ROOTED IN REVOLUTIONARY MEDICINE
In 1864, William Worrall Mayo, M.D., settled his family in Rochester, Minnesota, and opened a small medical practice dedicated to serving patients and advancing medical science through education and research. Over 150 years later, Mayo Clinic has transformed into the global authority in medicine, offering hope and healing to more than a million patients from around the world each year.

We’ve revolutionized surgery and developed lifesaving treatments, and we are committed to using the latest innovations in technology and equipment. By doubling down on research and education, Mayo consistently excels in bringing the latest discoveries to the patient faster. This allows our world-class teams to bring unparalleled expertise to all patients, providing the answers they simply cannot get anywhere else. But that’s not enough — we need better answers.

Despite monumental advances, many of today’s treatments for life-threatening diseases, including heart failure, Alzheimer’s disease, spinal cord injuries and diabetes, only address symptoms. Regenerative medicine is the solution to tackling the root cause of these conditions and more. As this emerging and promising field develops, it is positioned to become the underpinning of all patient care.

As we look to 2020 and beyond, Mayo Clinic is at an inflection point. With our history firmly rooted in revolutionary medicine, Mayo is best positioned to drive forward the next wave of medical innovation. We have the opportunity to transition to a new paradigm in medicine — accelerating health care into the future. The groundbreaking science of regenerative medicine empowers the body’s natural ability to heal, and we’re just beginning to tap its immense potential.

Driven by patients’ unmet needs, regenerative medicine is bringing new treatments to clinical application faster than ever before. Researchers are fascinated by the development of these novel, lifesaving medical therapies and surgical interventions. We are solving the world’s most serious and complex medical challenges — one patient at a time.

Only a decade ago, the field of regenerative health care was an emerging model with the potential to revolutionize medicine. Today, with the help of benefactors like you, the Mayo Clinic Center for Regenerative Medicine is turning that promise into reality. Together, we can envision an even more promising tomorrow.

With gratitude,

John H. Noseworthy, M.D.
President and CEO
Mayo Clinic
Imagine a world without organ failure, oxygen tanks and osteoarthritis — a place where insulin is a treatment of the past and “incurable” is no longer in the lexicon of health care professionals. Imagine if you could become the cure to your condition, able to empower the previously untapped capability of your body to regenerate, rejuvenate and repair. That is the promise of regenerative medicine, and Mayo Clinic is well on the way to making it a reality.

The human body is designed to heal itself.
When we suffer a cut, we bleed. The body sends a signal for the blood to clot, and in a few moments the bleeding ceases. This simple yet effective response from our own body is lifesaving. Imagine if we could capture this naturally occurring ability to heal and apply it to a wide range of conditions.

Powered by advances in fundamental science and a better understanding of the human body’s innate mechanisms of repair, regenerative medicine is rapidly evolving, allowing research and the clinical practice to halt and even reverse chronic and terminal disease.

Chronic diseases, conditions that are persistent or long-lasting, are quickly becoming the most prevalent threat to health. In North America alone, one in two adults suffers from one or more chronic health conditions. Mayo Clinic believes it doesn’t have to be this way, embracing this new science as a critical component in all of its activities and deploying regenerative medicine’s potential across every medical specialty.

Visionary benefactors make it possible for us to create a world where the previously unimaginable in health care can become reality. Thank you for helping us translate imaginations into reality for our patients and patients around the world.

Sincerely,

Andre Terzic, M.D., Ph.D.
Michael S. and Mary Sue Shannon Family Director, Center for Regenerative Medicine
Marriott Family Director, Comprehensive Cardiac Regenerative Medicine
Regenerative medicine is transforming today’s health care, where we fight disease, to the visionary health care of tomorrow: restoring health. By tapping into and boosting the body’s natural ability to heal, Mayo Clinic experts are making breakthrough discoveries that provide hope and healing to patients who are challenged by life-threatening conditions. Investment in the Center for Regenerative Medicine will revolutionize patient care at Mayo Clinic in Arizona, Florida, Minnesota and throughout the world.
FROM BENCH TO BEDSIDE: REGENERATIVE MEDICINE REACHING PATIENTS TODAY

“I missed 10 years of my life. I’m going to do a lot of things I wasn’t able to do before.”

– ANDY

Andy is Mayo Clinic’s first face transplant recipient. This extensive, life-changing surgery used regenerative techniques to improve his ability to chew, swallow, speak, breathe and smell.

“This approach demonstrates the transformative potential for other types of chronic wounds, changing the ‘treatment’ of patients to ‘healing’ patients.”

– ERIC DOZOIS, M.D.

A collaborative team of gastroenterologists, surgeons and stem cell experts helped Laurel get back in the water after healing a persistent open wound caused by an aggressive form of Crohn’s disease.

“I see happiness and I see my boys playing together. I see a happy family. And I believe that this work, this research that these doctors have put hard work into, is going to let us achieve that.”

– ANDREA

Diagnosed with a heart defect in utero, doctors were able to use stem cells obtained from the umbilical cord following Ryals’ birth to empower the right ventricle to grow bigger and stronger.
“This is truly a miracle. Before we even left Mayo, Jared’s heart function was restored to higher levels than his care team ever expected. Never did we imagine this would happen for our son.”

– PATTY

In the first clinical trial of its kind, Jared had 94 million stem cells from his own bone marrow injected into his heart, making it strong enough for a life-saving valve replacement surgery and giving new life to Patty’s son.

“Looking at neurodegenerative disorders, we don’t have anything like this. Even slowing the progression is a big deal.”

– WOLFGANG SINGER, M.D.

Using regenerative medicine, Mayo Clinic was able to slow the progression of Steve’s rare neurodegenerative disease – multiple system atrophy. This rapid and relentless condition has few options for treatment, making researchers’ innovative use for stem cells truly remarkable.

“The bending and softening of my knee is amazing. I saw results with this immediately – I truly wasn’t expecting it because of what I’ve been through before.”

– WENDY

By performing a lymph node transfer, surgeons were able to start regenerating Wendy’s lymphatic system and reduce the swelling in her leg. This cutting-edge treatment can also positively impact cancer patients, who are sometimes diagnosed with lymphedema due to damage caused by radiation in their cancer treatment.
OUT OF THIS WORLD

For Mayo Clinic, no vista is too far to explore when it comes to addressing the unmet needs of the patient — including outer space. In a collaboration with NASA and SpaceX, Mayo recently took its own giant leap for mankind by sending stem cells to the International Space Station.

“We know stem cells grow differently using simulated microgravity,” said Mayo Clinic’s Abba Zubair, M.D., Ph.D. “Primarily, our focus is to see if microgravity actually can help stem cells to expand faster, so that we can grow more of them to bring back to use for human application.”

Human stem cells are vital for research, for stem cell therapy (such as bone marrow transplant for the treatment of bone or blood cancers) and for regenerative tissue therapy. Dr. Zubair is researching the use of stem cells to help patients recover neurons and blood vessels after a stroke, and his findings could impact stem cell treatments across all specialties.

A problem in the development of life-changing stem cell therapies is that as many as 200 million cells are needed to treat a patient, and expanding vast numbers of stem cells on Earth can take weeks. When word went out that NASA was looking for research opportunities with the space station, Dr. Zubair and the team at Mayo jumped at the chance to explore their hypothesis.

On the International Space Station, experiments provided information about gene expression in the expanded stem cells, real-time analysis of the cell cycle, and details about molecular changes that occurred. The frozen cells have returned to Earth and will undergo further testing to determine whether microgravity produces stem cells that are functional and safe to treat the swelling and inflammation that occur in stroke.

“My work in regenerative medicine has always been intentionally translational — not just to study what the cells do and what can be done with them but to make a difference for patients. That’s what makes our project unique.”

If growing stem cells in space proves feasible, Dr. Zubair imagines a future in which cells are continually grown in a space station or satellite to later be used for patients. It may even be possible to generate human tissues and organs in microgravity, where 3-D structures are easier to grow.
Mayo Clinic has a long history of providing first-in-class health care to patients. Many of today’s medical treatments, procedures and disease-prevention approaches are the result of breakthroughs that harness Mayo’s scientific discoveries and clinical practice applications. The Center for Regenerative Medicine capitalizes on our culture of innovation to drive new regenerative treatments across medical and surgical specialties, greatly accelerating Mayo’s ability to address unmet patient needs.

<table>
<thead>
<tr>
<th>100+ Active Clinical Trials (cancer, cardiology, gastroenterology, kidney, liver, lung, musculoskeletal, neurology, ophthalmology, surgery, urology, wound healing and more)</th>
<th>120,000+ Procedures Performed Annually</th>
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<tbody>
<tr>
<td>2,300+ Patient Consults</td>
<td>500+ Patients Using Regenerative Therapy Suites</td>
</tr>
<tr>
<td>64+ Patents Filed</td>
<td>11+ New Companies and Partnerships Formed</td>
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<tr>
<td>2,100+ Publications</td>
<td>250% Acceleration of Regenerative Medicine Activity in recent years.</td>
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THE PATH TO HEALTH CARE’S FUTURE
Bringing Regenerative Solutions to the Forefront of Patient Care

Everything we do at Mayo Clinic is guided by our primary value: The needs of the patient come first. As we harness the potential of regenerative science, we strategically focus on conditions with a lack of current treatments and where patient needs are the greatest. Regenerative medicine aims to restore wellness, offering hope and healing to patients who have conditions that were incurable. Guided by the rigor of best practices, Mayo Clinic has designed a seamless pathway to maximize innovation into patient-ready solutions.
DISCOVERY

Mayo Clinic Center for Regenerative Medicine experts relentlessly pursue discoveries that can deliver hope and better health to people today and for generations to come.

- Advances in biomedical technology enable unprecedented **scientific breakthroughs**.
- Physician-scientist engineers are pioneering **new approaches** that lead to rejuvenation, regeneration and repair of the body.
- Understanding the essence of disease helps **defeat the root cause**.
- Regenerative science has **cascading benefits** across various disease conditions.

TRANSLATION

Advancing initial discoveries into powerful new therapies is essential to creating the medicine of tomorrow. The Center for Regenerative Medicine has created an indispensable pathway for medical specialties to bring their innovative discoveries to the patient.

- Launch of **clinical trials** and **validation of therapies** ensures safe and effective treatments.
- Dedicated resources expedite the **navigation of complex regulatory protocols**.
- Multidisciplinary collaboration and unparalleled expertise allow **rapid advancement**.
- Production of **patient-ready treatments** ensures new therapies have broad reach.

APPLICATION

Following successful clinical trials and validation of therapies, the application phase brings transformative regenerative solutions to patient care.

- **Revolutionary discoveries** reach patient care.
- **Wellness is restored** to patients with previously unmet needs.
- Regenerative therapy becomes a **vital component** of medical and surgical practice.
- Solutions are readily available and can have **global impact**.
BRIDGING THE GAP

Forward-thinking leadership, unparalleled expertise and a commitment to solving unmet patient needs allow Mayo Clinic to bridge the gap between the delivery of traditional health care today and the rapid advancement of revolutionary care in the near future. This pioneering work would not be possible without visionary philanthropy.

INCREASING TRANSLATIONAL CAPABILITIES

Traditionally, it could take years for physician-scientists to develop the essential expertise to create regenerative therapies and traverse the regulatory process. Today, experts across Mayo Clinic have access to resources that empower any specialty to advance new discoveries toward regenerative treatments. By seamlessly integrating manufacturing with regulatory and clinical trial competence, these translational capabilities collectively position the Center for Regenerative Medicine as an attractive partner and enabler in revolutionizing patient care. Continuing to build and enhance this work is pivotal to success.
The infrastructure required to achieve rapid translation of discoveries into transformative therapies for patients is essential to developing the future of medicine. Together, several platforms make this translational work possible, including:

- Early feasibility studies and first-in-human phase I and phase II clinical trials lay the groundwork for advancing discoveries.
- Having a patient’s own cells readily available is critical, as they are often used as a starting point for regenerative therapies.
- Off-the-shelf, cell-free regenerative therapies that have the advantage of being immediately available, much like conventional medical therapies.
- Manufacturing many stem cell doses at one time ensures that every patient can receive the same benefit.
- Guidance on designing clinical trials, validating therapies and providing large-scale production of lifesaving treatments empowers Mayo’s best and brightest to focus on innovation.

BUILDING POWERFUL COLLABORATIONS

Destination Medical Center (DMC) is a robust economic development initiative dedicated to creating a global destination for health and wellness. Within DMC, Discovery Square is being developed as a center for health care innovation where world-leading medical practitioners, educators, researchers and businesses come together as a thriving hub to develop powerful solutions.

Mayo Clinic serves as an anchor tenant in the first Discovery Square building, allowing for meaningful collaboration to exist between Mayo and the world. The Center for Regenerative Medicine will use this newly dedicated space to create safe and effective products for therapeutic treatment.

EDUCATING FUTURE HEALTH CARE LEADERS

Recognizing the importance of regenerative medicine to the future research and practice of health care, Mayo Clinic is committed to providing numerous opportunities for current health care practitioners and students to become educated in this new and evolving field – building the workforce of the future.

A first-of-its-kind, the Mayo Clinic Graduate School of Biomedical Sciences has launched a new program of transdisciplinary doctoral training in regenerative sciences. This educational opportunity is designed to equip the next generation of leaders with the skills necessary for the discovery, translation and application of regenerative solutions. An advanced education is essential for students pursuing leadership in the regenerative health care space.

CREATING NEW PATIENT CARE DELIVERY MODELS

With the creation of revolutionary treatments, Mayo Clinic has also pioneered new ways to deliver care. Regenerative Medicine Therapeutic Suites provide a patient-focused space that integrates clinical functions and a laboratory where each patient’s own cells are processed for treatment. This could serve as a progressive point-of-care model for the future, and it is currently being used to treat musculoskeletal conditions like osteoarthritis of the knee.
JOIN US: THE MOST EXCITING WORK LIES AHEAD

Only one Mayo Clinic exists in the world. Patients know this renowned medical institution as a place of compassionate care coupled with medical innovation and ingenuity. As we stand on the brink of discoveries that promise to revolutionize health care, Mayo is poised to serve patient needs in ways that the Mayo family and their colleagues could not have imagined. The future holds even more promise. We ask for your support to make patient-inspired innovation happen even faster.

As a top-ranked and trusted academic medical institution that is highly regarded for its integrated patient care, Mayo Clinic is committed to advancing the science and practice of health care with regenerative medicine.

The untapped potential of regenerative medicine is only beginning to be explored. As the field continues to develop, health care will be notably disrupted. The Mayo Clinic Center for Regenerative Medicine envisions a foundational shift where patients will no longer just manage a chronic condition because new healing therapies will become routine. Typical epithets of fighting a disease can fade away as an emphasis on healing takes hold.

The traditional notion of taking tissue from the body, programming stem cells with messaging, and returning them to the patient will soon become one of many options to promote healing from within. Mayo Clinic is actively working on new forms of treatment, including off-the-shelf, affordable therapies that can bring the future of health care to the masses. In short, regenerative medicine of today is only the beginning, and Mayo is unceasingly pushing the boundaries to develop safe and effective treatments.

On behalf of our patients, thank you for your interest in helping Mayo Clinic transform medicine. Because of the generous support of Mayo Clinic benefactors who see the need for tackling the imponderables and creating better health care for all, regenerative medicine will become the future of all health care.
THE NEAR FUTURE

About 500,000 Americans per year suffer from severe laryngeal scarring or removal of their larynx due to disease or trauma. The current solution? Laryngectomy. These patients are missing out on many of life’s little pleasures because the procedure’s resultant hole left them without a voice and created an opening directly into their lungs. A simple shower is dangerous as even the slightest amount of water in the lungs can be deadly.

David G. Lott, M.D., and his team are pursuing a truly revolutionary idea — using regenerative techniques to build an entirely new larynx from the patients’ own cells.