

ICDR TOOLKIT

# Medical Rehabilitation: Research and Resources for Interagency Collaboration in an Emerging Field

A Toolkit for  
Interagency Collaboration



INTERAGENCY COMMITTEE ON  
DISABILITY RESEARCH

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# Introduction

The broad scope of the medical rehabilitation field lends itself to addressing the complex needs of a population that is aging and experiencing higher rates of chronic conditions and disability than previous generations. However, medical rehabilitation research tends to be clinical and observational in nature, making it more expensive than other types of research to conduct (DeLisa, 2004). While outcomes need to be clinically effective and cost effective to be covered by health insurers, cost-effectiveness studies can be challenging to conduct due to the complex nature of many rehabilitation interventions (DeLisa, 2004). These challenges create significant barriers to conducting medical rehabilitation research. To address these challenges and a variety of others, federal interagency collaboration is essential to move the field forward. The field of medical rehabilitation has been developing and progressing over the past several decades, yet increased collaboration is needed to ensure the efficiency and timeliness of this progress. With enhanced federal interagency collaboration on medical rehabilitation research, people with disabilities will benefit from interventions that lead to overall improved quality of life.

## About the ICDR

The Interagency Committee on Disability Research (ICDR) was authorized by the amended 1973 Rehabilitation Act to coordinate federal research efforts surrounding disability, independent living, and rehabilitation research, to include assistive technology research and universal design. The ICDR's vision is to be widely recognized for facilitating and coordinating federal interagency efforts and for promoting collaborative relationships that maximize the best use of federal resources for disability, independent living, and rehabilitation research.

## Strategic Plan Goals

The three goals designated in the **ICDR's 2018 – 2021 Government-Wide Strategic Plan** are:

**Goal #1:** Improve interagency coordination and collaboration in four thematic research areas: transition, economics of disability, accessibility, and disparities.

**Goal #2:** Develop a government-wide inventory of disability, independent living, and rehabilitation research.

**Goal #3:** Promote ongoing stakeholder input on gaps and priorities for disability, independent living, and rehabilitation research.

Under Goal #1, Objective 8 states: “Convene stakeholders to build upon newly defined and emerging Federal agency priorities for medical rehabilitation.” The ICDR conducted teleconferences in March and April 2016 to gather stakeholder input on gaps in the field of medical rehabilitation research. This input facilitated the development of several problem statements in the supplemental document *Working Group Research Gaps, Problem Statements, and Final Priorities*. This toolkit compiles current medical rehabilitation research and resources across the federal government and is designed to address this same objective by highlighting future areas for collaboration in medical rehabilitation research.

## **Purpose of the Toolkit**

The resources in this toolkit present the current landscape of medical rehabilitation research and are meant to promote interagency collaboration in future research at the federal level. These resources can help people with disabilities and their caregivers, medical rehabilitation providers, medical rehabilitation researchers, and federal agencies focused on medical rehabilitation services and research. The toolkit offers a wide range of current research and resources developed through research from federal agencies and examples of best practices from across the public and private sectors. This toolkit also discusses current gaps in the field of medical rehabilitation research and highlights areas for future research and federal collaboration.

# Background

Medical rehabilitation, also referred to as physical medicine and rehabilitation (PM&R), physiatry, or rehabilitation medicine, seeks to “enhance and restore functional ability and quality of life to those with physical impairments or disabilities affecting the brain, spinal cord, nerves, bones, joints, ligaments, muscles, and tendons” (American Academy of Physical Medicine and Rehabilitation [AAPM&R], 2021a). Medical rehabilitation as a field of study in the United States dates back to the polio epidemic and the First and Second World Wars (Sandel, 2012). Since then, the field of medical rehabilitation has changed and developed. For example, in the

**An estimated 2.4 billion people currently have health conditions that could benefit from medical rehabilitation.**

1990s, medical rehabilitation expanded to cover additional specialties. Now, the American Board of Physical Medicine and Rehabilitation includes seven subspecialties: brain injury medicine, hospice and palliative care, neuromuscular medicine, pain medicine, pediatric rehabilitation, spinal cord injury medicine, and sports medicine.

Medical rehabilitation has a broad scope and targets patients with a wide range of health conditions or disabilities. An estimated 2.4 billion people currently have health conditions that could benefit from medical rehabilitation (Cieza et al., 2020). This number increased by 63 percent from 1.48 billion as of 1990. While the effectiveness of medical rehabilitation can be complex to evaluate, there is now evidence that many rehabilitative interventions are cost effective (Cieza et al., 2020; Howard-Wilsher et al., 2016). The demand for rehabilitation is expected to continue to increase, as people are living longer but with higher rates of chronic disease and disability.

Medical rehabilitation's emphasis is on maximizing people's quality of life and independence and not on a medical "cure" as with other specialties. The National Institute of Child Health and Human Development (NICHD), part of the National Institutes of Health (NIH), defines the two goals of medical rehabilitation as the following: "to maximize function, participation, independence, and quality of life for a person with a disabling condition and to maintain and prevent further decline in a person's functioning" (NICHD, n.d.). Increased collaboration across the medical rehabilitation field will move the field forward toward these two important goals.

# Relevant Legislation on Medical Rehabilitation Research

The following provides a brief overview of the history of legislation impacting medical rehabilitation research and shaping the landscape of the field currently.

## **Barden- LaFollete Vocational Rehabilitation Act**

The Barden-LaFollete Vocational Rehabilitation Act passed in 1943 added physical rehabilitation to the goals of federally funded vocational rehabilitation programs and certain medical rehabilitation programs (Sandel, 2012). Additionally, it expanded rehabilitation to additional groups of people with disabilities.

## **Hill-Burton Act**

The Hill-Burton Act passed in 1946 (also known as the Hospital Survey and Construction Act) provided authorization for states to construct hospitals, public health centers, and health facilities, but it did not include funding for rehabilitation facilities or hospitals (Sandel, 2012). Amendments to the Hill-Burton Act in 1954 were passed to fund the construction of rehabilitation facilities.

## **Social Security Act**

The Social Security Act was passed in 1935 and established federal assistance to adults with disabilities and expanded existing vocational rehabilitation programs (National Health Law Program, 2021). In 1965, amendments to this Act established the Medicare and Medicaid programs for the elderly, people with disabilities, and



individuals with low income. In 1972, Medicare coverage expanded to include more benefits and services for the disabled and funded inpatient rehabilitation facilities (AAPM&R, 2021b).

## **Americans with Disabilities Act**

The Americans with Disabilities Act (ADA) of 1990 provides protection against discrimination for people with disabilities in various arenas, including employment, government activities (to include Congress), commercial facilities, transportation, telecommunications, and public accommodations. The ADA does not list the specific conditions or impairments covered under “disability,” but it defines a disability as a “physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record of such impairment, or a person who is perceived by others as having such an impairment” (U.S. Department of Justice, 2020). The ADA and subsequent National Institutes of Health Amendments of 1990 established the National Center for Medical Rehabilitation Research within NICHD at NIH (NIH, 2016).

# Federal Research and Resources on Medical Rehabilitation

## U.S. Department of Defense

The U.S. Department of Defense (DoD) is a federal executive department that coordinates and supervises all agencies of the government related to national security and the U.S. Armed Forces (DoD, n.d.). DoD's role is to provide the military power and presence to deter war and ensure the nation's security.

## CONGRESSIONALLY DIRECTED MEDICAL RESEARCH PROGRAMS

The Congressionally Directed Medical Research Programs (CDMRP), created in 1992, develops novel approaches to biomedical research and seeks to fill major research gaps (CDMRP, 2021). The CDMRP funds high-impact, high-risk, and high-gain projects with the goal of leading to cures or improvements in patient care, as well as breakthrough technologies and resources with clinical benefit. The CDMRP's innovative research aims to improve the quality of health care for military service members and the general public. More about CDMRP is available on its [website](#).

### *Perspectives on Recovery and Interventions to Restore Function Across the First Year of Spinal Cord Injury (2019 – 2022)*

A CDMRP grantee at Case Western Reserve University is conducting a study on the needs of veterans who have experienced spinal cord injury (SCI), as well as their caregivers' needs, during the first year of injury. This study compares the experiences of veterans and their caregivers with the experiences of civilians in order to make policy and treatment changes to ensure successful rehabilitation. The goal of this study is to impact how people with SCI make sense of their recovery and

choose treatment options to successfully reintegrate into the community. More information about this study is available on the Federal Reporter [website](#).

***Clinical Trial of ReHeal Negative-Pressure Wound Therapy Glove (2019 – 2022)***

A CDMRP grantee at the University of Washington is studying the ability of negative-pressure wound therapy to augment the body’s capacity to heal wounds. This study proposes the use of the ReHeal Glove, a non-adherent silicone glove that allows the continuous application of negative-pressure wound therapy while also allowing free movement of the hand and regular monitoring of the wound without dressing changes. The ReHeal Glove promotes early rehabilitation, greater range of motion, and an earlier return to duty for patients, while saving time for the clinician and patients. This technology allows for the reduction of unnecessary wound changes, allowing discharges to occur sooner. More information about this project is available on the Federal Reporter [website](#).

***Defense Medical Research and Development Program***

The CDMRP provides Defense Medical Research and Development Program execution management support for six main Defense Health Program research areas: (1) Medical Simulation and Information Sciences Research Program (JPC-1); (2) Military Infectious Diseases Research Program (JPC-2); (3) Military Operational Medicine Research Program (JPC-5); (4) Combat Casualty Care Research Program (JPC-6); (5) Radiation Health Effects Research Program (JPC-7); and (6) Clinical and Rehabilitative Medicine Research Program (JPC-8). Each of these research programs is guided by a Joint Program Committee (JPC), made up of DoD and non-DoD medical and military technical experts.

The [Clinical and Rehabilitative Medicine Research Program \(JPC-8\)](#) aims to “ethically and responsibly develop long-term strategies to find, evaluate, and fund cutting edge research in reconstruction, rehabilitation, and definitive care for injured Warfighters to improve the standard of care and outcomes, return Service

members to full form and function, and ultimately restore the Warfighter to duty and improve his or her quality of life.” Research sponsored by this program includes neuromusculoskeletal injury rehabilitation, pain management, regenerative medicine, and sensory systems traumatic injury (including vision, hearing, and balance).

## **National Science Foundation**

The National Science Foundation (NSF) is an independent federal agency founded in 1950 that supports and promotes the field of science in order to transform the future of the country. In advancing science, NSF also assists with advancing “the national health, prosperity, and welfare” (NSF, n.d.). NSF has a variety of programs that support rehabilitation research. The **Disability and Rehabilitation Engineering** program funds research to improve the quality of life for people with disabilities, with a specific focus on rehabilitation robotics and neuroengineering. A comprehensive list of NSF programs related to rehabilitation is available on their [website](#). The following are a selection of NSF-funded projects related to medical rehabilitation:

### **AFFORDABLE ASSISTIVE DEVICES FOR STROKE SURVIVOR REHABILITATION (2018)**

This NSF-funded **I-Corps** project further developed an affordable, variable-dosage exoskeleton (APEX). This wearable upper-body device assists and supports the limbs while responding to specific user needs through feedback loops of communicative sensors and modeling. APEX offers support on a spectrum and reduces power consumption and prolongs the capacity of the device through low-cost, low-mass actuators. The goal of this project was for patients to use APEX in their own homes while the analytics were sent to their therapist, trainer, or physician. More about this NSF-funded project is available on the Federal Reporter [website](#).

## **NON-INVASIVE VENTILATION TREATMENT FOR COPD PATIENTS (2018)**

This NSF-funded I-Corps project developed a novel noninvasive ventilation modality for treating mild and severe chronic obstructive pulmonary disease (COPD). The device works by supplementing the patient's breathing with pressure changes on their chest and abdomen. This noninvasive, mobile, and lightweight ventilator allows patients to engage in physical activity and live their daily lives. Some of the long-term impacts this project found were: (1) increased quality of life and treatment effectiveness for severe COPD patients; (2) development of novel pulmonary rehabilitation therapies; and (3) expansion of noninvasive ventilation technology in the field of pulmonary care to supplement and enhance current ventilation techniques. More about this project is available on the Federal Reporter [website](#).

## **HYBRID ACTIVE-PASSIVE ACTUATION FOR SAFETY AND PERFORMANCE IN PHYSICAL HUMAN-ROBOT COLLABORATION AND REHABILITATION (2018 – 2021)**

This NSF-funded project was part of the National Robotics Initiative, and it studied the design and control of robots that use active and passive components. This project used an approach known as Balanced Active-Passive Hybrid Actuation, which offered high-power capabilities and enabled human-robot physical collaboration. A major application of this project is rehabilitation robotics for retraining intentional movement for patients with neural injury such as stroke. The actuators developed in this study will allow for the use of a strong, accurate, and safe rehabilitation robot for the legs. More information about this study is available on the Federal Reporter [website](#).

## **U.S. Department of Health and Human Services**

The U.S. Department of Health and Human Services (HHS) is a federal executive department whose mission is to “enhance the health and well-being of Americans, by providing for effective health and human services by fostering sound, sustained advances in the sciences underlying medicine, public health, and social services” (HHS, 2020). The Department’s scope is broad. With 11 different operating divisions, HHS is working on medical rehabilitation research in a variety of contexts.

### **ADMINISTRATION FOR COMMUNITY LIVING**

The Administration for Community Living (ACL) within HHS aims to help older adults and people of all ages with disabilities to “live where they choose, with the people they choose, and with the ability to fully participate in their communities” (ACL, 2020). ACL funds a variety of community-level targeted programs for older adults and people with disabilities, as well as research and education efforts.

### ***National Institute on Disability, Independent Living, and Rehabilitation Research***

The National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) is the primary disability research agency in the federal government. NIDILRR’s aim is to produce new knowledge and promote its effective use in order to improve the abilities of people with disabilities to perform their daily activities. In addition, NIDILRR’s research hopes to expand the capacity for society to provide opportunities and accommodations for people with disabilities. NIDILRR examines a wide range of disabilities across the lifespan, including all aspects of living with a disability.

NIDILRR funds a wide range of project types, many of which focus specifically on rehabilitation. Below are links to some of NIDILRR’s programs related to rehabilitation:

- **Model Systems Program** — This program provides coordinated systems of rehabilitation care and conducts research on SCI, traumatic brain injury (TBI), and burn injury.
- **Rehabilitation Research and Training Center Program (RRTC)** — These Centers engage in research, training, and information sharing on topics related to improving rehabilitation methodology and service delivery systems; improving health and function; and promoting employment, independent living, family support, and economic and social self-sufficiency for people with disabilities.
- **Rehabilitation Engineering Research Center Program (RERC)** — These Centers fund engineering research to develop technologies that solve rehabilitation or environmental barrier problems for people with disabilities.

Information on all of NIDILRR’s programs is available on [ACL’s website](#). The following are two examples of NIDILRR-funded research projects related to medical rehabilitation:

### **Measuring Activities of Daily Living in Stroke Patients with Motion Artificial Intelligence (2018 – 2019)**

A NIDILRR-funded Small Business Innovation Research project created a motion artificial intelligence analysis software to monitor activities of daily living for stroke survivors with disabilities. The project had the survivors use a smart wearable device, which used a supervised machine learning algorithm to detect and monitor 23 activities of daily living. The goal of this project was to provide information for health care providers on the duration, metabolic equivalent, and frequency of engagement in particular activities. This type of technology aims to give providers a way to monitor post-inpatient care, reduce the risk of re-hospitalization, and provide indicators of independence and rehabilitation efficacy. More information is available about the project at [this link](#).

## **Improving Rehabilitation and Reducing Re-Occurrence of Diabetic Foot Ulcers by Shifting Plantar Pressure with Exo-Tendon and Exo-Skeletal Footwear Systems (2018 – 2020)**

This NIDILRR-funded project focused on novel exoskeleton footwear that reduces plantar loading, accelerates and improves rehabilitation after diabetic foot ulcer, and minimizes its recurrence. This type of footwear aims to help people who have experienced diabetic foot ulcers to resume activities of daily living, maintain employment and function, and prevent amputation. This project's goal was to bring this novel exoskeleton footwear toward commercialization through optimizing the performance, conducting performance testing, and evaluating and validating deployed prototypes with patients. More information about this project is available at the following [link](#).

## **CENTERS FOR DISEASE CONTROL AND PREVENTION**

The Centers for Disease Control and Prevention (CDC) works to protect the health and safety of Americans from diseases both foreign and domestic (CDC, 2019). It supports increasing the health security of the country through critical research and health information.

### ***National Center for Injury Prevention and Control***

The National Center for Injury Prevention and Control within the CDC provides resources to Americans to protect themselves, their families, and their communities. The Center tracks data and trends on fatal and nonfatal injuries. In addition, the CDC's Injury Center provides research about preventing injuries and violence, as well as funds programs and activities to prevent overdose, suicide, and adverse childhood experiences.

CDC's Injury Center also provides [information on TBI](#), to include facts, statistics, provider resources, publications and reports, practice guidelines, and related CDC



initiatives. In 2018, the CDC was charged with developing a **National Concussion Surveillance System**, which will assist with improving prevention, care, and recovery efforts at the CDC and across groups focused on helping people who experience a TBI (CDC, 2021).

### ***Additional CDC Injury Center Resources on Traumatic Brain Injury***

- **CDC Study Finds that Adoption of the Brain Trauma Foundation Guidelines Could Result in a Substantial Reduction in Traumatic Brain-Injury-Related Deaths**
- **Traumatic Brain Injury in the United States: The Future of Registries and Data Systems**
- **How You May Feel After a Concussion & Tips for Your Recovery**
- **CDC Pediatric mTBI Guideline**

## **NATIONAL INSTITUTES OF HEALTH**

NIH is the country’s main medical research agency. NIH works to pursue “fundamental knowledge about the nature and behavior of living systems and the application of the knowledge to enhance health, lengthen life, and reduce illness and disability” (NIH, 2017). NIH develops and maintains resources to help the nation prevent disease and improve health. Additionally, promoting scientific integrity, public accountability, and social responsibility are other integral parts of NIH’s mission.

Rehabilitation research is a main focus across NIH, funded by 17 of its Institutes and Centers, with over \$500 million invested in rehabilitation research per year

(NIH, 2016). NIH released its first rehabilitation research plan in 1993, with the most recent **NIH Research Plan on Rehabilitation** released in 2016. This plan outlines six main areas of rehabilitation research that NIH coordinates: (1) rehabilitation across the lifespan; (2) family and community; (3) technology use and development; (4) research design and methodology; (5) translational science; and (6) building research capacity and infrastructure. The plan outlines objectives and examples for each of these areas.

NIH also provides coordination on medical rehabilitation research across other federal agencies. NIH works closely with NIDILRR, the U.S. Department of Veterans Affairs (VA), and other agencies to ensure the best use of federal spending in the field. In 2016, NIH sponsored a conference on medical rehabilitation entitled **Rehabilitation Research at NIH: Moving the Field Forward**.

***Eunice Kennedy Shriver National Institute of Child Health and Human Development***

The Eunice Kennedy Shriver National Institute of Child Health and Human Development began in 1962 to examine human development during the life course, with a focus on understanding disabilities and events that occur during pregnancy. NICHD funds research efforts that work to save lives, improve well-being, and reduce societal costs associated with illness and disability. NICHD's mission is "to lead research and training to understand human development, improve reproductive health, enhance the lives of children and adolescents, and optimize abilities for all" (NICHD, 2019).

In 2011, NICHD assembled a Blue Ribbon Panel with 13 panel members to review medical rehabilitation across NIH. The panel reviewed the total funding levels supporting medical rehabilitation research across each Institute/Center in NIH and gathered quantitative data on the National Center for Medical Rehabilitation Research (NCMRR). The final report offers recommendations regarding how to

improve the coordination of medical rehabilitation research across NIH. The final report is available [here](#).

In October 2020, NICHD co-sponsored a conference, **Rehabilitation Research 2020: Envisioning a Functional Future**, along with the National Institute of Neurological Disorders and Stroke, the National Center for Complementary and Integrative Health, the National Institute on Aging, and the National Institute on Deafness and Other Communication Disorders. The purpose of this event was to highlight advances in rehabilitation research and to guide the revision of the NIH Research Plan on Rehabilitation. This event hosted a virtual exhibit hall, showcasing research posters from NICHD, NSF, NIDILRR, VA, as well as several trans-NIH programs.

### ***National Center for Medical Rehabilitation Research***

NCMRR was established within NICHD after the passage of the ADA and the subsequent Public Law 101-613, National Institutes of Health Amendments of 1990. NCMRR seeks to build scientific knowledge to “enhance the health, productivity, independence, and quality of life of people with physical disabilities” (NCMRR, 2021). NCMRR supports medical rehabilitation research through grants, training and career development activities, small business and technology grants, and research infrastructure. NCMRR also engages in collaborations with other NIH Institutes, federal partners, and public-private partnerships. Topics of research NCMRR supports include: pathophysiology and management of chronically injured nervous and musculoskeletal systems (including stroke, TBI, SCI, and orthopedic conditions); repair and recovery of motor and cognitive function; functional plasticity, adaptation, and windows of opportunity for rehabilitative interventions; rehabilitative strategies involving pharmaceutical, stimulation, neuroengineering approaches, exercise, motor training, and behavioral modifications; pediatric rehabilitation; secondary conditions associated with chronic disabilities; improved diagnosis, assessment, and outcome measures; and development of orthotics, prosthetics, and other assistive technologies and devices.

## **NATIONAL ADVISORY BOARD ON MEDICAL REHABILITATION RESEARCH**

Also included in P.L. 101-613 was the mandate to establish the **National Advisory Board on Medical Rehabilitation Research**. The Board advises the directors of NIH, NICHD, and NCMRR on issues and policies related to NCMRR's programs. The Board is comprised of 6 members with disabilities and 12 members representing health and scientific disabilities related to medical rehabilitation.

## **MEDICAL REHABILITATION RESEARCH RESOURCE NETWORK**

The **Medical Rehabilitation Research Resource Network (MR3 Network)** is made up of six Rehabilitation Research Resource Centers across the nation that provide infrastructure and access to expertise, technologies, and resources to develop medical rehabilitation research. The MR3 Network is supported by NCMRR, the National Institute of Neurological Disorders and Stroke, the National Institute of Biomedical Imaging and Bioengineering, the National Institute on Deafness and Other Communication Disorders, the National Center for Complementary and Integrative Health, and the National Institute for Nursing Research.

The MR3 Network consists of the following six resource centers:

1. **The Alliance for Regenerative Rehabilitation Research and Training (AR<sup>3</sup>T)**
2. **The Center for Reliable Sensor Technology-Based Outcomes for Rehabilitation (RESTORE)**
3. **The Center for Smart Use of Technology to Assess Real-world Outcomes (C-STAR)**
4. **The Learning Health Systems Rehabilitation Research Network (LeaRRn)**
5. **The National Center of Neuromodulation for Rehabilitation (NC NM<sub>4</sub>R)**
6. **The National Pediatric Rehabilitation Resource Center (C-PROGRESS)**

MR3 Network Centers provide access to expertise across the field of medical rehabilitation research, including expertise in regenerative rehabilitation, neuro-modulation, pediatric rehabilitation, technology for real-world assessment, and translation/dissemination research. Through the MR3 Network, researchers also have access to courses and workshops, technologies, consultations, pilot project funding, and collaborative opportunities across allied disciplines such as neuroscience, applied behavior, social sciences, and engineering. Additional information about the resources available is on the [MR3 Network website](#).

## **U.S. Department of Veterans Affairs**

The VA is a federal executive agency responsible for administering benefits and services earned by veterans of the U.S. military. The VA is the largest integrated health care system in the United States and serves approximately 9 million veterans each year (VA, 2021).

Research conducted at the VA has come to be seen as a model for bench-to-bedside research, with 60 percent of VA researchers also providing direct patient care (VA, n.d.). The Office of Research and Development is composed of the following four research centers of excellence: (1) Biomedical Laboratory Research and Development Service; (2) Clinical Science Research and Development Service; (3) Health Services Research and Development Service; and (4) Rehabilitation Research and Development Service.

The five strategic priorities of VA research are to: (1) increase veterans' access to high-quality clinical trials; (2) increase the real-world impact of VA research; (3) put VA data to work for veterans; (4) actively promote diversity, equity, and inclusion; and (5) build community through VA research.

## PHYSICAL MEDICINE AND REHABILITATION SERVICES

The Veterans Health Administration's **Physical Medicine and Rehabilitation Services (PM&RS)** coordinates the national policies and programs for medical rehabilitation for veterans with disabilities. The goal of PM&RS is to advance the health, independence, and quality of life for veterans with disabilities. This office provides clinical expertise and clinical and practice guidance to provide comprehensive rehabilitation services in the following specialty areas: kinesiotherapy, occupational therapy, physical therapy, and physiatry. PM&RS aims to offer high-quality and comprehensive interdisciplinary care and promote advancement in rehabilitative care and evidence-based treatment.

## REHABILITATION RESEARCH AND DEVELOPMENT SERVICE

The VA's Rehabilitation Research and Development Service (RR&D) within the Office of Research and Development aims to “advance scientific knowledge and foster innovations to maximize Veterans’ functional independence, quality of life and participation in their lives and community” (VA, 2013). Additionally, RR&D invests in developing rehabilitation research capacity and investing in the next generation of VA rehabilitation researchers. RR&D focuses on ensuring rehabilitation research is translated into clinical practice to improve the health and well-being of veterans (VA, 2013). A list of the RR&D's Centers is available [here](#). A complete list of funded VA research projects by year is available [here](#).

Below are several VA-funded research topics related to medical rehabilitation:

- **Hearing Loss**
- **Traumatic Brain Injury**
- **Prosthetics/Limb Loss**
- **Multiple Sclerosis**
- **Spinal Cord Injury**

### ***Learn More About Medical Rehabilitation Research at the VA***

- Resources across the VA on precision rehabilitation are provided in **this document** from the Office of Research and Development.
- The publication ***VA Research Advance 2017–2018*** highlights VA medical rehabilitation research each topic area.

### **CENTER OF INNOVATION ON DISABILITY AND REHABILITATION RESEARCH (2013 – 2019)**

The Center of Innovation on Disability and Rehabilitation Research (CINDRR) conducted research to identify, develop, and test strategies to (1) improve veteran rehabilitation services across the continuum of care and (2) provide long-term support for veterans with disabilities and their families relating to access utilization, cost, quality, and health outcomes. The goal of CINDRR was to advance the science of medical rehabilitation through work related to outcomes across selected populations (e.g., TBI, SCI). CINDRR's investigations used consistent measures of key concepts across its studies and worked to develop population-specific measures.

Investigators on the CINDRR project continue to collaborate and work toward the same goal despite the project's end. Current funders for these investigators include VA investigator-initiated research projects, the Office of Rural Health, PM&RS, other national VHA program offices, NIH, the National Endowment for the Arts, and the Neilsen Foundation. More information about this Center is available **here**.

## **CENTER FOR VISUAL AND NEUROCOGNITIVE REHABILITATION (2017 – 2022)**

The VA's **Center for Visual and Neurocognitive Rehabilitation** (CVNR) aims to improve veterans' health and quality of life by conducting research on the rehabilitation of visual and related neurological impairments. CVNR engages researchers and clinicians in collaboration to advance evidence-based rehabilitation. This Center's research ranges from the basic science of repair mechanisms to the development of creative interventions to improve function and social reintegration. CVNR works to develop innovative approaches and assist with knowledge translation to clinically relevant treatments.

### **Interagency Collaboration**

Collaboration between federal agencies is an integral part of moving the field of medical rehabilitation forward, especially as it is still developing. Partnerships between federal agencies for sharing research and resources can assist with filling the research gaps and ensuring resources are available for people with disabilities receiving medical rehabilitation services. The following are several federal inter-agency projects in the field of medical rehabilitation.

### **CDC, NIH, VA, AND DOD – REPORT TO CONGRESS ON TRAUMATIC BRAIN INJURY (2013)**

TBI rates among active-duty U.S. military personnel increased throughout the duration of Operation Enduring Freedom (Afghanistan) and Operation Iraqi Freedom. In 2008, Congress passed the Traumatic Brain Injury Act of 2008 to address this, requiring the CDC and NIH, in consultation with the DoD and VA, to collaborate to develop improved ways of collecting and disseminating information about the incidence and prevalence of TBI among former military personnel. These agencies were charged with determining means of future collaboration on the development and improvement of TBI diagnostic tools and treatments. In response, the CDC, NIH,



DoD, and VA developed a Leadership Panel of experts in the TBI research field. This Panel's recommendations were submitted to Congress in 2013 and are published in the *Report to Congress on Traumatic Brain Injury in the United States: Understanding the Public Health Problem among Current and Former Military Personnel*.

### **DARPA, NIH, VA, DOD, AND FDA — INNOVATION PATHWAY INITIATIVE PROGRAM (2011)**

In 2011, the Food and Drug Administration's (FDA) Center for Devices and Radiological Health proposed a new program, the Innovation Pathway, to improve the review process to help patients obtain safe, breakthrough medical devices in a timely manner. This program was designed to increase the collaboration between the FDA and medical device developers. The Defense Advanced Research Projects Agency (DARPA), NIH, VA, and DoD all worked closely with the FDA to conduct a pilot review of a direct brain-control upper extremity prosthetic, the DARPA Arm (NIH, 2016). The goal of this pilot program was to reduce the overall time and cost for development, assessment, and review of medical devices that patients would benefit from expedited access to (FDA, 2016).

### **DOD, NIH, AND VA — FEDERAL INTERAGENCY TRAUMATIC BRAIN INJURY RESEARCH (FITBIR) INFORMATICS SYSTEM (2011 – PRESENT)**

The **FITBIR Informatics System** is an extensible, scalable informatics platform housing TBI-relevant data across all data types. FITBIR is a collaboration between the DoD, NIH, and VA designed to share data across the entire TBI research field and foster collaboration among researchers. FITBIR currently serves as a central repository for data on TBI research. FITBIR is a “combination of modules that supports sharing subject level de-identified data, rather than summaries or interpretations of this information” (FITBIR, n.d.). By doing so, this allows for the re-analysis and re-aggregation, integration, and comparison of the data with other data, tools, and measures.

### **ICDR AND NCMRR — A 2-DAY WORKSHOP (2007)**

In 2007, the ICDR Subcommittee on Medical Rehabilitation and NCMRR cosponsored a 2-day workshop, *A Research Agenda for Getting Beyond the Plateau: Promoting Recovery through the Chronic Phase*. During this workshop, 11 experts in medical rehabilitation evaluated physiological, behavioral, and psychosocial approaches to facilitate functional recovery and participation in the chronic phase of recovery. Together they developed a strategy and potential research agenda for moving beyond the plateau after the acute phase of recovery from a traumatic injury or stroke.

### **NIDILRR AND VA — COLLABORATION BETWEEN TBI MODEL SYSTEMS CENTERS AND POLYTRAUMA REHABILITATION CENTERS (2008 – PRESENT)**

In 2008, NIDILRR and VA initiated an interagency agreement to develop a database for the Polytrauma Rehabilitation Centers (PRCs), similar to the TBI Model Systems Centers' national database (Dijkers et al., 2018). The TBI National Data and Statistical Center helped to develop a similar but separate system to offer training, technical and administrative support, standard operating procedures development, and data access. In 2010, PRCs began to enroll in this national database. Collaboration between the PRCs and the TBI Model Systems Centers has continued past the development of the national database. For example, PRCs have representation at the TBI Model System Centers meetings and committees, and VA PRCs are now referred to as VA TBI Model System Centers despite the funding remaining separate.

### **NSF, NIH, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, U.S. DEPARTMENT OF AGRICULTURE, U.S. DEPARTMENT OF TRANSPORTATION, AND THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH — NATIONAL ROBOTICS INITIATIVE (2011 – PRESENT)**

The National Robotics Initiative is a collaboration between the NSF, NIH, National Aeronautics and Space Administration, the U.S. Departments of Agriculture and

Transportation, and the National Institute for Occupational Safety and Health that focuses on supporting research across the U.S. to advance the science of robot integration. Research projects funded through this program are aimed at the integration of robots to benefit humans through increasing safety and independence. Some projects focus on the use of robots in the field of medical rehabilitation. More information about this program is available on the [NSF website](#).

### **NSF, NIH, U.S. DEPARTMENT OF ENERGY, AND INTERNATIONAL PARTNERS — COLLABORATIVE RESEARCH IN COMPUTATIONAL NEUROSCIENCE (2002 – PRESENT)**

The [Collaborative Research in Computational Neuroscience](#) program brings together researchers to develop the “understanding of nervous system structure and function, mechanisms underlying nervous system disorders, and computational strategies used by the nervous system” (NSF, 2020). Funders of this collaborative program include NSF, NIH, the U.S. Department of Energy, and partners in Germany, France, Israel, Japan, and Spain. A list of projects funded by this program is available [here](#).

### **TBI INTERAGENCY CONFERENCES (1999 – PRESENT)**

NIDILRR and the Traumatic Brain Injury Model System Centers have led the effort to host a series of TBI Federal Interagency Conferences, beginning in 1999 (Dijkers et al., 2018). These conferences have brought together over 30 federal agencies and institutions (NIDILRR, CDC, DoD, U.S. Department of Energy, VA, Health Resources and Services Administration, and NIH), and four have been held since their inception (December 1999, March 2006, June 2011, and June 2018). These conferences have offered a way for federal agency staff and researchers to collaborate and learn from each other about emerging evidence-based practices and the latest research methods and interventions in the field.

# Best Practices and Standards Across Medical Rehabilitation Research

As the field of medical rehabilitation continues to grow, several best practices and innovative methods of research exist that can serve to enhance interagency collaboration. The following examples are a selection of best practices across the federal and private sector of medical rehabilitation:

## **WHO's Rehabilitation 2030 Initiative and Rehabilitation Competency Framework**

In 2017, WHO launched the **Rehabilitation 2030 Initiative** to draw attention to the unmet needs for rehabilitation worldwide. This Initiative spotlights the need to develop the capacity of health systems to offer rehabilitation services. This campaign has a three-fold emphasis: (1) rehabilitation should be available to all of the population at all stages of the life course; (2) efforts to strengthen rehabilitation should focus on integrating it into all levels of the health system; and (3) rehabilitation is an essential health service, necessary in reaching universal health coverage.

As part of this Initiative, in January 2021 WHO released a **Rehabilitation Competency Framework**. Many countries have an underequipped rehabilitation workforce to meet the rising rehabilitation demand in their population, necessitating an expansion and strengthening of regulation and quality assurance mechanisms across the field. Competency frameworks can serve as key tools for fostering the development of competency-based education and training and for developing instruments to assess performance. WHO recognizes the need to adapt competency frameworks to a variety of

rehabilitation settings, so it also released a [guide on adapting the Framework to specific contexts](#) and a [guide on developing a rehabilitation program and curriculum based on a contextualized competency framework](#).

## **VA/DoD Clinical Practice Guidelines**

In 2004, the VA/DoD Evidence-Based Practice Guideline Work Group launched. Its purpose is to advise the VA/DoD Health Executive Council on the use of clinical and epidemiological evidence across the Veterans Health Administration and Military Health System to improve the health of these populations. The Work Group has developed evidence-based rehabilitation guidelines based on high-cost, high-volume, high-risk, and problem-prone conditions, prioritized by cost, feasibility, and knowledge of the etiology of the gap. Guidelines are available in the following four areas:

1. [Management and Rehabilitation of Post-Acute Mild Traumatic Brain Injury](#)
2. [Lower Limb Amputation](#)
3. [Stroke Rehabilitation](#)
4. [The Management of Upper Extremity Amputation Rehabilitation](#)

More information about the VA/DoD Clinical Practice Guidelines are available on the [VA website](#).

## **Evidence-Based Practice in the Field of Medical Rehabilitation**

As the field of medical rehabilitation continues to develop, so does the guidance around evidence-based practice in this field. The following are two articles that discuss best practices for medical rehabilitation professionals staying up-to-date with evidence-based practices.

Dijkers, Murphy, and Krellman (2012) recommend that clinicians reference the following types of resources to ensure they are keeping up with evidence-based practice:

- Systematic reviews
- Meta-analyses
- Metasyntheses
- Health technology assessments
- Clinical practice guidelines
- Clinical pathways
- Databases of evaluations of primary studies
- Databases of extractions from primary studies
- Critically appraised topics and articles
- Evidence-based practice journals
- Targeted evidence dissemination

In an article that discusses methods to improve evidence synthesis and the application of knowledge, Johnston and Dijkers (2012) recommend the following methods:

- Define outcomes in terms of meaning and importance to the persons served.
- Update the technical basis of systematic review by including modern research designs and statistical inference.

- Evidence grading and recommendations for practice should consider effect size and direction of biases.
- Evidence of dose-response relationships should increase confidence in study results.
- Develop more discriminating methods of grading biases associated with imperfect masking and measurement.
- Consider overall bias and conflict of interest.
- Establish requirements to ensure expertise and minimize bias of review panels.
- Review panels should explicate their reasons for judgements that depart from those indicated by standard a priori criteria.
- Develop and promulgate improved standards and methods for reviewing quality of evidence for measurement.
- Explicate criteria for judging generalizability of study results.
- Choose and develop methods for translating evidence into practice recommendations.
- Develop evidence standards and methods for assistive technology devices and services.
- Develop a process to synthesize and grade the evidence inherent in clinical experience.

# Areas for Future Development and Collaboration in Medical Rehabilitation Research

## **VA Office of Research and Development — Recommendations for Future Research**

In 2013, the VA Office of Research and Development convened a group of experts in medical rehabilitation to identify several areas for future research in this field. They proposed multiple specific topic areas for study under the following three domains: (1) physiological function (molecule, cell, tissue, and organs); (2) physical and mental function; and (3) social and community integration and design and delivery of rehabilitation services. The extensive list of proposed research topics is available in [this publication](#) in the *Journal of Rehabilitation Research and Development*.

## **Rehabilitation Medicine Summit: Building Research Capacity**

In 2005, the Foundation for Physical Medicine and Rehabilitation, AAPM&R, the American Congress of Rehabilitation Medicine, and the Association of Academic Physiatrists organized a Rehabilitation Medicine Summit that convened in Washington, D.C. (Frontera et al., 2006). Participants in this summit included leading researchers in the field, senior and junior researchers, government agencies, department chairs, deans, research directors, professional organizations, disability consumer groups, and multiple medical specialties. The stated goal of the research summit was to “advance and promote research in medical rehabilitation by making recommendations to expand research capacity” (Frontera et al., 2006). Five main topic areas related to research capacity were identified as problem areas: (1)



researchers; (2) research culture, environment, and infrastructure; (3) funding; (4) partnerships; and (5) metrics. Participants in the summit discussed the following potential solutions: (1) coalitions; (2) training; (3) career paths; (4) partnerships to conduct research; (5) infrastructure; (6) message to funding agencies; (7) rehabilitation science model; and (8) mission statements and strategic plans. While participants discussed both short- and long-term goals for improving metrics, they suggested that information gathering should begin immediately on rehabilitation research trainees, the size of the rehabilitation research cadre, productivity, and federal agency expenditures on rehabilitation research. More detailed information about the findings from this research summit is available in [this report](#).

### **ICDR Medical Rehabilitation Brainstorming Session**

In 2016, the ICDR Health and Function Work Group convened for a medical rehabilitation brainstorming session. The group emphasized that a consistent definition is needed for rehabilitation research and proposed that the definition should be consistent with the one proposed by the NIH Blue Ribbon Panel: “The study of mechanisms and interventions that prevent, improve, restore, or replace lost, underdeveloped or deteriorating function where ‘function’ is defined at the level of impairment, activity, and participation according to the WHO-ICF Model” (NIH, 2012). Additionally, the group members discussed the need for the ICDR Strategic Plan to be consistent with the NIH Research Plan on Rehabilitation and the Blue Ribbon Panel on Medical Rehabilitation Research at NIH. The brainstorming session covered several additional topics, including: (1) health and functioning; (2) capacity building; (3) methodological approaches; (4) translational science; (5) economics; and (6) access to care/reimbursement. More information about this brainstorming session can be found on the [ICDR website](#).

***ICDR Brainstorming Session —***

***Proposed Medical Rehabilitation Research Topics***

- Neuropharmacology and neurological rehabilitation and how they may impede or help recovery in various conditions.
- New medical interventions (e.g., stem cell techniques).
- Alterations, body function, physiology, and understanding the relationships of chronic conditions and diseases.
- Aging, sex, and genetic variability associated with diseases and conditions and how they translate to disabilities.
- Clinical research related to patient outcomes, effectiveness, and utilization of orthotics and prostheses.
- Cognitive prostheses for people with brain injury, etc.
- Case management that helps patients and families navigate their care.
- Risk factors for complications and conditions that people with disabilities experience.
- Telehealth modalities for improving function, patient monitoring wellness, health care access, and complication prevention.
- Long-term consequences of disability, and the impact of poverty and the social determinants of health. Some of the complications that patients encounter are related to unemployment and/or poverty levels.

## WHO World Report on Disability – Rehabilitation

In 2011, WHO published the *World Report on Disability*. Chapter 4 of this report provides a definition of medical rehabilitation and details the rehabilitation process. This report discusses a variety of unmet global needs in rehabilitation medicine. In order to address the variety of complex needs, WHO recommends the following areas of focus:

- Reforming policies, laws, and delivery systems, including development or revision of national rehabilitation plans.
- Developing funding mechanisms to address barriers related to financing of rehabilitation.
- Increasing human resources for rehabilitation, including training and retention of rehabilitation personnel.
- Expanding and decentralizing service delivery.
- Increasing the use and affordability of technology and assistive devices.
- Expanding research programs, including improving information and access to good practice guidelines.

The full chapter on rehabilitation in WHO's *World Report on Disability* is available [here](#).

## WHO Rehabilitation in Health Systems — Research Priority Recommendations

In a 2017 report on rehabilitation in health systems, WHO recommended the following areas for action to improve the field of medical rehabilitation globally:

- System-level research on rehabilitation, including the types and impacts of different service delivery models, governance structures, and financial allocation and distribution.
- Cost–benefit analysis of rehabilitation.
- Rehabilitation workforce development, including approaches to training, distribution, and scaling up.
- The rehabilitation needs of populations throughout the lifespan and health conditions and impairment.
- Cultural and contextual considerations for rehabilitation service delivery.
- Facilitators and barriers to accessing rehabilitation.
- Development of a standardized measure of the impact of rehabilitation.

The full WHO report, *Rehabilitation in Health Systems*, is available [here](#).

# Resources

The following are both federal and non-federal resources related to medical rehabilitation to encourage collaboration among federal agency staff, researchers, medical rehabilitation organizations, providers, and people receiving medical rehabilitation and their caregivers. The resources are organized by type and include: (1) consumer resources; (2) fact sheets; (3) organizations; (4) provider resources; (5) research tools and datasets; (6) toolkits; and (7) webinars.

## Consumer Resources

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### **BrainLine — Resource Directory**

BrainLine is a “national multimedia project offering authoritative information and support” to people with brain injury or PTSD, their family and friends, and rehabilitation professionals who work with them. BrainLine’s resource library offers a wealth of information on treatment, managing symptoms, community and support, personal stories, legal and finance information, caregiver information, and military-specific information on TBI and PTSD for veterans, service members, and their families. The Resource Directory can be searched by city, state, and zip code, and you can narrow your search by what type of resources you are searching for.

<https://www.brainline.org/resource-directory>

### ***Choosing a High-Quality Medical Rehabilitation Program:***

#### ***An NRH Field Guide for People with Disabilities***

This guide was prepared through a NIDILRR-funded grant awarded to the Health and Disability Research Institute at Boston University with the goal of helping people with disabilities choose high-quality rehabilitation programs. It is composed of four

parts: (1) a description of medical rehabilitation – what it is, how it can help you, and the different rehabilitation professionals’ roles; (2) health insurance plans – what your plan will and will not cover; (3) different types of available rehabilitation programs; and (4) how you can find a high-quality program to suit your needs. At the back of the guide there are useful checklists, organizations, websites, and phone numbers.

<https://search.naric.com/public/choosingquality.pdf>

### **Commission on the Accreditation of Rehabilitation Facilities (CARF) International**

CARF International provides accreditation for health and human services across the globe and helps providers improve the quality of services, demonstrate value, and meet international organizational and program standards. In addition to resources for providers, CARF has a list of **consumer resources** by topic area. CARF also has a free **Medical Rehab Connection newsletter**.

<http://www.carf.org/home/>

## **Fact Sheets**

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### **CDC and NIDILRR – *Moderate to Severe Traumatic Brain Injury is a Lifelong Condition***

This fact sheet from the CDC and NIDILRR uses data from the TBI Model Systems National Database to illustrate the burden of moderate and severe TBI on public health. Additionally, it provides policy strategies for addressing the long-term consequences of TBI.

[https://www.cdc.gov/traumaticbraininjury/pdf/Moderate\\_to\\_Severe\\_TBI\\_Lifelong-a.pdf](https://www.cdc.gov/traumaticbraininjury/pdf/Moderate_to_Severe_TBI_Lifelong-a.pdf)

### VA Research Topic Fact Sheets

The VA has fact sheets for all of their research topic areas, providing information about current VA research, a timeline with milestones, and recent research highlights. Fact sheets are available for several topic areas relating to medical rehabilitation, such as **Traumatic Brain Injury**, **Spinal Cord Injury**, **Hearing Loss**, and **Vision Loss**.

<https://www.research.va.gov/topics/default.cfm>

### WHO Fact Sheet on Rehabilitation

WHO has put together an online fact sheet about rehabilitation, including its benefits, misconceptions, and an estimate of the global need for rehabilitation. This fact sheet also details ways WHO is addressing the increased global need for rehabilitation services.

<https://www.who.int/news-room/fact-sheets/detail/rehabilitation>

## Organizations

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### American Academy of Physical Medicine and Rehabilitation (AAPM&R)

AAPM&R is the professional organization for physicians who specialize in PM&R, treating a wide variety of medical conditions affecting the brain, spinal cord, nerves, bones, joints, ligaments, muscles, and tendons to maximize function and quality of life. AAPM&R focuses on providing: (1) resources for regulatory, certification, and licensure requirements; (2) education for career enhancement; (3) information about changes that may impact practice; and (4) a way to get involved to be a voice for the specialty. AAPM&R has a detailed **historical timeline of the PM&R field** on their website. Additionally, AAPM&R tracks important information on **regulation changes** that affect the PM&R field.

<https://www.aapmr.org/>

### **American Congress of Rehabilitation Medicine (ACRM)**

ACRM is a nonprofit professional organization that curates and disseminates interdisciplinary rehabilitation research with the goal of improving the lives of people with disabilities. ACRM affects change by improving researchers' investigations and dissemination of findings, educating providers on best practices, and advocating for funding for rehabilitation research.

<https://acrm.org/>

### **American Medical Rehabilitation Providers Association (AMRPA)**

AMRPA is a professional association that aims to engage in “legislative and regulatory advocacy, policy development, educational resources, and technical assistance” and to act in the interest of medical rehabilitation providers. AMRPA's site offers online learning opportunities, practice resource advocacy efforts, information for patients, and events.

<https://amrpa.org/>

### **Association of Academic Physiatrists (AAP)**

AAP is a professional organization for physiatrists who are committed to improving patient care through research and education. AAP offers opportunities for mentorship, leadership, and discovery for professional physiatrists. Their focus is on research, education, advocacy, and academic development.

[https://www.physiatry.org/general/custom.asp?page=About\\_AAP](https://www.physiatry.org/general/custom.asp?page=About_AAP)

### **International Society of Physical and Rehabilitation Medicine (ISPRM)**

ISPRM is an international non-government organization of PM&R physicians. It aims to improve PM&R practice and organize international PM&R research. The goal of ISPRM is to “contribute to the optimal functioning and quality of life of people experiencing disability.”

<https://www.isprm.org/>



**Mayo Clinic Rehabilitation Medicine Research Center**

The Rehabilitation Medicine Research Center at Mayo Clinic aims to provide hope to people with disabilities through discovery, translation, and application of new knowledge in rehabilitation medicine. Researchers and providers work together across more than a dozen departments and sections at Mayo Clinic to improve health and restore function for people with disabilities. The Center provides research activity organized around medical, musculoskeletal, and neurological rehabilitation.

<https://www.mayo.edu/research/centers-programs/rehabilitation-medicine-research-center/overview>

**National Association of Rehabilitation Providers and Agencies (NARA)**

NARA is an organization that represents therapists, rehabilitation providers, and rehabilitation support organizations across the U.S. It includes rehabilitation agencies, private practices, schools and athletic organizations, and inpatient and adult living and skilled nursing facilities. NARA provides educational opportunities, legislative updates, and advocacy for its stakeholders.

<https://naranet.org>

**Rehabilitation Engineering and Assistive Technology Society of America (RESNA)**

RESNA is a nonprofit professional organization that focuses on advancing the health and well-being of people with disabilities through access to technology. RESNA facilitates this through offering “certification, continuing education, and professional development; developing assistive technology standards; promoting research and public policy; and sponsoring forums for the exchange of information and ideas to meet the needs of our multidisciplinary constituency.”

<https://www.resna.org/>

## Provider Resources

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### **AAPM&R Clinical Practice Guidelines**

The AAPM&R website provides a list of clinical practice guidelines in the field that it either endorses or affirms. These clinical practice guidelines are scientifically reviewed by a committee. The aim of these guidelines is to ensure that practitioners have meaningful guidelines and to help identify gaps for the development of future guidelines.

<https://www.aapmr.org/quality-practice/evidence-based-medicine/clinical-practice-guidelines/aapm-r-endorsed-guidelines>

### **American Occupational Therapy Association Rehabilitation and Disability Evidence-Based Practice Resources**

The evidence-based practice resources on this web page are reviewed by clinical experts in the rehabilitation field and are designed to help professionals ensure they have the latest research and can apply it to their practice. Resources include systematic reviews, critically appraised topics, practice guidelines, infographics, and intervention ideas.

<https://www.aota.org/practice/practice-essentials/evidencebased-practiceknowledge-translation>

### **Concussion Calculator**

The Concussion Calculator from the Toronto Rehabilitation Institute includes five questions providers can ask their patients and provides a percent risk of the patient developing prolonged concussion symptoms. This calculator also includes best practice recommendations for providers based upon their patient's risk. This calculator is ideally used in the acute phase of a concussion, right after an injury; however, it is accurate throughout the first 6 months following a patient's concussion.

<https://www.kite-uhn.com/tricordrr>

### **Guideline Central – Physical Medicine and Rehabilitation**

Guideline Central hosts evidence-based clinical decision support tools for health care professionals in a variety of fields. The site partners with over 35 medical societies and government agencies to maintain their peer-reviewed tools that physicians can use for guidance in managing specific medical conditions. Users can search the database of guidelines by intended user, category, specialty, and authoring agency. Guideline Central has a page dedicated to PM&R guidelines.

<https://www.guidelinecentral.com/summaries/specialties/physical-medicine-and-rehabilitation/>

### **The Cochrane Library**

This library is an online collection of databases containing the latest rigorous research on effective health care treatments, interventions, methodologies, and diagnostic tests. The aim is to provide high-quality resources to help inform health care decision-making.

<http://www.thecochranelibrary.com/view/o/index.html>

## **Research Tools and Datasets**

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### **Disability Statistics**

Disability Statistics is a website created and maintained by the K. Lisa Yang and Hock E. Tan Institute on Employment and Disability at Cornell University. This website offers an interactive search tool where researchers can view statistics by topic area by selecting a statistic and adjusting search filters. Disability Statistics also offers a searchable tool to find disability status reports by state and year. Specific to rehabilitation, Disability Statistics hosts a **Rehabilitation Dataset Directory** and a **Rehabilitation Research Cross-Dataset Variable Catalog**. A variety of other research

tools are available on this website.

<https://www.disabilitystatistics.org/>

### **National Rehabilitation Information Center (NARIC)**

NARIC has been curating direct, personal, and high-quality information services to anyone across the United States since 1977. NARIC offers interactive information on disability and rehabilitation through online publications, searchable databases, and timely reference and referral data. NARIC also hosts a **REHABDATA Thesaurus**, which provides indexing and informative abstracting for documents from across a wide variety of rehabilitation and disability information sources. Users can search through over 330,000 records by category.

<https://www.naric.com/?q=en/home>

### **OpenSim Community**

OpenSim is a “freely available software system that allows you to build, exchange, and analyze musculoskeletal models and dynamic simulations of movement.” OpenSim models are also available on the website, in addition to simulation data, scripts, and setup files that are actively maintained.

<https://opensim.stanford.edu/>

### **PM&R Knowledge NOW**

PM&R Knowledge NOW is an online resource for physiatrists and patients that offers overviews of conditions and treatments in the PM&R field. This online resource continues to evolve and provides information on 300 different clinical topic areas. PM&R Knowledge NOW provides practice guidelines, related articles, educational content, and therapeutic information. An example of one of the research resources on PM&R Knowledge NOW is this **article on Outcome**

**Measurement in Rehabilitation.**

<https://now.aapmr.org/>

**Physiotherapy Evidence Database**

The Physiotherapy Evidence Database is a site produced by the Institute for Musculoskeletal Health at the University of Sydney and Sydney Local Health District and hosted by Neuroscience Research Australia. It offers free access to 52,000 trials, reviews, and guidelines related to physiotherapy interventions. This site also provides information by topic area, a wide range of resources, and opportunities to learn more about evidence-based practices in the field.

<https://pedro.org.au/>

**Rehabilitation Measures Database**

The Shirley Ryan AbilityLab hosts a database of rehabilitation instruments for both clinicians and researchers. These measures are divided by category and include stroke, spinal injuries, brain injury, Parkinson's disease, neuromuscular conditions, vestibular disorders, older adults and geriatric care, cancer, musculoskeletal conditions, and arthritis. The site also hosts a series of education modules on rehabilitation outcome measurement.

<https://www.sralab.org/rehabilitation-measures>

**WHO Rehabilitation Need Estimator**

The WHO Rehabilitation Need Estimator is an online resource that provides global estimates of the need for rehabilitation services by region. The goal of this resource is to illustrate the need for rehabilitation to be an integral part of the whole health care system across the globe. More information about WHO's efforts to improve rehabilitation services is in [this paper](#), which the resource is based on.

<https://vizhub.healthdata.org/rehabilitation/>

## Toolkits

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### **Implementing Telerehabilitation Within Outpatient Rehabilitation Program (TR-Telerehab Toolkit)**

This toolkit from the Toronto Rehabilitation Institute’s Brain Rehabilitation Program and Mobility Innovations Centre offers resources to help organizations and providers “implement, improve, and evaluate virtual rehabilitation.” It contains information on how to prepare patients and families for virtual rehabilitation, how to prepare for a successful virtual rehabilitation session, a virtual rehabilitation safety checklist, how to prepare for medical events during virtual therapy, evaluation tools, and many other resources.

<https://www.kite-uhn.com/tools/tr-telerehab-toolkit>

### **Participation and Quality of Life (PAR-QoL) Toolkit**

The PAR-QoL Toolkit provides SCI clinicians and researchers education and resources related to the outcome tool selection process. This collection of information on participation and quality of life outcome tools details the sensitivity of the tool to secondary health condition impact, the validity and reliability of the tools, and the underlying quality of life construct of each measure. The aim of this toolkit is to spur improvements in the field of SCI clinical practice and research.

Link: <http://parqol.com/>

### **Reactive Balance Training Toolkit (Rebal Kit)**

The Toronto Rehabilitation Institute released the Reactive Balance Training Toolkit to assist rehabilitation professionals, such as physiotherapists or kinesiologists, with using reactive balance training in their practices. The toolkit offers a training manual, data collection sheets and logs, intensity scales, patient handouts, reactive balance training studies, videos, and case studies.

Link: <https://www.kite-uhn.com/tools/rebal>

## Webinars

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### **AAPM&R – Webinar Archive**

AAPM&R's site has links to a variety of past webinars on regulatory, federal, quality, and coding and reimbursements issues for the physiatry field. A list of upcoming live and virtual events is also available.

<https://www.aapmr.org/education/online-education-and-resources/webinars/workshops-webinars>

### **ACRM Webinar and Video Library**

The ACRM site hosts a webinar and video library that offers free access to educational content for all users within a variety of rehabilitation categories. The library has both upcoming and recorded webinars and video recordings of previous ACRM annual conferences.

<https://acrm.org/resources/video-library/>

### **ISPRM Webinars**

ISPRM has a library of recordings from previous ISPRM webinars, as well as information about upcoming webinars. Webinars focus on a variety of global issues in the field of PM&R.

<https://www.isprm.org/isprm-webinars/>

### **John Hopkins Physical Medicine and Rehabilitation – Webinars**

John Hopkins Department of Physical Medicine and Rehabilitation hosts a collection of webinars from their clinicians sharing their expertise on a variety of rehabilitation topics.

[https://www.hopkinsmedicine.org/physical\\_medicine\\_rehabilitation/education\\_training/webinars.html](https://www.hopkinsmedicine.org/physical_medicine_rehabilitation/education_training/webinars.html)

### **NICHD Webinar – Rehabilitation Research 2020: Envisioning a Functional Future**

This trans-NIH conference highlighted progress across rehabilitation research since the last rehabilitation research conference at NIH in 2016. A conference summary and conference videos are available on the NICHD website.

<https://www.nichd.nih.gov/about/meetings/2020/101520>



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