. Dr. Gier is a Hospitalist with Gates Hospitalists in Kansas City.

After many years of service, both Jerry Kennett, MD, and Joseph A. Corrado, MD, are leaving their positions in Cardiology and General Surgery, respectively. We thank both for their generous service to our Journal as well as MSMA, including serving as Presidents for our Association.

Jeffrey Coughenour, MD, Medical Director, Frank L. Mitchell, Jr., MD, Professor of Surgery (Acute Care Surgery) with University of Missouri-Columbia, is our next General Surgery Editorial Board Member.

Vrinda Trivedi, MD, Assistant Professor of Medicine at the University Missouri-Columbia, is stepping up as our Cardiology Board Member.

Brian R. Stotter, MD, Assistant Professor of Pediatrics at Washington University School of Medicine will be our new Nephrology Editorial Board Member. We thank Gary Singer, MD, for his service.

David B. Liss, MD, Division Chief for Medical Toxicology; Program Director, Medical Toxicology Fellowship; Associate Professor, Emergency Medicine, is the new Editorial Board Member in Toxicology and Addiction Medicine. He replaces Dougles M. Burgess, MD, whom we thank for his service.

Missouri Medicine welcomes Abid M. Bhat, MD, as the new Sleep Medicine Editorial Board Member. He is a Professor of Medicine in the Division of Pulmonary, Critical Care, and Sleep Medicine at University Health Hospital, University of Missouri – Kansas City School of Medicine.

Missouri Medicine remains one of the country's foremost state medical journals. Thanks go to MSMA for 121 years of supporting its journal, Walsworth Publishing Company for over a century 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.

The Committee on Publication Chair and Editor, John C. Hagan, III, MD, and Managing Editor, Lizabeth Fleenor, BJ, MA, appreciate the many contributions of the MSMA, its leadership, Alliance, and Active members and others. The Committee on Publication appreciates the Association's continued support of the Journal. By any objective criteria Missouri Medicine is among the top three state medical society journals in the United States.

Committee on Public Affairs

The Commission on Public Health met by videoconference on July 1, 2024, to discuss one resolution referred to us by Council. We entertained lively discussion on it, and offered the following recommendation for Council, which was approved:

Resolution #8 – Continued Ozempic Research

Mr. Chairman, your Committee on Public Health discussed the Resolution at length and found that of the two resolved clauses the first one is seemingly outdated at this point, and the second resolved clause would be applicable to all facets of the practice of medicine, not just this one specific area.

For these reasons the committee recommends that Council NOT ADOPT Resolution 8. **MM**

Missouri State Medical Association

Statement of Financial Position
December 31, 2024

ASSETS

	2024	2023
CURRENT ASSETS:		
Cash and Cash Equivalents	$ 1,132,461	$ 867,041
Certificates of Deposit	-	350,000
Current Investments	13,241,265	12,782,344
Interest Receivable	31,955	31,136
Accounts Receivable	-	14,839
Prepaid Expenses	32,554	42,263
Due from Affiliates	635	2,942
Total Current Assets	14,438,870	14,090,565
FIXED ASSETS:		
Land	83,000	83,000
Construction in Progress	350,514	-
Building and Improvements	604,391	604,391
Organization Costs	-	1,430
Furniture and Equipment	26,643	64,647
Less: Accumulated Depreciation	(607,386)	(641,329)
Total Net Fixed Assets	457,162	112,139
NON-CURRENT ASSETS:		
Pension Benefit Asset	802,332	385,717
Deferred Tax Asset	-	41,860
Investment in Association Health Plan	9,000	9,000
Non-Current Investments	3,731,953	2,924,456
Total Non-Current Assets	4,543,285	3,361,033
TOTAL ASSETS	$ 19,439,317	$ 17,563,737

LIABILITIES AND NET ASSETS

	2024	2023
CURRENT LIABILITIES:		
Accounts Payable and Accrued Expenses	$ 30,218	$ 29,357
Producer Commissions Payable	-	7,420
Income Taxes Payable	3,216	755
Accrued Vacation	56,101	63,798
Payroll Liabilites	11,044	7,249
Funds Held for Others	71,581	60,062
Contract Liabilities - Subscriptions, Fees and Conference Income Received in Advance	60,000	15,500
Contract Liabilities - Dues Received in Advance	519,825	573,870
Total Current Liabilities	751,985	758,011
NON-CURRENT LIABILITIES:		
Deferred Compensation Agreement	244,838	266,526
Total Non-Current Liabilities	244,838	266,526
Total Liabilities	996,823	1,024,537
NET ASSETS:		
Without Donor Restrictions	18,442,494	16,539,200
Total Net Assets	18,442,494	16,539,200
TOTAL LIABILITIES AND NET ASSETS	$ 19,439,317	$ 17,563,737

Missouri State Medical Foundation

Statement of Financial Position
December 31, 2024

ASSETS

	2024
CURRENT ASSETS:	
Cash	$ 345,728
Investments	5,730,127
Notes Receivable - Current	77,111
Accrued Interest	25,122
Total Current Assets	6,178,088
EQUIPMENT:	
Software	10,692
Less: Accumulated Depreciation	(10,692)
Total Net Fixed Assets	-
NON-CURRENT ASSETS:	
Investments	1,602,699
Notes Receivable - Long Term	238,609
Allowance for Credit Losses	(59,986)
Notes Receivable - Long Term (Net)	178,623
Total Non-Current Assets	1,781,322
TOTAL ASSETS	$ 7,959,410

LIABILITIES AND NET ASSETS

LIABILITIES:	
Excise Tax Payable	$ 7,791
Funds Held for Others	169,229
TOTAL LIABILITIES	177,020
NET ASSETS:	
Without Donor Restriction	7,782,390
TOTAL LIABILITIES AND NET ASSETS	$ 7,959,410

Missouri Physicians Health Program

Statement of Financial Position
December 31, 2024

ASSETS

	2024	2023
CURRENT ASSETS:		
Cash and Cash Equivalents		
Cash - Checking	$ 81,560	$ 192,652
Cash - McIntosh Fund	4,654	13,414
Investments - McIntosh Fund	99,578	164,891
Accounts Receivable	-	116,199
Allowance for Doubtful Accounts	-	(33,627)
Prepaid Expenses	-	2,726
Total Current Assets	185,792	456,255
NON-CURRENT ASSETS:		
Investments - McIntosh Fund	34,661	19,565
Property and Equipment		
Office Furniture and Equipment	44,626	44,626
Less: Accumulated Depreciation	(43,380)	(42,897)
Net Property and Equipment	1,246	1,729
Total Non-Current Assets	35,907	21,294
TOTAL ASSETS	$ 221,699	$ 477,549

LIABILITIES AND NET ASSETS

CURRENT LIABILITIES:		
Accounts Payable	$ 3,555	$ 4,826
Accrued Vacation	-	37,063
Total Current Liabilities	3,555	41,889
NET ASSETS:		
Without donor restrictions	218,144	435,660
Total Liabilities and Net Assets	$ 221,699	$ 477,549

2025 Annual Convention Attendance

Delegates	***62***
Members	***36***
Staff	***8***
Guests	***63***
Officers	***7***
Councilors/Vice	***24***
Alliance	***17***
Total	***217***

(Actual numbers will not balance due to overlaps in positions served.)

OFFICERS
Brian Biggers, MD
Alexander Hover, MD
George Mansour, MD
Ellen Nichols, MD
David Pohl, MD
Elie Azrak, MD
Laurin Council, MD

COUNCILORS
Erin Gardner, MD
Chakshu Gupta, MD
David Kuhlman, MD
Dorothy Munch, DO
Jenny Page, MD
Inderjit Singh, MD
Tim Swearengin, DO
Christopher Swingle, DO
Lisa Thomas, MD
Kevin Weikart, MD
Amy Zguta, MD
Joane Loethen, MD
Louis DelCampo, MD
Lacy Raper
Peggy Barjenbruch, MD
Rachel Kyllo, MD

VICE COUNCILORS
Sarah Florio, MD
Jenny Powell, MD
Keith Ratcliff, MD
Barbara White, DO
Deepu Sudhakaran, MD
Bethany Baumgartner
Kelly Schmidt, MD
Sara Hawatmeh, MD

DELEGATES

District 2
Barbara White, DO

District 3
Christopher Ficther, MD
Deepu Sudhakaran, MD
Elie Azrak, MD
Gary Gaddis, MD
George Mansour, MD
Jo-Ellen Ryall, MD
Laurin Council, MD
Stephen Slocum, MD
Sam Page, Jr., MD

District 4
Keith Ratcliff, MD
Martin Willman, MD
Matthew Meier, DO
Ngozi Wilkins, MD

District 5
Jenny Powell, MD
Kelly Schmidt, MD
Milamari Cunningham, MD

District 6
Karl Staser, MD

District 7
Betty Drees, MD
George Salah, DO
John Hagan, III, MD
Sarah Florio, MD

District 8
Brian Biggers, MD
Carlin Ridpath, MD
David Haustein, MD
Doughlas McNeal, MD
Edward Gwin, MD
Ellen Nichols, MD
Jacob Thomas, MD
James Blaine, MD
James Rogers, MD
Jami Skrade, MD
John Harger, MD
Kyle John, MD
Michael Clarke, MD
Minh-Thu Le, MD
Sanjay Havaldar, MD
William Taylor, MD
Melissa Gaines, MD
Donald Kratz, MD

MEDICAL SCHOOLS

Kansas City University
Ashley Glass
Hailey VanRonzelen

Saint Louis University
Karen Dale
Megan Kearns

University of Missouri-Columbia
Carl Laude
Taylor LaValle

Washington University
Miranda Mize

International Medical Graduate Section
Louis DelCampo, MD
Deepu Sudhakaran, MD

Women Physicians Section
Kelly Schmidt, MD

Young Physician Section
Rachel Kyllo, MD
Sara Hawatmeh, MD

DELEGATES AT LARGE

Past Presidents
David Barbe, MD
Edmond Cabbabe, MD
Joseph Corrado, MD
Alexander Hover, MD
George Hruza, MD
Ravi Johar, MD
Norman Knowlton, III, MD
Warren Lovinger, Jr., MD
David Pohl, MD
Stephen Slocum, MD
Charles Van Way, III, MD
James Wolfe, MD

Speaker
Laurin Council, MD

Vice Speaker
George Mansour, MD

Members
Ivan Bahamon
Peggy Barjenbruch, MD
Bethany Baumgartner
Olivia Chen
Louis DelCampo, MD
Maaya Dev
Jay Devineni
Ruth Ehie
Erin Gardner, MD
Chakshu Gupta, MD
John Hagan, III, MD
Sarah Jiang
Aishva Kothari
David Kuhlman, MD
Rachel Kyllo, MD
Joanne Loethen, MD
Amanda Maytin-Hevia
Evan Mihalakakos
Miranda Mize
Dorothy Munch, DO
J. Randolph Mullins, MD
Carl Myers, MD
Jenny Page, MD
Jay Patel
Lacy Raper
John Rollo, MD
Robert Shaw, MD
Samantha Shuster
Inderjit Singh, MD
Tim Swearengin, DO
Christopher Swingle, DO
Lisa Thomas, MD
Zenobia Tucker
Mason Tuttle
Kevin Weikart, MD
Timothy Woods, MD
Amy Zguta, MD **MM**

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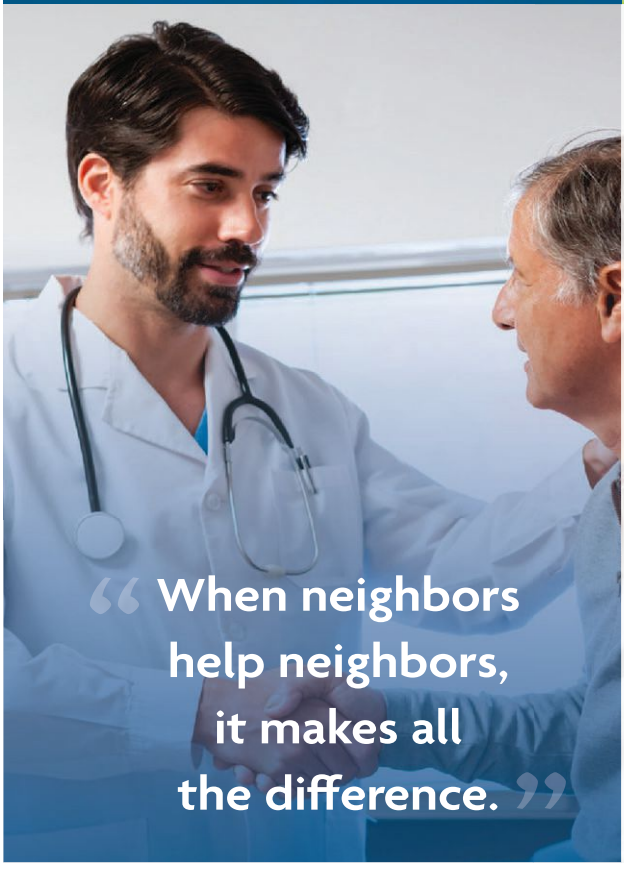
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