Association *of* Academic Physiatrists
MENTOR. DISCOVER. LEAD.

PHYSIATRY IN MOTION

SUMMER 2025

Contents

About the Cover

The cover art was completed by Isabella Dinelli, a MS-4 from the University of South Alabama Whiddon College of Medicine.

Description of cover: This art piece entitled "Across" was created in Procreate and inspired by a hike in a botanical garden in the rain. It reflects the idea that sometimes a single step in the rehabilitation journey can feel as impossible as walking on water. With resilience, we conquer what we once thought was beyond our reach and accomplish things we once thought were impossible. The work symbolizes perseverance, forward motion, and accomplishing the seemingly impossible, merging the serenity of nature with the determination at the heart of rehabilitation medicine. Inspired by the journeys of PM&R patients, it captures the courage behind each step and the power of moving forward against the odds.

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Letter from the Editor

Dear AAP Community,

It is my honor to welcome you to the Summer 2025 issue of Physiatry in Motion, the official newsletter of the Association of Academic Physiatrists Resident/Fellow Council (AAP RFC).

The theme for this issue of Physiatry in Motion was "The Future of Physiatry: Innovation, Integration, and Impact". This theme invited contributors to discuss how Physical Medicine and Rehabilitation is evolving through innovation in clinical care, research, education, and advocacy. It emphasizes forward-thinking perspectives, interdisciplinary integration, and the transformative impact physiatrists can have on patient lives, systems of care, and the healthcare landscape.

I would like to thank each of the contributors, artists, as well as the technology subcommittee who have worked hard to bring this issue to life. Stay tuned for our winter edition later this year.

Sincerely,
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CAN AI INTERPRET EMGS? AND WHAT DOES THE FUTURE OF ELECTRODIAGNOSIS HAVE IN STORE?

SUMMER 2025 TOP SUBMISSION WINNER

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Electrodiagnostic studies (EDX), including electromyography (EMG) and nerve conduction studies (NCS), are foundational tools in physiatry. They serve as an extension to the physical exam and allow insight into nerve and muscle function, which facilitates the narrowing of broad and murky differentials. Yet, their steep learning curve, high operator dependence, and time-intensive nature results in inter-rater variability and limited access in many underserved areas of the US and globally. Artificial intelligence (AI) is now omnipresent in today's conversations of the future, particularly in medicine, with new radiology, pathology, and cardiology diagnostic tools full of new AI features.[1,2,3] However, EDX pose district challenges with their complex wave forms, significant noise and artifacts, and dependence on contextual clinical interpretation. With that said, physiatrists must ask: Can AI reliably interpret electrodiagnostic studies, and if so, how will it impact our field?

Where is the research at?

Several retrospective studies have evaluated AI's diagnostic performance against expert EMG reviewers.[4,5,6] Most have used one-dimensional convolutional neural networks (1D CNNs), which work by recognizing patterns in sequential data. In the case of electrodiagnostic studies, they could scan raw waveforms, looking for specific waveform features by using filters.[4] Another approach, instead of analyzing raw waveforms, the AI processes tabular time-ordered data such as distal latencies, amplitudes, and conduction velocities, then applies filters that move across the sequence of numerical values, identifying patterns that correspond to normal or abnormal physiology.[5,6] As relevant features are detected, the model combines and refines them layer by layer, ultimately outputting a probability for each diagnostic category. Two recent studies used a 1-D CNN, which did just this. The first comprised of 58 individuals who visited Seoul National University Hospital between June 2015 and July 2020.[5] There were 20 participants without any neuromuscular disease; 19 with neuropathy, including radiculopathy, motor axonal polyneuropathy, and motor neuron disease; and 19 with myopathy, including muscular dystrophy and inflammatory myopathy. The CNN and six physicians classified and electro-diagnosed the EMG waveforms as myopathic, neuropathic, or normal. The results of the study showed AI accuracy was 0.720 compared to 0.537 in the six neurologists. The second study, out of the same research group, which is currently in pre-print at the time of submission, used the same patient population with an improved AI model [6]. This time, the model had an accuracy of 0.875 compared to 0.694 in expert reviewers comprised of six neurologists. Both studies have significant limitations. Firstly, neither study used waveform interpretation. Secondly, the waveform data was cleaned with artifacts removed. Thirdly, the data set is too small to show stability of the model. Fourthly, the CNN was only sorting into three buckets: neuropathy, myopathy, and normal. Additionally, an inherent limitation to 1D CNNs is that it lacked clinical reasoning and could not interpret clinical context.

Most recently, researchers have explored multi-agent AI systems, which makes use of multiple individual AI models each with a distinct task. For instance, one model identifies waveform abnormalities, another analyzes structured outputs like latencies and amplitudes, and a final model synthesizes a diagnostic report. A 2025 study published an AI system called INterpretable multi-agent System for Pattern recognition in Integrated Rehab Electrophysiology (INSPIRE), which is built on a large language model (LLM) architecture rather than a traditional neural network like a 1D CNN.[7] Unlike a 1D CNN, which analyzes raw EMG waveforms or tabular data as continuous signal data to classify pathology, INSPIRE combines structured data (such as amplitudes, latencies, and conduction velocities), PDF images of waveform figures, patient demographics, and symptom description with language-based reasoning (Google Gemini 1.5 Pro). In the study, INSPIRE was given 219 EMG/NCS reports from a single center over a 4.5-year period. To evaluate performance, the researchers introduced the AI-Generated EMG Report Score (AIGERS), a composite scoring system based on four weighted criteria: detection of abnormal findings (40%), clinical diagnostic accuracy (30%), semantic similarity to the original physician report (20%), and clarity/readability of the output (10%).INSPIRE achieved an AIGERS score of 80.1%, which significantly outperformed a base large language model (56%). Its accuracy in classifying studies as normal vs. abnormal reached 92.9%. There are multiple shortcomings in the study, with a rather small sample size for LLMs and poor representation of rarer cases such as like myopathies, plexopathies, or neuromuscular junction disorders. Additionally, the study did not compare performance to physicians, which limits the generalizability of the findings. Lastly, there were reports of “hallucinations”, which are invented results, when only partial data was provided.

What does this mean for Physiatrist?

Ultimately, it's not a matter of if, but when AI becomes part of electrodiagnostic practice. The two different AI systems discussed, CNN based classifiers and multi-agent LMM frameworks, are very different visions of AI in EDX. CNN based models have potential for reliably classifying structured EDX data, while frameworks demonstrate the feasibility of integrating multiple data streams and generating clinical reports. As seen with other AI integration in imaging or diagnostic study interpretation, AI holds promise not as a replacement, but rather as an augmentation tool leading to increased efficiency. For trainees, AI can offer instant feedback to accelerate pattern recognition and diagnostic skills. In resource-limited settings, it may provide preliminary interpretations when specialists are unavailable. Still, implementation must be cautious, and clinician led. Tools must enhance and not deskill providers, and limitations must be clear. Ultimately, physiatrists have a responsibility to see this development and its regulatory framework occurs within the ethical standards and clinical priorities that prioritize patient-centered care.

References

1.Najjar R. Redefining Radiology: A Review of Artificial Intelligence Integration in Medical Imaging. Diagnostics (Basel). 2023 Aug 25;13(17):2760. doi: 10.3390/diagnostics13172760. PMID: 37685300; PMCID: PMC10487271.

2. Usta U, Taştekin E. Present and Future of Artificial Intelligence in Pathology. Balkan Med J. 2024 May 3;41(3):157-158. doi: 10.4274/balkanmedj.galenos.2024.2024.060324. PMID: 38700263; PMCID: PMC11077921.

3.Biondi-Zoccai G, D'Ascenzo F, Giordano S, Mirzoyev U, Erol Ç, Cenciarelli S, Leone P, Versaci F. Artificial Intelligence in Cardiology: General Perspectives and Focus on Interventional Cardiology. Anatol J Cardiol. 2025 Apr;29(4):152-163. doi: 10.14744/AnatolJCardiol.2025.5237. PMID: 40151850; PMCID: PMC11965948.

4.de Jonge S, Potters WV, Verhamme C. Artificial intelligence for automatic classification of needle EMG signals: A scoping review. Clin Neurophysiol. 2024;159:41-55. doi:10.1016/j.clinph.2023.12.134 Kim, S.H., Kim, G.S., Cho, W., Song, H., Jang, S., Lee, D., Kim, J., Chung, S.G., & Kim, K. (2022). Deep Learning Model for Needle Electromyography Electrodiagnosis in Comparison With Physician Assessment: A Retrospective Study. Archives of Physical Medicine and Rehabilitation.

5.Kim, S.H., Kim, G.S., Cho, W., Song, H., Jang, S., Lee, D., Kim, J., Chung, S.G., & Kim, K. (2022). Deep Learning Model for Needle Electromyography Electrodiagnosis in Comparison With Physician Assessment: A Retrospective Study. Archives of Physical Medicine and Rehabilitation.

6. Yoo, Ilhan & Yoo, Jaesung & Kim, Dongmin & Youn, Ina & Kim, Hyodong & Youn, Michelle & Won, Jun & Woosup, Cho & Myong, Youho & Kim, Sehoon & Yu, Ri & Kim, Sung-Min & Kim, Kwangsoo & Lee, Seung-Bo & Kim, Keewon. (2023). Deep learning-based algorithm versus physician judgement for myopathy and neuropathy diagnosis based on needle electromyography findings. 10.21203/rs.3.rs2719121/v1.

7. Alon Gorenshtein, Moran Sorka, Mohamed Khateb, Dvir Aran, Shahar Shelly, Agent-guided AI-powered interpretation and reporting of nerve conduction studies and EMG (INSPIRE), Clinical Neurophysiology, Volume 177, 2025, 2110792, ISSN 1388-2457

“WALANG HIYA KA” (YOU HAVE NO SHAME): LIVING IN THE PHILIPPINES WITH A DISABILITY

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“Walang hiya ka”, which translates to “You have no shame” in Tagalog translation. This was what I was called when visiting the Philippines when I was young. As I was growing up, I was not sure what this implied. Was it because I was being hard-headed or was I not considerate at the time when it came to following commands. I thought of this as I was pushing my auntie through the dirt to the rehab clinic’s wheelchair ramp in Metro Manila. I accidentally bumped into a rail, and she said “walang hiya ka.” I was bringing her to a physiatric assessment that I connected her to while in the Philippines. I realized how inaccessible resources and healthcare were, especially for individuals with disabilities. My auntie was suffering from her rare spinal cord injury for about a decade, and it was not until I visited this past winter that I started to connect her with resources nearby the rural province our family lives in. I tried to find more information but the fact that I had extreme difficulty deciphering the hidden texts and links embedded on the Internet does not make it easier for those living in rural third world countries.

To solve this problem at an individual and local level, there needs to be refinement in the healthcare system in the realm of rehabilitation. It was frustrating knowing that the cost of ultrasound-guided botulinum toxin injections for spasticity, especially for my auntie who suffers from spasticity in her legs, can be covered through the municipal government but the ability to obtain the reimbursement certificate prior to showing up to the clinic for the injections was a mission. Just having to roll a wheelchair through the dirt and sand after teaching my relatives in the Philippines how to properly transfer my auntie from bed to wheelchair to car was a challenge they had to overcome. Access to resources and facilities is not easy in the Philippines where public transport, such as jeepneys and motorized tricycle cabs, are not disability friendly. Having a private vehicle, which my family was fortunate to have while abroad made the journey less stressful.

The lack of family and caregiver education in the Philippines made me realize why some of my family members suffered from back and joint pain from transferring my auntie. There are times where my auntie feels ashamed because of the burden she thinks she places on the family but that was not true. The culture in this country is all about “kababayan” (fellow citizen) and “kapwa,” which is interconnectedness and care for another’s well-being. Despite the inaccessibility of resources and limited at-home visits by rehab specialists, her condition was manageable with the support that the community and neighbors had for each other. That was what I noticed when visiting the Philippines. There was always someone around to assist no matter the time of day because someone was always “on call.” Instead of her feeling ashamed because of her condition, this was a blessing in disguise since her condition made her connect with family and the community more.

Rehabilitation medicine is limited across different parts of the world and there is a high need, especially in third world countries. Living in the Philippines with a physical impairment did not stop my auntie. She was right when she said to me, “walang hiya,” because there is truth in that statement. I learned that no matter what situation we encounter in life, we must embrace it and make the world fit into our situation rather than have us fit into the world. This is her story.

THE LANGUAGE OF HEALING: BUILDING TRUST THROUGH CULTURE AND CARE

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PHYSICIAN FROM VENEZUELA APPLYING FOR RESIDENCY IN PHYSICAL MEDICINE AND REHABILITATION

Healing begins when we see the person beyond the diagnosis. My journey from Venezuela to the United States has shown me that empathy and communication are essential to transformative patient care.

I am the first doctor in my family and the first to emigrate to the United States. When I left Venezuela, I carried more than a medical degree. I brought a perspective shaped by crisis, scarcity, and a fierce belief in restoring dignity through care.

I came to the United States with the goal of pursuing a residency in Physical Medicine and Rehabilitation (PM&R). Like many international medical graduates (IMGs), I arrived with more than credentials—I came with lived experience.

In Venezuela, innovation was not a luxury. It was a necessity. Long before we wear white coats in the United States, IMGs learn to build bridges across languages, cultures, and collapsing systems. We adapt to limited resources and unpredictable conditions. We translate not just language but fear, uncertainty, and hope. These skills may not appear on a CV, but they define the spirit of physiatry: compassionate problem-solving, deep empathy, and an unwavering commitment to restoring function and dignity. In PM&R, we use tools like bracing, assistive devices, therapeutic exercise, and spasticity management to treat conditions and restore lives. That mission speaks deeply to my values and training.

During my sixth year of medical school, what we call our internship, I was rotating at the main public hospital on an island off Venezuela's northeast coast. Supplies were scarce, power outages were constant, and the demand for care often outstripped what was available.

One day, just as I was finishing a grueling 24-hour shift, I heard someone urgently ask, "Does anyone speak English?" No one answered. The silence that followed felt heavy and overwhelming.

The patient was an American tourist severely injured in a motorcycle crash. Thrown in the air after a car struck him from the side, he was frightened, isolated, and unable to communicate his needs. No one else at the hospital spoke English except me. Even though I was rotating on a different service and caring for other patients, I stepped in and offered my help, ready to support in whatever way needed. It did not matter that it would require more time at the hospital or more careful planning to keep up with my other responsibilities—I was committed to ensuring that every patient, especially one so vulnerable, felt heard and safe. I translated, explained procedures, answered questions, and stayed by his side through the long recovery days.

Thanks to basic but consistent rehabilitation—positioning, assisted transfers, and gait training—he progressed from being bedbound to walking with crutches. Upon discharge, he told me I had given him more than physical recovery; I had given him a sense of safety in an uncertain world.

That moment changed me. I realized how powerful it is to be simply understood. I wasn't just helping with his medical care—I was helping him feel human in a foreign place. I was still a medical student, but knowing I had made a difference was deeply rewarding.

In the United States, I continue to witness how language and culture create invisible yet deeply felt barriers to care. PM&R is uniquely positioned to break down these barriers, standing at the intersection of medicine and recovery. Whether helping a child with cerebral palsy improve mobility or supporting a cancer survivor manage fatigue and pain, physiatrists meet patients at their most vulnerable—and help them move forward with purpose. To truly shape the future, however, we must center equity, language access, and cultural humility as core competencies, not afterthoughts.

I am committed to advancing the development of culturally and linguistically responsive tools to screen for social determinants of health, which play a crucial role in patient recovery but are often poorly captured and coded in electronic health records. By improving how we identify and address these factors, we can better tailor rehabilitation care to meet the needs of diverse communities and truly fulfill physiatry's promise of equitable, compassionate, and patient-centered healing.

COMMOTIO CORDIS AND THE SPORTS PHYSIATRIST: INSIGHTS FROM A CARDIOLOGY ROTATION

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Introduction

Commotio cordis is a rare but potentially fatal cause of sudden cardiac arrest resulting from blunt impact to the chest, typically occurring during competitive sports.[1] It is the second leading cause of sudden cardiac death in young athletes, after hypertrophic cardiomyopathy.[2] Physiatrists often serve as sideline physicians during sporting events, where appropriate emergency preparedness and response is key to preventing commotio cordis–related deaths. Furthermore, patients who survive such events may face secondary challenges that extend beyond cardiac recovery such as cognitive impairment, neuromuscular deficits, psychological sequelae, and concerns regarding safe return to sport. Thus, as physiatrists our expertise in functional assessment, neurological recovery, and activity reintegration positions us to play a pivotal role in the recovery of commotio cordis survivors.

Sideline Coverage and Emergency Preparedness

Although commotio cordis does not cause structural damage to the myocardium, the ventricular fibrillation it induces can lead to sudden cardiac arrest. Survival is heavily dependent on immediate cardiopulmonary resuscitation (CPR) and rapid access to an automated external defibrillator (AED). Studies have shown that initiating resuscitation within 3 minutes results in survival rates of 40% or higher, whereas delays beyond 3 minutes reduce survival to approximately 5%.[1,3] Thus, one of the most direct ways physiatrists can influence outcomes in commotio cordis is through sideline coverage.

Our presence during athletic events places us at the critical junction where these injuries occur. Sports medicine physiatrists involved in sideline coverage can ensure AED availability and functionality, support training of coaching staff and athletes in CPR, and assist in the development and regular review of Emergency Action Plans (EAPs). By promoting preparedness at the field level, physiatrists can help improve outcomes in rare but high-stakes situations such as commotio cordis.

The Case for Physiatric Involvement Beyond the Sideline

One of the most challenging decisions following an athlete's survival of commotio cordis is determining whether they can safely return to sport. This decision should be made collaboratively by a multidisciplinary medical team, including the patient's cardiologist and sports physician.

First and foremost, cardiology plays a central role in the initial evaluation and medical clearance of commotio cordis survivors. Testing may include electrocardiography, echocardiography, stress testing, and electrophysiologic studies to assess for underlying cardiac pathology.[4] Once the patient is deemed medically stable, rehabilitation specialists can support the next phase of care—functional reintegration.

A critical consideration is the risk of post-anoxic brain injury. Survivors of prolonged cardiac arrest may experience varying degrees of cognitive and motor dysfunction.[5] With our understanding of neuroplasticity and recovery trajectories, physiatrists can play a key role in these cases. For patients exhibiting neurocognitive or physical deficits, a structured rehabilitation plan can enhance functional outcomes and quality of life. As physiatrists, we are uniquely equipped to coordinate interdisciplinary rehabilitation programs involving physical therapy, occupational therapy, speech-language pathology, and neuropsychology as appropriate.

In addition, the psychological impact of sudden cardiac events, particularly in adolescent athletes, may include anxiety, depressive symptoms, or fear of recurrence. These factors can influence both recovery and readiness to return to physical activity.[6] As physiatrists, we are often well-positioned to assess psychological readiness and reintegrate patients into physical activity.

Ultimately, a collaborative, multidisciplinary approach ensures that recovery efforts extend beyond cardiac clearance to encompass full readiness for return to sport or daily activity. Notably, approximately 70% of athletes with a history of commotio cordis achieve complete recovery and successfully return to sports.[7]

Getting Involved as a Trainee or Early-Career Physiatrist

For residents and early-career physiatrists, there are a number of ways to get involved in both sideline preparedness as well as the long-term care of athletes. Pursuing certification in Basic Life Support (BLS) if not already completed is essential, as these are foundational skills for any physician involved in sideline care. Elective rotations in sports medicine can provide direct exposure to on-field emergencies and real-time decision-making. In addition, attending national or regional conferences, like AAP, can provide trainees with sideline coverage workshops and mentorship opportunities. For those interested in deeper involvement, consider a sports medicine fellowship.

Beyond the emergent response, trainees can also engage in long-term recovery by pursuing rotations in neurorehabilitation, brain injury medicine, or cardiopulmonary rehab where survivors of commotio cordis may receive ongoing care. Participation in interdisciplinary team meetings or outpatient follow-up clinics can also offer insight into return-to-play evaluations, cognitive and physical rehabilitation planning, and mental health support. Together, these experiences equip young physiatrists with the skills needed to provide both immediate and ongoing care, positioning them as integral members of the athlete care team across the full continuum of recovery.

Conclusion

Although commotio cordis may originate as a cardiac emergency, its downstream effects can extend into the domain of physical medicine and rehabilitation. Despite the rarity of commotio cordis, the principles it raises about rapid emergency care, neurological vulnerability, and reintegration into life and sport mirror many of the scenarios we commonly manage in our specialty. By participating in both acute preparedness and post-acute rehabilitation, physiatrists can help optimize outcomes for survivors and contribute to broader efforts in prevention and athlete safety.

References

1. Maron BJ, Estes NA 3rd. Commotio cordis. N Engl J Med. 2010;362(10):917-927.
2. Menezes RG, Fatima H, Hussain SA, et al. Commotio cordis: a review. Med Sci Law. 2017;57(3):146-151.
3. McDermott ER, Tennent DJ, Patzkowski JC. On-field emergencies and emergency action plans. Sports Med Arthrosc Rev. 2021;29(4):e51-e56.
4. Maron BJ, Zipes DP. 36th Bethesda Conference: Eligibility recommendations for competitive athletes with cardiovascular abnormalities. J Am Coll Cardiol. 2005;45(8):1316-1375.
5. Zygun DA, Fassbender K, Streutker C, et al. Brain injury after cardiac arrest: prognosis and rehabilitation. NeuroRehabilitation. 2007;22(4):307-314.
6. Reardon CL, et al. Psychological impact of sudden cardiac arrest in athletes: a review. Sports Health. 2017;9(6):538-544.
7. De Gregorio C, Magaudda L. Blunt thoracic trauma and cardiac injury in the athlete: contemporary management. J Sports Med Phys Fit. 2018;58(5):721-726.

FROM COURT TO CLINIC: RETHINKING CONCUSSION RECOVERY

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I don't remember hitting the table.

One moment I was sprinting down the basketball court at my church, the next I was on the floor, staring at the ceiling, my forehead throbbing. I had been shoved out of bounds and my momentum carried me head-first into a nearby table. In true 14-year-old fashion, no one had thought to move the bulky, rusting table that was leaned up against the wall. When I reached up to wipe the sweat out of my eyes, my hand came away bloody.

The cut was bad; a jagged 2.5-inch laceration that went all the way to my skull. I ended up in a local urgent care, where I was quickly moved from the waiting room to the back. The physician cleaned and sutured the wound, gave me basic aftercare instructions, and sent me home. I remember a quick check of my pupils, but beyond that there was no neurological exam in sight. There was no discussion about a concussion, no specialist referral, no return-to-school or return-to-play plan.

In hindsight, the signs were all there. Immediately after the hit, I had a splitting headache and flashes of light in my vision. I was nauseous and my neck was sore from the whiplash. Over the next few days, brain fog crept in, and I became irritable in ways I didn't understand. Two days after the injury, I nearly failed a quiz in English, my favorite subject, something that had never happened before.

There was the social sting. I was fourteen, self-conscious, and walking around with a bulky bandage that hid the black sutures marching across my forehead. I laughed it off to friends, but inside I was unsettled. I worried that the fogginess and trouble concentrating might be my new baseline. I didn't like the way I felt and feared that this version of my brain was the new me.

I recovered about two months later, but the path was lonely and confusing. I didn't know what was "normal" after a head injury, and there was no one guiding me through what to watch for or when to worry. I lived in a big city with excellent medical resources. I was healthy, had good insurance, transportation, and a supportive family. None of that translated into comprehensive concussion care.

Looking back, part of the explanation is timing. A decade ago, the science of concussion management, especially in pediatric and adolescent patients, was still evolving. But even today, access to specialized, multidisciplinary concussion care remains inconsistent. And if someone like me, with every structural advantage, didn't get the care they needed, it's worth asking: what happens to kids without those advantages?

We know that concussions, particularly in young people, can trigger a host of symptoms beyond the acute injury, sometimes surfacing months later.[1] For children with preexisting conditions, the challenges can be amplified.[2] Timely, coordinated care can make a difference, yet studies show that children from socioeconomically disadvantaged backgrounds are less likely to receive follow-up with concussion specialists, relying instead on fragmented care in emergency or urgent care settings.[3]

The good news: when patients do make it into standardized multidisciplinary concussion programs, outcomes can be improved.[4] In these clinics, protocols ensure that every patient receives consistent follow-up, neuropsychological assessment, vestibular therapy, and return-to-learn guidance. Research that I am currently involved in appears to tell a similar story: the challenge isn't the care itself; it's getting people to it.

That's why physiatry has such a critical role in the future of concussion care. PM&R physicians are trained to think across systems, to coordinate physical, cognitive, and emotional recovery in ways few specialties do. Physiatrists are natural leaders for building care models that integrate acute treatment with long-term surveillance, especially for children at risk of delayed complications.

Imagine if every child discharged after a head injury, whether from a sports collision or a car accident, had a clear pathway into a concussion program. Imagine if distance to a specialty clinic was less of a barrier, because telehealth and community-based satellite programs brought the expertise closer to home. Imagine if schools had a direct connection to these teams, so reintegration was guided by medical evidence instead of trial and error.

For me, those three months of uncertainty were just that: months. I got better. But for too many kids, especially those in rural areas, without insurance, or with social barriers, the uncertainty can stretch into years. And the consequences aren't just medical; they're academic, social, and deeply personal.

If we want to rise to the challenge of "Innovation, Integration, and Impact" in the future of physiatry, we need to reimagine concussion care so that comprehensive, multidisciplinary follow-up is the standard, not the exception. Because if the system failed me, someone with every advantage, how many others without those advantages are slipping through the cracks?

References

1.Moore RD, Kay JJ, Ellemberg D. The long-term outcomes of sport-related concussion in pediatric populations. Int J Psychophysiol. 2018 Oct;132(Pt A):14–24.
2.Ellis MJ, Ritchie LJ, Koltek M, Hosain S, Cordingley D, Chu S, et al. Psychiatric outcomes after pediatric sports-related concussion. J Neurosurg Pediatr. 2015 Dec;16(6):709–18.
3.Pate J, Cummins I, Mooney J, Cooper K, McLeod C, Gould S. Socioeconomic and demographic considerations of pediatric concussion recovery. J Clin Neurosci. 2022 Jun;100:94–9.
4.O'Neil J, Rose S, Davidson A, Shiplett K, Castillo A, McNally K. Outcomes of Multidisciplinary Care for Pediatric Post-Concussive Symptoms. Neurology. 2019 Oct;93(14_Supplement_1):S18–S18.

THE GLOBAL STATE OF PHYSICAL MEDICINE & REHABILITATION MEDICAL EDUCATION: GAPS, BARRIERS, AND FUTURE DIRECTIONS

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Introduction

“More than 2.4 billion people globally require rehabilitation services but fewer than one in three receive them.” — World Health Organization

Physical Medicine & Rehabilitation (PM&R) is a specialty rooted in function, dignity, and disability justice. Yet in most parts of the world, it is barely present in the medical curriculum if at all.

In an era when the World Health Organization and the International Society of Physical and Rehabilitation Medicine (ISPRM) are calling for bold action to expand global rehabilitation access, medical education worldwide is lagging behind. While there has been a national survey that examined PM&R’s role in U.S. curricula, no global effort has mapped PM&R education worldwide until now.[2]

Our team launched the first international survey evaluating PM&R awareness, exposure, and educational gaps in medical schools across the globe. We found points to both a crisis and an opportunity.

What the Data Reveals: PM&R Is Missing, But the Demand Is Not

From July 2024 to February 2025, we surveyed 666 medical students and recent graduates representing over 30 countries. The vast majority (86%) came from Asia, with others representing North America (6%), Africa (3%), Europe (2%), and additional regions.

Only 7% of respondents reported having access to a PM&R department or elective during medical school. That meant 93% of students worldwide were completing their training with little to no structured exposure to rehabilitation medicine.

Despite the absence of formal training, student enthusiasm for PM&R was striking. Nearly all respondents expressed sincere desire to learn more about rehabilitation medicine, with overwhelming interest in areas such as but not limited to pain management, stroke recovery, and spinal cord injury care. Many students wanted to attend lectures/Q&A sessions, shadow PM&R physicians, and/or participate in hands-on workshops with nearly nine in ten wanting a diversity centered workshop.

When asked what stood in the way, students pointed to three recurring themes. Most lacked clinical exposure to rehabilitation altogether, while many noted the absence of mentorship or role models within the field. Others shared that they had never received a clear explanation of what PM&R truly entails, underscoring the need for visibility in medical education as much as access.

Why It Matters: for Patients, for Equity, and for Us

Rehabilitation is not a luxury; it is a right. Whether caring for individuals with stroke, children cerebral palsy, spinal cord injury, or amputation, PM&R bridges the space between illness and recovery, diagnosis and independence.

Early rehabilitation determines lifelong outcomes, especially in pediatric populations. Yet when most future doctors are never exposed to PM&R, how can we expect them to refer, collaborate, or advocate for patients who need it?

This is not just a curriculum issue, it's a health equity issue.

The Path Forward: Global Action Starts in the Classroom

To align with the ISPRM Strategic Plan 2030 and to build an inclusive future for rehabilitation, meaningful reform in medical education is essential.[3] This means weaving PM&R content directly into core medical school curricula through lectures, case-based learning, and required rotations so that students encounter the specialty not as an optional sidebar, but as a vital part of comprehensive care. It also requires building intentional partnerships with PM&R physicians working in low-resource regions, ensuring that global insights and community-based practices are reflected in the training pipeline.

Equally important is the need to expand mentorship and shadowing opportunities, particularly for students in countries where PM&R departments are scarce or nonexistent. Student-led initiatives focused on disability health, adaptive medicine, and inclusive care can be powerful entry points when they are supported, recognized, and integrated into broader institutional goals. And where formal departments have not yet taken root, advocacy for their creation must be prioritized, both to nurture future physiatrists and to ensure patients everywhere have access to life-changing rehabilitation services.

Conclusion: We Can't Wait Another Generation

Physiatry calls on us to meet patients where they are, restore what has been lost, and protect the right to live fully and functionally. If we want a healthcare system that centers justice, we must start by training students who understand it.

The interest is already there. The question is, are we ready to meet it?

References

1.World Health Organization. (2024, April 22). Rehabilitation. WHO Newsroom – Fact sheets. Retrieved from https://www.who.int/news-room/fact-sheets/detail/rehabilitation

2.Adeniyi A, Fuentes S, Farah R, Lawani S, Sosa O, Puckerine M, Stein J, von Rickenbach KJ. Fostering Inclusivity in PM&R: A National Survey. Am J Phys Med Rehabil. 2025 Jul 1;104(7):679-685. doi: 10.1097/PHM.0000000000002671. Epub 2024 Dec 3. PMID: 39642334.

3.International Society of Physical and Rehabilitation Medicine. (2025, February 26). Strategic Plan 2030: ISPRM's roadmap to growth and achievement. ISPRM News & Announcements. Retrieved from https://isprm.org/strategic-plan-2030-isprms-roadmap-to-growth-and-achievement/

WITNESSING ARC^{EX}: NONINVASIVE CERVICAL STIMULATION IN A PATIENT WITH CHRONIC SPINAL CORD INJURY

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During the first week of my PM&R away rotation, I was assigned one afternoon to a local rehab center to observe a breakthrough therapy for chronic cervical spinal cord injury. That morning, my attending told me this new technology had been demonstrating remarkable success in helping individuals regain upper extremity function, and that it would be a great opportunity for me to witness. She explained that it utilizes transcutaneous electrical stimulation over the cervical spinal cord – a foreign but intriguing concept to me. Given it was only my third day of exposure to PM&R, I had no idea what to expect. That afternoon I walked into the rehab with a sense of curiosity and uncertainty, excited to see how an emerging technology was impacting lives.

Upon arriving at the rehab center, I met two residents who were also assigned to observe. “How do these sessions typically go?” I asked. They looked at each other, shrugged, and responded, “Not entirely sure – this is new for us too.” Up to that moment, I had assumed that they had seen this treatment dozens of times; only then did I realize just how cutting-edge this therapy was.

We walked into the physical therapy room, where a patient sat in a wheelchair with two coin-sized pads stuck to the back of his neck. With a half-smile and a look of doubt in his eyes, he jokingly said, “I guess let’s give this a shot.” A physical therapist stood next to him with a handheld device wired to the pads. She explained that she was holding the ARC^{EX} stimulator, which delivers electrical stimulation to the electrodes positioned over the patient’s cervical spine. The physical therapist described that the ARC^{EX} system helps to activate voluntary movements during rehabilitation sessions, allowing for potential restoration of upper extremity strength, sensation, and function in individuals with chronic cervical spinal cord injuries.

Before the stimulation began, the patient practiced bending his arm to meet his mouth, mimicking the motion of feeding himself. Each attempt seemed slow and laborious, and he was unable to fully complete the movement. He quickly became fatigued. Then the physical therapist started the ARC^{EX} stimulation, asking him to continue the same task and to share any changes he noticed as she adjusted the parameters. In the beginning, he reported no differences. But after about ten minutes, his demeanor completely changed; he smiled ear-to-ear as he touched his hand to his mouth for the first time since his injury years ago. He repeated the motion several times without tiring, something he had never imagined doing before.

This moment was nothing short of remarkable. In just minutes, I witnessed a patient carry out a movement that seemed impossible for years, thanks to an innovative, targeted intervention. This is exactly what drew me to pursue a career in physiatry – the opportunity to help patients regain function in their lives – and validated my interest in a procedural route within PM&R. On the third day of my first PM&R rotation, I witnessed exactly what I wanted in my future career: the intersection of cutting-edge intervention and life-changing impact.

ACCESSIBILITY FOR PATIENTS WITH SENSORY DISABILITIES

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As PM&R physicians, it is imperative to understand and support our patients with various disabilities. Sensory impairments are widespread in the United States, with hearing and vision loss being the most common. Among adults 18 and over, 13% have some difficulty hearing, and this percentage increases with age with 26.8% of adults 65 and older reporting hearing loss.[1] The CDC reports that 2-3 out of every 1,000 children born in the United States are born with some level of hearing loss in at least one ear.[2] Approximately 48 million Americans live with some type of hearing loss.[3] Vision loss is also common, with 6.8% of children under 18 having a diagnosed vision condition. Around 4.2 million Americans over 40 have an uncorrectable vision impairment, and this number is set to double by 2050.[4] Both hearing and vision loss are among the top 5 most prevalent disabilities in the United States.

Individuals with sensory disabilities face challenges such as social isolation, limited mobility, communication, and difficulty with ADLs. Elderly people with hearing loss are more likely to be lonely or self-isolate due to frustrations in following conversations or increased cognitive load due to decreased auditory processing. Decreased community involvement and social relationships are also frequently seen and can lead to long term cognitive decline.[5,6] Mobility is also impacted by hearing loss, with people reporting issues with balance, gait speed, and reduced postural control and stability. People with vision loss often have similar challenges, with mobility difficulties, psychosocial impairment and limitations with ADLs. All these factors lead to major life changes in someone experiencing hearing or vision loss. These changes are often so great that these individuals are not able to work, with only 35% of deaf people being employed, and 44% of blind or visually impaired people being employed.[7,8] People with sensory disabilities are also more likely to be under the poverty line, and therefore face increased cost barriers.[9] Systemic barriers and bias against people with disabilities also contribute to these statistics. Due to all these factors, both hearing and vision loss are also at risk for social and physical medical comorbidities.

Hearing loss leads to a variety of comorbidities such as cognitive decline, cardiovascular disease, diabetes and psychosocial conditions. Mobility impairments like postural instability lead to increased risk of falling and increased frailty in elderly individuals. Cognitive impairment and increased incidence of dementia is associated with severity of hearing loss, and also leads to increased social isolation, depression and loneliness. Cardiovascular risk factors are also reportedly higher in individuals with hearing loss, with hypertension prevalence about 10% higher when compared to people without hearing loss. This increased hypertension puts them at risk for stroke, kidney disease and other sequelae.[10] Vision loss also has similar comorbidities and quality of life has been shown to decrease as vision loss increases.[11] Mobility can be difficult for those with vision loss and they are at increased risk of falls, fractures and injurious accidents.[12] People with vision loss also have a higher level of psychological distress, which leads to increased levels of depression and anxiety. People with sensory disabilities are at increased risk for many health conditions and often have increased difficulty accessing healthcare services.

Many of the day-to-day challenges that people with sensory disabilities face also impact their ability to access necessary healthcare. A study done by the CDC showed that those with vision impairment were less likely to have health insurance, less likely to have a primary health care provider, and were more likely to report cost as a barrier to accessing necessary care.[13] Those with hearing loss also face similar barriers, reporting decreased satisfaction with patient-physician communication, have lower health care utilization, and are less likely to have a primary care doctor.[14]

Someone with visual impairment will likely deal with transportation challenges, and lack of assistive technology at their physician's office. Someone with hearing loss may have a more difficult time communicating with their provider, and difficulty scheduling appointments. These obstacles can be overcome with the use of assistive technology and expanding accessibility measures, such as providing instructions in Braille, utilizing an ASL interpreter, and working with transportation services; however more work must be done to increase these measures and provide those with sensory disabilities adequate healthcare. PM&R physicians should strive to make our practices as inclusive as possible, providing the best healthcare possible to those with all types of access needs.

References

1. Madans JH, Weeks JD, Elgaddal N. Hearing difficulties among adults: United States, 2019. NCHS Data Brief, no 414. Hyattsville, MD: National Center for Health Statistics. 2021. DOI: https://dx.doi.org/10.15620/cdc:107540

2. U.S. Department of Health and Human Services. (2024, September 24). Quick statistics about hearing, balance, & dizziness. National Institute of Deafness and Other Communication Disorders. https://www.nidcd.nih.gov/health/statistics/quick-statistics-hearing#1

3. Lin FR, Niparko JK, Ferrucci L. Hearing loss prevalence in the United States. Arch Intern Med. 2011 Nov 14;171(20):1851-2. doi: 10.1001/archinternmed.2011.506. PMID: 22083573; PMCID: PMC3564588.

4. Centers for Disease Control and Prevention. (2024, May 15). Fast facts: Vision loss. Centers for Disease Control and Prevention. https://www.cdc.gov/vision-health/data-research/vision-loss-facts/index.html

5. Podury A, Jiam NT, Kim M, Donnenfield JI, Dhand A. Hearing and sociality: the implications of hearing loss on social life. Front Neurosci. 2023 Oct 3;17:1245434. doi: 10.3389/fnins.2023.1245434. PMID: 37854291; PMCID: PMC10579609.

6. Fisher DE, Ward MM, Hoffman HJ, Li CM, Cotch MF. Impact of Sensory Impairments on Functional Disability in Adults With Arthritis. Am J Prev Med. 2016 Apr;50(4):454-462. doi: 10.1016/j.amepre.2015.07.014. Epub 2015 Sep 26. PMID: 26410186; PMCID: PMC4801663.

7. Disability employment research: Key takeaways. The American Foundation for the Blind. (n.d.). https://afb.org/research-and-initiatives/employment/reviewing-disability-employment-research-people-blind-visually

8. Supporting deaf people: Closing the employment gap. National Deaf Center. (2023, October 27). https://nationaldeafcenter.org/news-items/supporting-deaf-people-closing-the-employment-gap

9. Disability Statistics. https://disabilitystatistics.org/acs/7

10. Besser, J., Stropahl, M., Urry, E., & Launer, S. (2018). Comorbidities of hearing loss and the implications of multimorbidity for Audiological Care. Hearing Research, 369, 3–14. https://doi.org/10.1016/j.heares.2018.06.008

11. Rein DB, Wirth KE, Johnson CA, Lee PP. Estimating quality-adjusted life year losses associated with visual field deficits using methodological approaches. Ophthalmic Epidemiol. 2007 Jul-Aug;14(4):258-64. doi: 10.1080/01658100701473267. PMID: 17896306.

12. Sciences, N. A. of, Engineering, & Medicine, and. (2016, September 15). The impact of Vision Loss. Making Eye Health a Population Health Imperative: Vision for Tomorrow. https://www.ncbi.nlm.nih.gov/books/NBK402367/#:~:text=As%20of%202012%2C%20117%20million,to%20take%20comorbidities%20into%20account

13. Cheng Q, Okoro CA, Mendez I, Lundeen EA, Saaddine JB, Stein R, et al. Health Care Access and Use Among Adults With and Without Vision Impairment: Behavioral Risk Factor Surveillance System, 2018. Prev Chronic Dis 2022;19:220066. DOI: http://dx.doi.org/10.5888/pcd19.220066

14. Steinberg AG, Barnett S, Meador HE, Wiggins EA, Zazove P. Health care system accessibility. Experiences and perceptions of deaf people. J Gen Intern Med. 2006 Mar;21(3):260-6. doi: 10.1111/j.1525-1497.2006.00340.x. PMID: 16499543;