CDMRP
DEPARTMENT OF DEFENSE
CONGRESSIONALLY DIRECTED MEDICAL RESEARCH PROGRAMS

Vision Research Program

Strategic Plan

INTRODUCTION

The Congressionally Directed Medical Research Programs (CDMRP) represents a unique partnership among the U.S. Congress, the military, and the public to fund innovative and impactful medical research in targeted program areas. Programs managed by the CDMRP have formalized strategic plans that identify program-specific research priorities; how to best address these urgencies; short- and long-term goals; investment strategies; and ways to identify and evaluate program successes with respect to the priorities.

The Vision Research Program (VRP) Strategic Plan identifies the high-impact research goals that are most important to the program and its stakeholders while providing a framework that is adaptable to changes in the medical research and clinical care environments to address those goals. This plan has been formulated to provide greater clarity of the program's goals over time. Congress appropriates funding for the VRP on an annual basis; therefore, there is no guarantee of future funding. The VRP Strategic Plan will be reviewed during the program's annual Vision Setting meeting and updated as necessary.

VRP BACKGROUND AND OVERVIEW

Eye injury and visual dysfunction resulting from battlefield trauma affect many Service Members and Veterans. Surveillance data from the U.S. Department of Defense (DOD) indicate that eye injury accounts for approximately 15% of all injuries from battlefield trauma sustained during the wars in Afghanistan and Iraq,[1] resulting in more than 270,000 ambulatory patients and 5,237 hospitalizations between 2000 and the first quarter of 2017.[2] An epidemiology study of 652 Soldiers admitted to Walter Reed Army Medical Center from 2001 to 2011 showed that 30% of patients became legally blind in their injured eyes.[3] In addition, traumatic brain injury (TBI), which affected more than 468,000 Service Members through the third quarter of 2022,[4] can have significant impact on vision even when there is no injury to the eye.[5]

Congress established the VRP in fiscal year 2009 (FY09) to "target the various causes, effects and treatment of visual injury resulting from exposures to the elements during combat operations, and damage from explosive devices." The VRP was administered by the U.S. Army Medical Research and Development Command's (USAMRDC) Telemedicine and Advanced Technology Research Center from FY09 to FY12 and was transitioned to the CDMRP for administration starting with the FY13 program cycle. Congressional appropriation for the VRP from FY09 through FY23 totaled $184.95 million (M) (Figure 1).

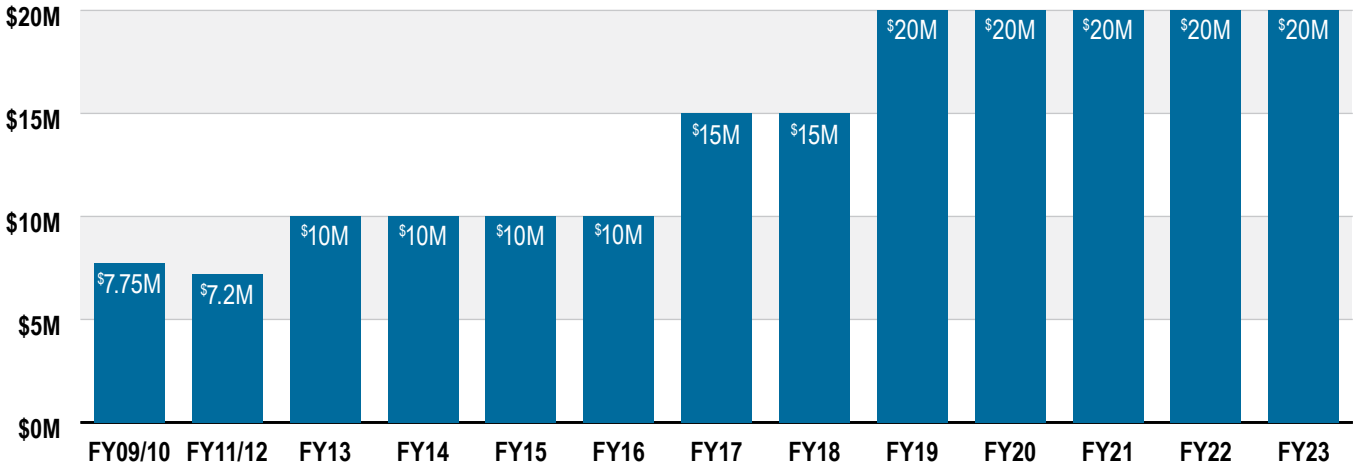

Figure 1. VRP appropriation, FY09-FY23

VISION AND MISSION OF THE VRP

VISION: Transform vision trauma care for our armed forces and the nation

MISSION: To address clinical needs through innovative research targeting the mechanism, effects, and treatment of service-connected eye injuries and vision dysfunction

FUNDING LANDSCAPE

The VRP is the nation's primary funder of research on vision injury, including injury to the ocular system and TBI-associated visual dysfunction. Before the establishment of the VRP, there was little vision injury research outside of DOD and Department of Veterans Affairs' (VA) laboratories. Through the VRP, funding for vision injury research is available to investigators in academic institutions and companies across the United States and other countries that are eligible to apply for federal grant. As a result, the vision injury research field has grown rapidly since the establishment of the VRP in FY09. Through FY22, the VRP has made more than 160 awards to 130 principal investigators at more than 80 institutions/companies around the world.

The VRP funds research across the continuum of care (Figure 2). Battlefield and en route care is defined as management of combat-related eye and vision trauma at or close to the point of injury, with the goals of saving the eye, transporting the casualty to definitive care, or returning the Warrior to battle. Definitive acute care is defined as definitive treatment and management of eye and vision trauma, including care for degeneration, visual dysfunction, or disease secondary to the trauma, with the goals of returning to duty or transitioning to chronic care. Chronic care is defined as long-term chronic care, including restoration and rehabilitation, with the goals of restoring eyesight and improving or preserving quality of life.

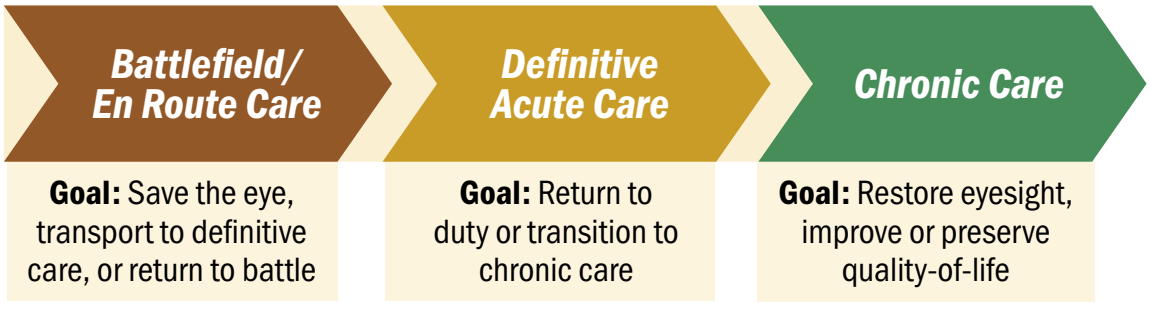

Figure 2. The vision injury continuum of care

The VA Rehabilitation Research and Development Service (RR&D) sponsors vision injury research as part of its Sensory Systems/ Communication Disorders portfolio, which encompasses hearing, speech, and vision research projects.[6] In FY22, the VA RR&D invested $10.9M to fund 54 vision research awards, primarily focusing on rehabilitation and vision restoration (representing direct costs only; the VA program does not include indirect costs because it is an intramural program). The total approved costs for the full award period for projects active in FY22 was $57.7M (direct costs only).

Additional vision injury research funding opportunities may come from the Defense Health Agency's Military Operational Medicine Research Program and the CDMRP's Joint Warfighter Medical Research Program, depending on capability gap requirements and availability of funds.

Research on vision injury depends on the continued advancement in vision science and training of vision scientists. Both are sustained primarily by funding from the National Eye Institute (NEI). The NEI has been and still is the sole support institute for many areas of eye research and is a major source of funds for all of the vision sciences. In FY22, the NEI invested $718.3M and $103.9M in extramural and intramural research, respectively, in six program areas: retinal disease; corneal disease; lens and cataract; glaucoma and optic neuropathies; strabismus, amblyopia, and visual processing; and low vision and blindness rehabilitation. The NEI is also a participant in the National Institutes of Health (NIH) Brain Research through Advancing Innovative Neurotechnologies (BRAIN) and NIH Regenerative Medicine initiatives. The VRP and the NEI share common goals in funding research that prevents and treats the degeneration or injury of critical components of the eye and restores impaired or lost vision. In 2018, the VRP and the NEI established the DOD-NEI Vision Research Collaborative (VRC) to facilitate coordinated investment in research that advances the missions of both agencies. Through the VRC, the NEI participates in select VRP funding opportunities and provides an additional funding source to meritorious VRP applications. The NEI has invested $4.65M in six applications since the establishment of the VRC.

In addition to federal funders, there are more than 30 non-profit organizations that collectively invest more than $50M each year in specific areas of vision research, notably age-related macular degeneration (AMD), diabetic retinopathy, and glaucoma.

RESEARCH LANDSCAPE

Vision science has seen rapid and exciting developments in both basic and clinical research over the past decades. These developments have translated into new or improved diagnosis and/or treatment methods for visual system diseases and injuries. For example, a gene therapy to treat a rare form of inherited blindness was approved by the U.S. Food and Drug Administration (FDA)—the first FDA-approved gene therapy for any genetic disease.[7] Stem cell therapies to treat AMD are in clinical trials.[8] Several types of retinal prosthesis are at various stages of clinical trials or applications, transforming the lives of blind patients.[9] Optical coherence tomography (OCT) has revolutionized ophthalmic imaging.[10] Artificial intelligence (AI) has been successfully used to detect cellular changes and quantify severity of retinal diseases such as AMD and Stargardt, bringing diagnosis to new levels.[11]

Vision injury research has benefited greatly from the advancements in vision science and, since FY09, from the availability of dedicated funds through the VRP. We have gained unprecedented understanding of the molecular, cellular, and biomechanical changes associated with common visual system injuries. Automation, ruggedization, and AI are pushing OCT, ultrasound, and other diagnostic technologies closer to the point of injury. Multiple therapeutics ranging from pro-regeneration eye drops to bioengineered retinal tissue grafts have advanced from preclinical testing to the brink of clinical translation. Novel technologies such as retinal thermofusion and thermoresponsive ocular bandage are expanding our clinical toolbox. Prosthetics for retina-blind and cortical-blind patients are in clinical trials.

While vision injury research has undergone rapid growth and made significant progress, much more needs to be done. Solutions must be translated into clinical applications. A number of products in the VRP's pipeline are in, or poised for, clinical testing in the near future Some could reach clinical application within the next 5 years. Notably, therapeutic development is faster for some injuries than others. Some injuries, such as TBI-associated visual dysfunction and proliferative vitreoretinopathy, still lack promising therapeutic candidates ready for clinical testing. In general, the development of more clinically relevant injury models is needed to accelerate the translation of preclinical study outcomes. Finally, the field must prepare for vision injuries in future wars. New weapon systems such as high-power laser and directed energy weapons will cause new injuries that must be researched and mitigated. War against near-peer adversaries will call for the capability to deliver prolonged field care in austere environments.

STRATEGIC DIRECTION

To transform vision trauma care for our armed forces and the nation, the VRP will advance research along two lines of effort:

- Accelerate research in eye injury and vision dysfunction due to military exposure
- Expand care capability in a forward operating environment and a prolonged field care setting

Within these lines of effort, the VRP will determine its Focus Areas each year at annual Vision Setting meetings.

INVESTMENT STRATEGY

The VRP will invest in innovative research that has the potential to significantly advance one or more of our lines of effort. To foster both the testing of innovative early ideas and the pushing of promising studies toward clinical translation, the VRP will invest across different phases of the research pipeline. Figure 3 shows the award mechanisms that the VRP has utilized. The specific offering of award mechanisms will be determined at annual Vision Setting meetings. Additional award mechanism(s) could be offered to support program goals as needed.

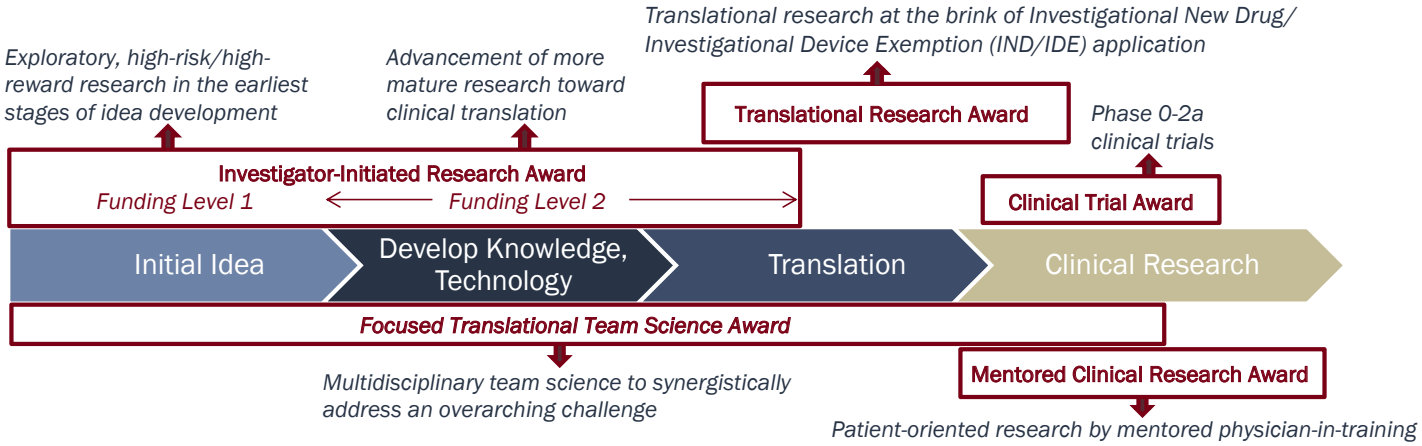

Figure 3. The VRP employs multiple award mechanisms to invest across different phases of the research pipeline

The Investigator-Initiated Research Award (IIRA) Funding Level 1 supports exploratory, high-risk/high-reward research that is in the earliest stages of idea development. Funding Level 2 supports the advancement of more mature research toward clinical translation. The Translational Research Award (TRA) supports translational research that includes a Pilot Clinical Trial that is designed to inform the feasibility, rationale, and design of subsequent clinical trials through limited clinical testing of a novel intervention. The Clinical Trial Award (CTA) supports the rapid implementation of early-phase clinical trials (i.e., phase 0 through phase 2a) of new interventions. The Mentored Clinical Research Award (MCRA) supports patient-oriented vision injury research and develops the research expertise of highly motivated military/civilian physicians in training. Together, these award mechanisms enable promising projects to enter and exit the VRP's pipeline at any phase between early preclinical and clinical. Interventions that successfully complete TRAs and CTAs will be sufficiently de-risked to attract funding from other sources for follow-up clinical trials.

Additionally, the VRP invests in highly collaborative and translational team initiatives with the potential of synergistic, accelerated advancement. The Focused Translational Team Science Award asks investigators to consider major barrier(s) and/or gap(s) in vision injury research and envision what may be achievable in 10-15 years. Based on the long-term expectation, investigators will identify what should and can be achieved in the short term, assemble a multidisciplinary research team, and design research projects that together form a concerted and synergistic effort to achieve these goals.

MEASURING PROGRESS

The VRP conducts program evaluation annually prior to Vision Setting and ad hoc as needed. Scientific return is measured by publications, presentations, funding applied to and obtained, and patent applications filed and granted. Through the last quarter of 2022, research funded by the VRP has resulted in 15 clinical trials (including VRP-funded and externally funded), 29 patents and patent applications, and more than 230 peer-reviewed publications.

The VRP will track the progression of projects and, ultimately, the clinical return of our investment. Parameters to be considered will include IND/IDE applications, clinical trials, and interventions or diagnostics that successfully transition to clinical applications.

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