

CITY OF HOPE MULTIPLE MYELOMA OUTCOMES SUMMARY

City of Hope's median survival for multiple myeloma significantly exceeds SEER National and SEER LA survival overall and across all age groups (<60, 60-70, >70 years).

Judy and Bernard Briskin Center for Multiple Myeloma Research: Providing optimal outcomes for patients



Clinical research nurse Elizabeth Spangler, B.S.N.

As one of seven centers comprising the Hematologic Malignancies Research Institute, we provide comprehensive care with a multidisciplinary approach. Thanks to the generous gift from the Briskin Family Foundation, City of Hope’s Judy and Bernard Briskin Center for Multiple Myeloma Research is the only Southern California member of the Multiple Myeloma Research Consortium, a partnership of some 22 facilities across the country, dedicated to rapidly bringing the most promising new treatments to patients. As a leader in treating hematologic malignancies, we have one of the highest volumes of multiple myeloma patients in Southern California. By integrating across multiple expertise domains, our collaborative team continues to advance care through groundbreaking research and dedication to addressing the concerns of each patient.

Our Briskin Center takes a multidisciplinary approach to treat multiple myeloma. These specialties include:

- Hematologist oncologists
- Molecular epidemiologists
- Research scientists
- Geneticists and genetic counselors
- Nurse practitioners, nurses and nurse coordinators
- Social workers, psychologists and psychiatrists
- Financial counselors
- Patient navigators
- Radiation oncologists
- Social workers

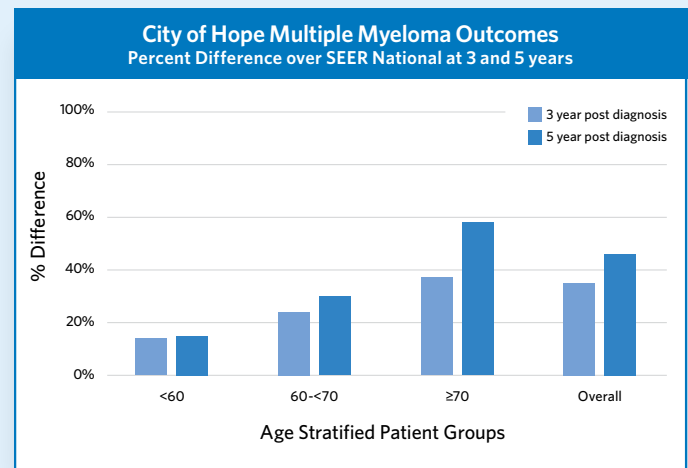
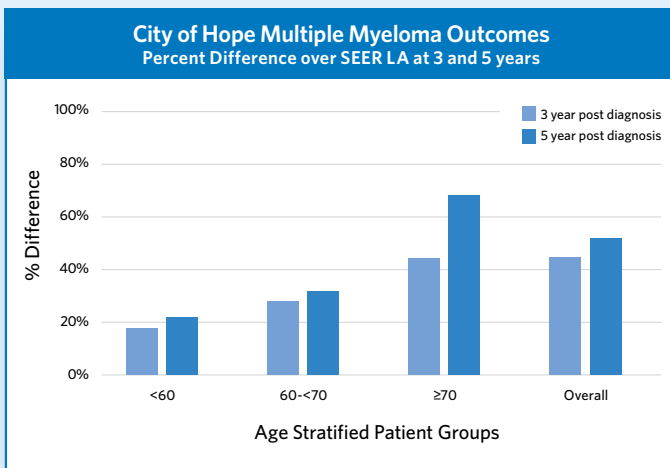
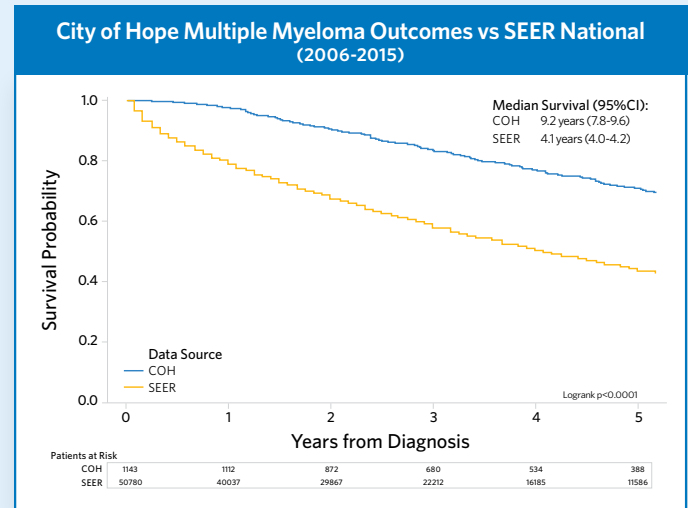
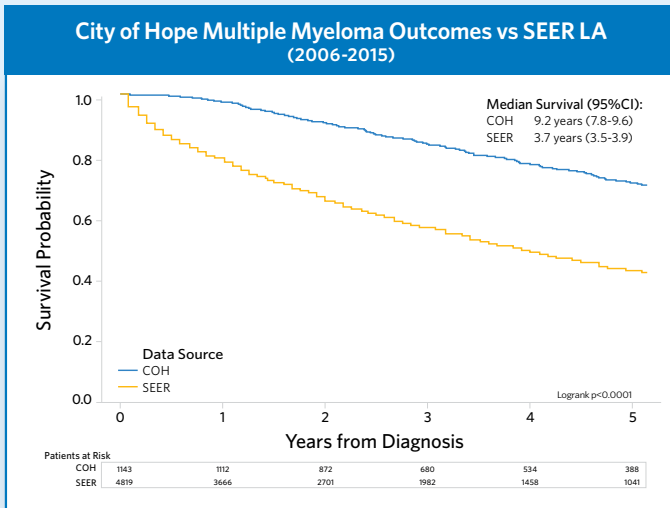
Why We Measure Outcomes

We measure outcomes because we are constantly challenging ourselves to improve care, inform clinicians with a measure of our performance and to prove our value to patients.

City of Hope exceeds both SEER LA and SEER National median survival for multiple myeloma

Median Survival Is More Than Double the Los Angeles Survival (all ages)

Median Survival Is Over 120% Longer Than the National Survival (all ages)



When the survival probabilities for City of Hope multiple myeloma patients at three different age groups (<60, 60-<70 and ≥70 years of age), as well as overall data, were compared to the SEER* National data at three and five years postdiagnosis, the percent differences ranged from 14% to 37% and 15% to 58%, respectively. Similarly, this same data set compared against SEER LA data showed percent differences ranging from 18% to 44% and 21% to 68% at three and five years.

The National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) Program

An authoritative source on cancer incidence and survival, the SEER Program provides cancer statistics to reduce the cancer burden among the U.S. population. It is supported by the Surveillance Research Program, which provides national leadership in cancer surveillance using analytical tools and methodological expertise in collecting, analyzing, interpreting and disseminating reliable population-based statistics.

Data were derived from the City of Hope Cancer Registry (CNeXT) and SEER November 2018 Disease Specific Files as the comparator. All patients were diagnosed from 2006 through 2015 with a follow-up cut-off date of Dec. 31, 2016. Unadjusted overall survival estimates for multiple myeloma patients are reported.

This Is How We Do It

Our innovative past work helped grow the field of multiple myeloma research, and our current research is giving patients the best chance for extended survival

City of Hope's experience, specialized therapy protocols and extensive program of clinical trials provides tailored treatment regimens to patients at all stages of myeloma, from the newly diagnosed to those with advanced disease who no longer respond to standard therapy.

A PROUD HISTORY

Development of myeloma cell lines for basic research

- Steven T. Rosen, M.D., the Morgan & Helen Chu Director's Chair of the Beckman Research Institute, chief scientific officer and provost at City of Hope, created the myeloma cell lines now used in more than 150 laboratories nationwide.
- Researchers can use human cell lines to gain better understanding of the characteristics, behavior and signaling of steroid-sensitive and -resistant multiple myeloma cells, which allows for the development of better treatments.

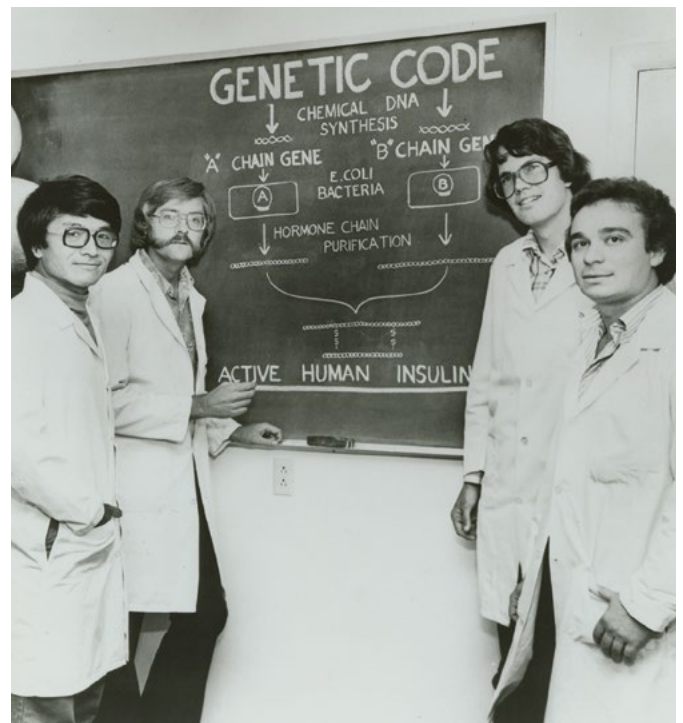
Creation of technology to create monoclonal antibody treatments

- Arthur D. Riggs, Ph.D., director emeritus of the Arthur Riggs Diabetes & Metabolism Research Institute and the Samuel Rahbar Chair in Diabetes & Drug Discovery, and his team developed the technology that makes possible the monoclonal antibody treatments in use today.
- That technology is behind today's development of monoclonal antibody treatments for multiple myeloma, including the drugs daratumumab and elotuzomab.

A PROMISING FUTURE

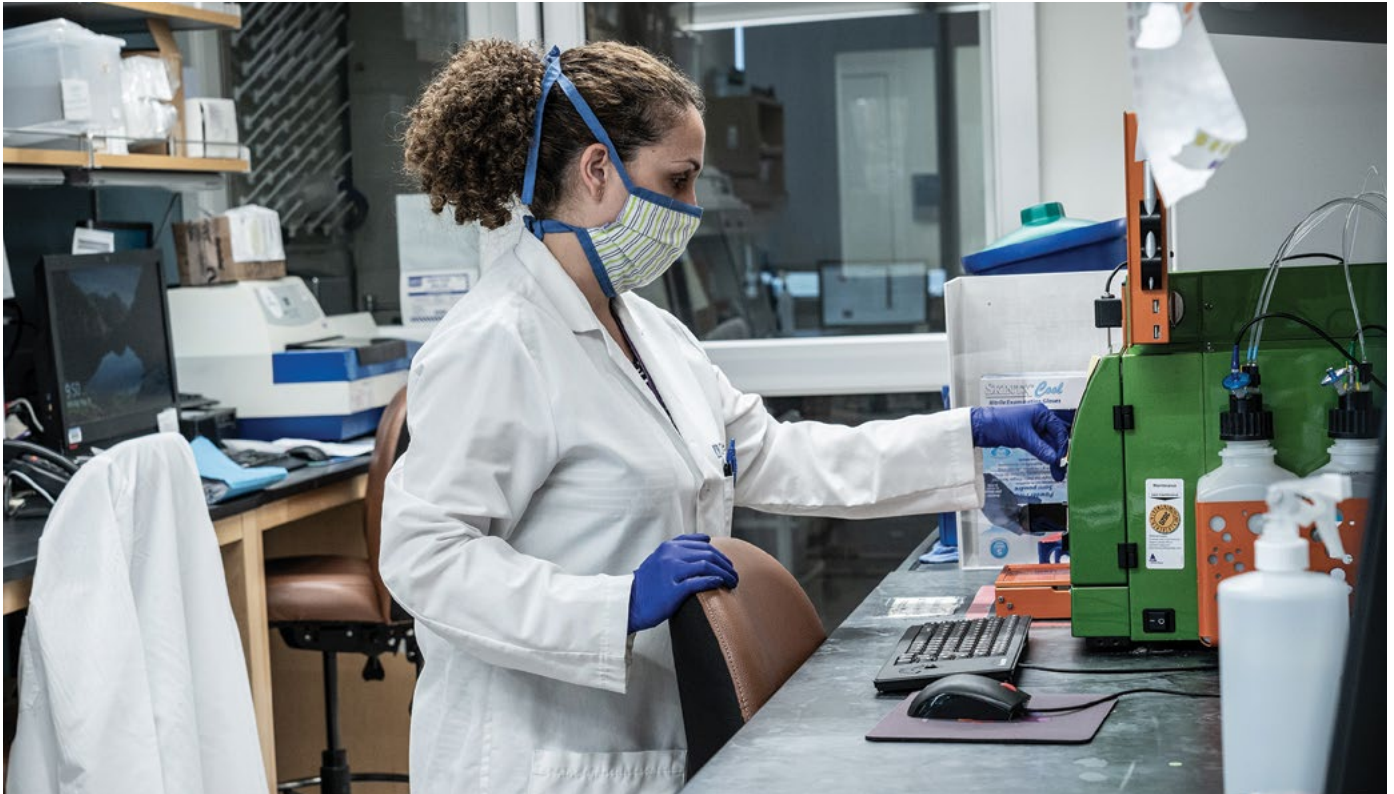
Crafting new imaging tools for better detection

- Briskin Center Associate Professor Flavia Pichiorri, Ph.D., M.S., and her team have developed a highly sensitive imaging tool that uses the new copper-labeled daratumumab antibody (64Cu-DOTA) they have developed. Daratumumab is an antibody used as a standard-of-care myeloma treatment that targets the CD38 cell surface protein.



(L-R) Keiichi Itakura, Ph.D., Arthur D. Riggs, Ph.D., and the team that revolutionized diabetes treatment by using synthetic DNA chemistry and recombinant DNA technology to make a novel gene that coded for human insulin

- In a Phase 1 clinical trial of the imaging agent, myeloma was detectable in regions of the body that the currently standard PET (positron emission tomography) scan cannot detect.
- Future work will continue to assess the safety and toxicity of this tool, with the hope that it can be used to better monitor patients' recovery and can allow for earlier detection of smoldering myeloma.
- Additional research is also being conducted using a radiolabeled anti-CD38 antibody to deliver targeted therapeutic doses of radiation.



Understanding the genetic underpinnings of lymphoma and multiple myeloma

- Department of Pathology Associate Clinical Professor Joo Song, M.D., and Department of Diabetes Complications & Metabolism Associate Professor Dustin Schones, Ph.D., received a Steven Gordon and Briskin Family innovation grant to compare genetic and nongenetic changes between lymphoma and multiple myeloma to better understand how these antibody cell producing disorders differ.
- This research uncovered commonalities in the methylation patterns of antibody-producing myeloma cells, with planned next steps to study how these changes are unique to multiple myeloma and not observed in lymphoma, which may help direct new therapies.

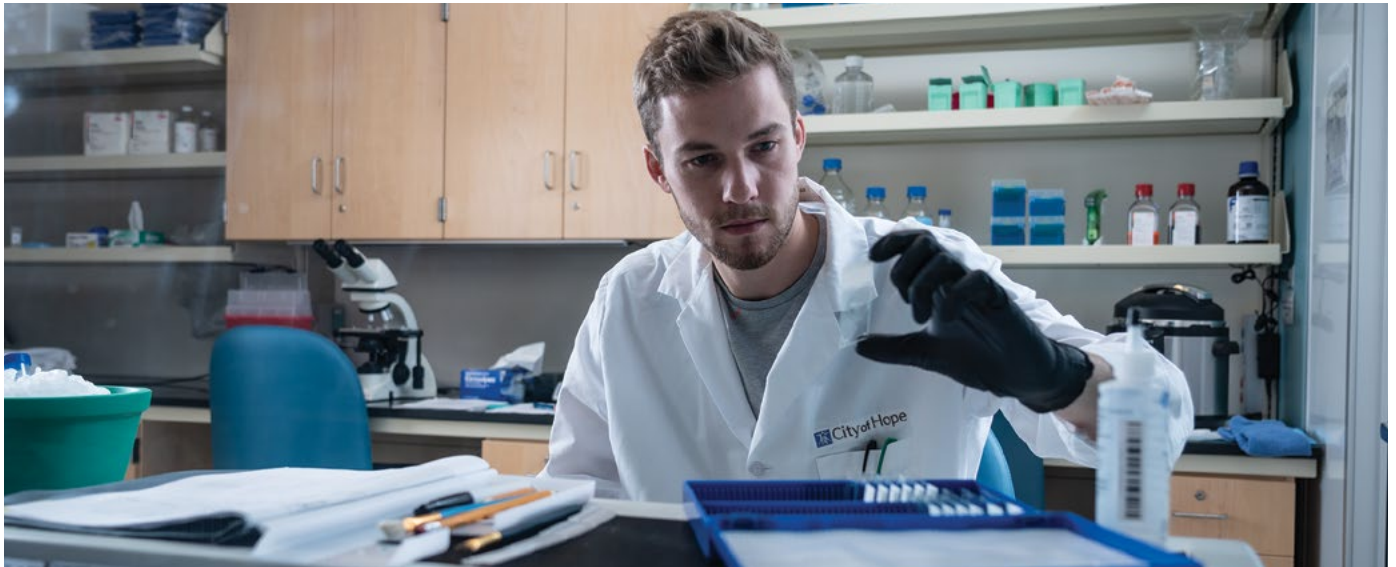
Leveraging learnings from multiple myeloma research to combat new challenges

- Researchers at City of Hope have previously conducted studies on leflunomide, a Food and Drug Administration-approved rheumatoid arthritis drug that showed promise

in relapsed myeloma and is now being studied in high risk smoldering myeloma. Now, Sanjeet Dadwal, M.D., chief of the Division of Infectious Diseases, and Steven T. Rosen, M.D., are using insights from these studies to guide current research of the inexpensive, orally available drug's ability to treat patients with severe COVID-19 infection and a simultaneous malignancy. The team is currently conducting a Phase 1 clinical trial to evaluate the safety and tolerability of leflunomide and to recruit participants from local medical centers who are treating cancer patients for SARS-CoV-2. If the results show promise, City of Hope will conduct a Phase 2 trial.

- This year alone, researchers from the Briskin Center have published 19 peer-reviewed articles, presented at nine academic and medical meetings and have been awarded two new innovation grants.

City of Hope is a leader in transplant and CAR T cell therapy for the treatment of multiple myeloma



Multiple myeloma is a rare cancer, accounting for less than 10% of all blood and bone marrow cancers. Because the cancer can present differently across patients, there are multiple treatments available to patients with multiple myeloma. The most effective treatment for multiple myeloma is high-dose chemotherapy combined with stem cell transplant. City of Hope has one of the largest and most successful transplantation programs in the country and is a world-leader in setting standards and improving long-term outcomes for both children and adults.

Leading the way with transplant innovation

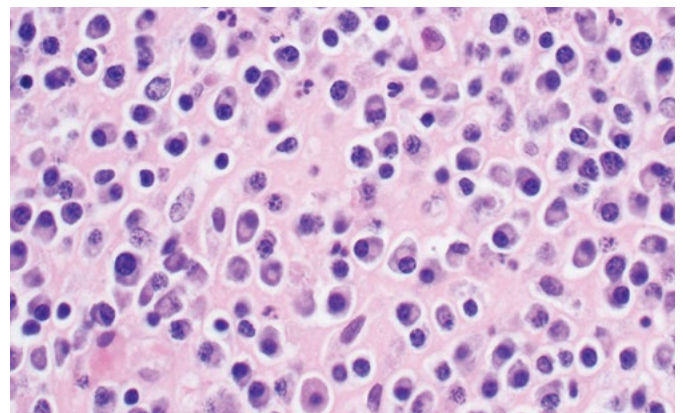
Over 16,000 bone marrow transplants have been performed at City of Hope, with exceptional survival rates, according to the Center for International Blood & Marrow Transplant Research.

To address the growing need for high-quality transplantation, City of Hope recently expanded its bone marrow transplantation (BMT) program to include outpatient procedures at the Duarte campus, allowing patients who live close by to return home after their daily treatments. The program allows greater autonomy for multiple myeloma patients undergoing autologous (using their own cells) transplants and consistently receives high satisfaction ratings.

City of Hope is uniquely positioned to treat patients in a safe environment and provide uninterrupted care because of our longstanding experience with immunocompromised or immunosuppressed patients. Experts within the BMT program are well-versed in maintaining the highest

standards for infection prevention and control, and following strict protocols.

In addition to autologous or allogeneic transplants, City of Hope is home to other state-of-the-art, personalized treatment options, including single or combination drug therapy, radiation therapy for local disease, new and emerging therapies, and supportive care.



A world leader in CAR T and T cell therapies

Our expertise includes both autologous and allogeneic stem cell transplants (using cells directly from the patient and from another person, respectively), using cells derived from bone marrow, peripheral blood and cord blood.

City of Hope was among the first to develop chimeric antigen receptor (CAR) T cell therapy as a bridge therapy to bone marrow transplant for patients with leukemia and lymphoma. Since then, this immunotherapy has also been expanded to multiple myeloma patients. By reengineering a patient's own immune cells to recognize and attack cancer cells, remission can be reached and a potentially curative transplant can take place.

Our institution is home to one of the most comprehensive CAR T cell programs in the world, with over 600 patients treated in nearly 80 clinical trials either current or completed, targeting hematologic malignancies and solid tumors.

CAR T cell therapy clinical trials for myeloma include:

- A Phase 1 trial evaluating the best dose of CS1-CAR T cell therapy after chemotherapy in patients who have relapsed or refractory CS1-positive multiple myeloma

- Evaluation of the safety and efficacy of a B cell maturation antigen targeting CAR T cell therapy for patients with multiple myeloma

T cell therapy clinical trials for myeloma include:

- A Phase 1/2 study of a novel, native T cell immunotherapy that has specificity against several tumor-specific targets for patients with relapsed or refractory multiple myeloma
- A Phase 1 trial evaluating the safety and pharmacokinetics of escalating doses of Cevostamab (BFCR4350A) in patients with relapsed or refractory multiple myeloma
- A Phase 1/2, first-in-human, dose escalation study of Talquetamab, a humanized GPRC5D x CD3 bispecific antibody, in patients with relapsed or refractory multiple myeloma
- A first-in-human study of a trispecific T cell engager SAR442257 in patients with relapsed and refractory multiple myeloma
- A dose escalation study of Teclistamab, a humanized B cell maturation antigen and CD3 DuoBody(R) antibody in patients with relapsed or refractory multiple myeloma



Providing on-site and ongoing research and clinical trials



City of Hope has a “bench to bedside” approach that is unlike any other cancer center. Our scientists and physician investigators collaborate to investigate early detection diagnostics and develop new potential therapies and cures for multiple myeloma. The number of clinical trials at City of Hope and our ability to manufacture treatments mean patients potentially have access to leading-edge treatments years before they reach market. The Kenneth Goldman and Briskin Family Clinical Trials Program manages and coordinates all trials related to the treatment of multiple myeloma, as part of the Judy and Bernard Briskin Center for Multiple Myeloma Research.

Last year, City of Hope conducted more than 700 clinical trials, enrolling over 4,700 patients.

Our current multiple myeloma cancer investigations include:

- Early access to lifesaving treatments by partnering with both pharmaceutical companies and other academic institutions to conduct clinical trials
- Approximately 30 current clinical trials specifically targeting multiple myeloma
- Myeloma-Developing Regimens Using Genomics (MyDRUG) clinical trial
 - » MyDRUG is an ongoing platform trial, sponsored by the Multiple Myeloma Research Foundation, which has selected City of Hope as one of just 17 sites across the country.
 - » In order to address the heterogenous nature of multiple myeloma, this platform study will offer every patient enrolled a combination of backbone regimen plus a targeted therapeutic agent within each study arm and will evaluate response rate as the primary outcome.
- Focusing on precision treatments that are tailor-made for each patient. Because multiple myeloma can have several different presentations, treatment plans at City of Hope are individualized and incorporate the newest combination therapies.

“There is no one treatment for myeloma. In other words, one size does not fit all. And here at City of Hope, we tailor treatments for each individual. This personalized medicine always offers the best options and outcomes for our patients.”

— Amrita Krishnan, M.D.
Director, Multiple Myeloma Program

Meet our multiple myeloma experts



**Amrita Krishnan, M.D.,
Division Chief**

- Hematologist oncologist
- Director, Judy and Bernard Briskin Center for Multiple Myeloma Research
- Professor, Department of Hematology & Hematopoietic Cell Transplantation



**Michael Rosenzweig,
M.D., M.S.**

- Hematologist oncologist
- Associate Clinical Professor, Department of Hematology & Hematopoietic Cell Transplantation



Nitya Nathwani, M.D.

- Hematologist oncologist
- Associate Clinical Professor, Department of Hematology & Hematopoietic Cell Transplantation



Maung Myo Htut, M.D.

- Hematologist oncologist
- Associate Clinical Professor, Division of Myeloma



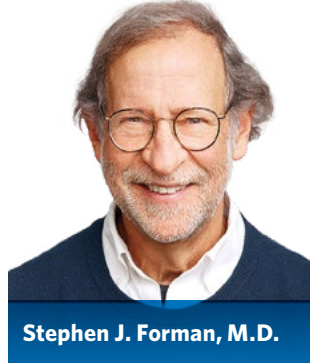
Jonathan Keats, Ph.D.

- Assistant Professor, Integrated Cancer Genomics Division, TGen
- Director, Bioinformatics, TGen
- Head, Multiple Myeloma Research Laboratory, TGen



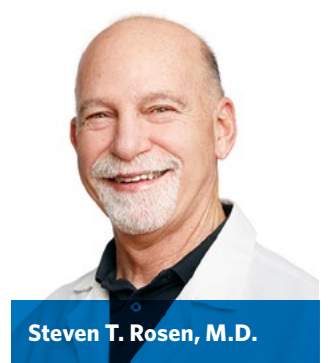
Flavia Pichiorri, Ph.D., M.S.

- Research scientist, basic and translational research
- Associate Professor, Judy and Bernard Briskin Center for Multiple Myeloma Research



Stephen J. Forman, M.D.

- Hematologist oncologist
- Director, Hematologic Malignancies Research Institute
- Professor, Department of Hematology & Hematopoietic Cell Transplantation
- Co-leader, Hematologic Malignancies Program
- Principal Investigator, Lymphoma SPORE
- Director, T Cell Therapeutics Research Laboratory



Steven T. Rosen, M.D.

- Medical oncologist and hematologist
- Director, Comprehensive Cancer Center
- Director, Beckman Research Institute of City of Hope
- Provost and Chief Scientific Officer
- Irell & Manella Cancer Center Director's Distinguished Chair
- Morgan & Helen Chu Director's Chair of the Beckman Research Institute

JUDY AND BERNARD BRISKIN CENTER FOR MULTIPLE MYELOMA RESEARCH SCIENTIFIC ADVISORY BOARD

Our advisory board is comprised of world-renowned authorities from both within City of Hope, such as director Amrita Krishnan, M.D., and across other institutions. The board meets regularly to review our progress and examine significant advances in the larger multiple myeloma community, and makes recommendations to move our work forward. Board members include Stephen J. Forman, M.D., and Steven T. Rosen, M.D.

Our Center for Survivorship and Outcomes — helping patients improve their quality of life

At City of Hope, we recognize that care doesn't end once a patient steps out of the hospital doors. We are committed to lifelong follow-up of hematology patients to develop better treatments, including one of the largest cohorts (more than 11,000) of long-term hematopoietic cell transplantation survivors in active follow-up. This research allows us to assess the challenges faced by our survivors and provide additional resources to assist their journey.

For many of our patients, that journey includes receiving a bone marrow transplant (BMT). We have had more than 16,000 patients from around the country and the world undergo bone marrow, cord blood or stem cell transplants at City of Hope. As a means to support our transplant community and thank our donors, each year City of Hope hosts an annual BMT reunion. It is a special opportunity for survivors to meet their donors and thank them for their lifesaving contribution.



We take our survivorship seriously. As one of seven centers in our Hematologic Malignancies Research Institute, our comprehensive survivorship program continues to support patients and their families through treatment and after. Our ongoing, long-term data collection continues to inform the work we do in hematological malignancies and multiple myeloma, allowing us to continually improve care by:

- Immediately addressing any postsurgical complications
- Managing any side effects that may occur
- Assisting in early detection should the cancer recur
- Recommending health monitoring practices and improve patient education
- Connecting patients with social workers, psychologists, financial advisers or other support, as needed

Call us at [800-COH-4DRS \(264-4377\)](tel:800-COH-4DRS), Monday through Friday, 8 a.m. to 6 p.m., to begin the referral process for your patients with multiple myeloma.

Visit CityofHope.org/clinical-program/myeloma to see if one of our clinical trials holds promise for your patients.



1500 E. Duarte Road
Duarte, CA 91010

CityofHope.org



National
Comprehensive
Cancer
Network®



©2021 City of Hope and the City of Hope logo are registered trademarks of City of Hope. City of Hope strongly supports and values the uniqueness of all individuals and promotes a work environment where diversity is embraced.