



Hackensack Meridian
John Theurer Cancer Center ✧
at Hackensack University
Medical Center

ONCOLOGY | 2022 YEAR IN REVIEW

WE ARE AT AN INFLECTION POINT IN CANCER CARE, AND JOHN THEURER CANCER CENTER IS AT THE FOREFRONT...

As oncologists, we are truly fortunate to be part of what is happening in cancer care. Cancer medicine is becoming increasingly complex and will be a leading example of transformation in care delivery in the next 20 years, with three areas of focus:

Bringing Clarity Through Precision Medicine, Data Analytics and Value-Based Care

First, the mounting number of novel anti-cancer therapies (more than 6,000, representing two-thirds of therapies in the pipeline of medicine) and a growing awareness of cancer molecular diversity (i.e., all patients are different), will likely lead to the replacement of chemotherapy with more targeted therapies and immune-based therapies.

With these advancements comes the necessity to bring clarity using precision medicine, data analytics and value-based care to answer the two most important questions in oncology: For patients, “What is my best option now?” and as a society, “What is the best sequence of care?” Answering these questions is required to improve each individual outcome and optimize resources to continue to support innovation.

Shifting Toward Preemptive Medicine

Second, there will be a shift toward more preemptive medicine in early detection, risk mitigation and prevention of recurrence. Today, more than two-thirds of cancer diagnoses and resulting cancer deaths have no available screening tests. This is highly relevant as cancer



incidence will increase by more than 50 percent during the next 25 years — and without exception, patients diagnosed with early-stage cancer do better by far than those diagnosed with advanced-stage cancer, with five-year survival rates of 80-90 percent compared with 5-10 percent. As an example of this shift, the field has started to take advantage of liquid biopsies and next-generation sequencing to explore the early detection of cancer, as well as minimal or measurable residual disease (MRD) post-therapy. In partnership with Memorial Sloan Kettering Cancer Center, John Theurer Cancer Center (JTCC) is opening a center for cancer prevention as an example of applied molecular medicine.

Increased Transparency and Convenience of Care

Third, and accelerated by the pandemic, the public and patients’ expectations have changed from expertise at their fingertips to care delivered at home (or closer to home) with increased transparency and convenience. We plan to focus on building a seamless process for patients to receive oncologic care, leveraging advances including technology, wearables for monitoring, micro labs that allow patients to have testing while “on the run,” improved drug delivery and home treatments, as well as molecular wellness to measure the benefit of changing lifestyles.

One of the biggest needs is to expand the availability of navigators who chaperone patients from the first suspicion of cancer through their recovery — assisting patients in organizing testing, making appointments, coordinating supportive care and more.



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Equipped to Reinvent the Future of Cancer Care

JTCC is perfectly equipped for such exciting times: Delivering highly subspecialized care across our 16 divisions, JTCC has decades of expertise in cell therapy, a nationally recognized clinical trials program including a Phase I unit, and a destination blood cancers program. Our best-in-class genomics solution with an on-site genomic testing lab performing paired DNA and RNA profiling allows us to apply precision medicine at scale. Our genomics approach also helps support research endeavors, particularly through our outcome division.

Our partnership with Memorial Sloan Kettering and our affiliation with the National Cancer Institute (NCI)-designated Lombardi Comprehensive Cancer Center at Georgetown University, together with our translational work with the Center for Discovery and Innovation (CDI), illustrate JTCC’s passion and commitment to partner with the best to reinvent cancer care together.

Geographically, JTCC is ready to provide all patients with the best care locally and, when needed, access to experts, cell therapies or clinical trials to optimize their outcome — whether through its affiliates or additional locations at Palisades Medical Center, Jersey Shore University Medical Center and the new Totowa Cancer Center, which is expected to open in 2023.

We are proud to share our 2022 accomplishments and plans for the future with you and look forward to collaborating with colleagues, donors, researchers and other partners in our shared mission of providing leading-edge cancer care — today and tomorrow, across the nation and beyond.

Andre Goy, M.D.
Physician-in-Chief for Oncology,
Hackensack Meridian Health
Chair and Chief Physician Officer,
John Theurer Cancer Center
Founding Chair of Oncology,
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JOHN THEURER CANCER CENTER: A QUARTER-CENTURY OF CANCER CARE EXCELLENCE

John Theurer Cancer Center, part of Hackensack University Medical Center, is New Jersey's largest and most comprehensive cancer program.

In less than 25 years, JTCC has become one of the most rapidly growing and prominent programs nationwide, with more than 1,200 team members collaborating in a highly subspecialized and multidisciplinary environment.

More people in the New Jersey/New York metropolitan area turn to John Theurer Cancer Center for cancer care each year than to any other facility in New Jersey. Program highlights include:

- Most advanced cancer program in New Jersey and leader in CAR T-cell therapy, a revolution in the management of refractory B cell malignancies, lymphoma, leukemia and myeloma.
- One of the top 10 BMT programs in the nation, which performed more than 400 stem cell transplantations last year.



- Leader in clinical science and drug discovery with more than 150 full-time equivalents (FTEs) in adult oncology research and a dedicated Phase I unit that is one of the most rapidly growing in the U.S.
- Destination program in hematological malignancies.
- Nationwide leader in non-invasive and robotic oncologic surgery.
- Comprehensive radiation technologies across all platforms, including proton beam radiotherapy and a new biologically guided radiation therapy (BGRT) system, which is one of only seven in the nation and the only system of its kind in the region.
- Best-in-class genomics platform on site – coupling dual DNA and RNA signatures by next-generation sequencing with artificial intelligence algorithms to support precision medicine.
- Data analytics platform and outcome division at JTCC to help support new care models, including value-based care.

2022 BY THE NUMBERS

OUR PROGRAM AND FACILITIES

- 16 | Subspecialties, each led by a recognized expert in the field
- 6 | Dedicated inpatient units for acute and chronic care
- 140 | inpatients at any given time
- 6 | Robotic surgical systems, including 1 single port robotic surgical system

OUR CLINICAL CARE

- 2 | Bone marrow transplant units
- 400+ | Bone marrow transplants performed each year
- > 8,000 | Bone marrow transplants since the program's inception in 1990
- > 200 | CAR T-cell procedures since the program's inception — more than any other program in the region
- 60,000+ | Infusions each year
- 21,307 | Unique Patients in 2022

OUR TEAM

- 1,200 | Team members at HUMC focused on cancer care, including 500 nurses in oncology and more than 50 oncologists at JTCC
- 50+ | advanced practice nurses dedicated to cancer care
- 150+ | clinical research professionals
- 20 | Years of Magnet designation by the American Nurses Credentialing Center for nursing excellence

OUR RESEARCH

- 450+ | State-of-the-art clinical trials — more than any other cancer center in New Jersey
- 35 | CAR T-cell or NK cell clinical trials have been performed, with an additional 10 trials in the pipeline to open soon
- 10 years | Started CAR T program
- 2,895 | Patients enrolled in oncology clinical trials in 2022 at Hackensack Meridian Health
- > 800 | peer-reviewed publications in the past five years



ACCREDITATIONS AND CERTIFICATIONS

John Theurer Cancer Center has earned numerous accreditations and certifications for delivering high-quality oncology care, including:

- Part of the NCI-designated Lombardi Comprehensive Cancer Center at Georgetown University
- American College of Surgeons Commission on Cancer (ACoS COC)
- National Accreditation Program for Breast Centers (NAPBC)
- American College of Radiation Oncology (ACR)
- Foundation for the Accreditation of Cellular Therapy (FACT)
- Quality Oncology Practice Initiative Certification (QOPI)
- Oncology Care Model Participating site – JTCC/RCCA
- BMT Cellular Lab - Foundation for the Accreditation of Cellular Therapy (FACT)
- Joint Commission Disease Specific Certifications in:
 - Brain Cancer
 - Breast Cancer
 - BMT Cancer
 - Colon/Rectal Cancer
 - Renal Cancer
 - Ovarian/Uterine Cancer
 - Prostate Cancer
 - Thoracic Cancer



CAR T-CELL THERAPY HAS REVOLUTIONIZED THE CARE OF PATIENTS WITH ADVANCED BLOOD CANCERS, AND JTCC HAS BEEN ONE OF THE CENTERS NATIONWIDE LEADING THIS EFFORT

JTCC was the first to offer CAR T-cell therapy in New Jersey. As the state's leading center for CAR T for lymphoma, leukemia and myeloma, JTCC is now exploring CAR T for solid tumors.

John Theurer Cancer Center was the first in New Jersey to offer chimeric antigen receptor CAR T-cell therapy almost a decade ago in collaboration with Dr. Steven A. Rosenberg's team at the National Institutes of Health. CAR T is a revolutionary immunotherapy and the first live gene modified cell therapy ever to receive FDA approval – creating an entirely new paradigm of a “one-and-done” approach to cancer treatment.

CAR T is now approved in B cell acute lymphoblastic leukemia (ALL) (second line), diffuse large B-cell lymphoma (second and third line), follicular lymphoma and transformed lymphoma (third line), as well as MCL (second line) and more recently in multiple myeloma.

“JTCC’s broad clinical research program has allowed us to be at the forefront of new developments and our CAR T-cell program was the first to be implemented

in New Jersey and remains the lead CAR T program in the state with trials in lymphoma, myeloma, leukemia, and now even solid tumors,” said Andre Goy, M.D., M.S., Chair & Executive Director, Lymphoma Division Chief – John Theurer Cancer Center; Chief Science Officer – Regional Cancer Care Associates, Lydia Pfund Chair for Lymphoma, Professor of Medicine – Georgetown University, Professor and Chair, Dept. of Oncology, Hackensack Meridian School of Medicine.

CAR T treatment is a manufactured cell product, after white blood cells are removed from the patient, transformed in the laboratory to recognize cancer cells, grown to large amounts, and returned to the patient where they further expand and can kill cancer cells.

CAR T-cell therapy is a highly specialized therapy that requires expertise, a sophisticated platform and resources to support patients who receive it. JTCC

investigators perform more than 500 cell transplantations a year and they have been involved in CAR T-cell research for nearly a decade. Additionally, many JTCC cancer specialists have exceptionally strong background in immunology making them natural adopters of CAR T therapy.

“JTCC’s robust BMT and clinical research programs helped us set up our CAR T therapy platform early on, with no hesitation, and this has allowed us to lead this form of therapy in our region and across our state,” said Dr. Goy.

“In contrast to many available options in the relapsed/refractory follicular lymphoma space that are given indefinitely, patients may experience long-term treatment-free observation after a single CAR-T cell infusion,” said Lori A. Leslie, M.D., hematologist and director of the Indolent Lymphoma and Chronic Lymphocytic Leukemia Research Programs at John Theurer Cancer Center. “As our research progresses, we hope to be able to offer this type of approach to a broader variety of patients including those with other indolent lymphomas and CLL.”

JTCC HEMATOLOGIST PUBLISHES RESEARCH ON CAR T-CELL THERAPY TREATMENT FOR LARGE B-CELL LYMPHOMA

Lori A. Leslie, M.D., hematologist and director of the Indolent Lymphoma and Chronic Lymphocytic Leukemia Research Programs at John Theurer Cancer Center, joined with an international group of colleagues to publish new research on a CAR T-cell therapy treatment option for a type of blood cancer called large B-cell lymphoma, the most common type of non-Hodgkin lymphoma.

The research, titled “Axicabtagene Ciloleucel as Second-Line Therapy for Large B-Cell Lymphoma,” was published on February 17, 2022, in the New England Journal of Medicine. This international, Phase III clinical trial included patients with relapsed or refractory large B-cell lymphoma who already received first-line chemoimmunotherapy treatment. This research has changed the paradigm of second-line therapy in diffuse large B-cell lymphoma (DLBCL) for the first time in 40 years.

CAR T-cell therapy with axicabtagene ciloleucel

(Yescarta®), known as “axi-cel,” was first approved in October 2017 for DLBCL that recurs after two or more prior therapies, or after autologous stem cell transplantation. Axi-cel was then approved for use in patients with follicular lymphoma that persists or recurs after two or more prior therapies in May 2021. In April 2022, it was approved as a second-line therapy for primary refractory DLBCL, or DLBCL that relapses within 12 months of upfront chemoimmunotherapy.

Like other CD19-targeted CAR T products with the same indication, axi-cel is delivered as a single intravenous (IV) infusion for patients with DLBCL or follicular lymphoma that has not responded to at least two other treatments, or one prior treatment of refractory disease or for early-risk relapse, as above.

“Our team found that axi-cel was safe, effective and resulted in significant improvements over standard of care therapies,” said Dr. Leslie. “The entire research team at John Theurer Cancer Center is proud to partner with our international colleagues on this groundbreaking research, which provides hope and new treatment options for patients with recurrent large B-cell lymphoma that is primary or refractory or relapses within one year of upfront chemotherapy.”

“John Theurer Cancer Center is an international leader in research for all types of blood cancers, and Dr. Leslie’s participation in this study is one more example of how our team members collaborate with colleagues from across the globe to bring the most advanced, life-saving clinical trials to our patients,” said Andre Goy.



CAR T LEADS TO REMISSION AFTER MYELOMA RECURRENCE

In 2009, Michael Masterson of Budd Lake, New Jersey, was diagnosed with multiple myeloma at age 55. Despite treatment, his cancer returned — twice. After the second recurrence in 2018, Michael’s physicians at John Theurer Cancer Center recommended that he participate in a clinical trial for CAR T-cell therapy.

Michael received a transfusion of 450 million T-cells, and his body responded very quickly.

“Right after the procedure, I had a few days of a fever, but that indicated that the treatment was working,” Michael said. “Overall, the procedure was very tolerable and I recovered rapidly.”

Nearly three years after his CAR T procedure, Michael remained in remission.

“My CAR T experience gave me excellent results, a rapid recovery and a return to normal life, which included being back to work only a few weeks after the procedure,” Michael says.

And he has seen firsthand the tremendous strides that JTCC has made in treating blood disorders over the years.

“When I was first diagnosed, there weren’t as many treatment options for multiple myeloma,” Michael said. “I am always nudging my treatment team, but I always find that they’ve already raised that bar. They are continuing to work on more new therapies to help people with blood cancers and disorders.”

WOMAN BEATS CANCER WITH CAR T

In 2017, at 34 weeks pregnant and age 31, Deborah Aschendorf, a nurse from Brooklyn, New York, was diagnosed with primary mediastinal diffuse B cell lymphoma. Within a week, she had a C-section to deliver her fourth child and started chemotherapy. However, when chemotherapy didn’t work as she’d hoped, doctors at Hackensack Meridian *Heath’s* John Theurer Cancer Center recommended CAR T.

“Even as a nurse, I didn’t know about CAR T. It had just been FDA approved,” explains Aschendorf. “It was so new, which made it terrifying. There was not much research at the time. However, it made sense that it would work.”

With the expert team at JTCC guiding her every step of the way, CAR T worked for Deborah — and compared to chemotherapy, her recovery time was quick.

“Within two weeks I was really back to myself. I was able to take care of my kids and get back to my life.”

CAR T – BY THE NUMBERS

< 10 years	CAR T-cell research experience
> 150	CAR T-cell procedures since the program’s inception — more than any other program in the region
35	CAR T-cell or NK cell clinical trials have been performed, with an additional 10 trials in the pipeline to open soon

IMPLEMENTING VALUE-BASED CARE WITH BIG DATA

Cancer Outcomes Tracking and Analysis (COTA) is an initiative using “big data” to observe patterns of response to therapy in patients with rare diseases.

John Theurer Cancer Center partners with other cancer care organizations to gather and organize meaningful data, including treatments and outcomes, and assign every patient to a clinically driven advanced classification system (a COTA Nodal Address, or CNA) — with the goal of ensuring that everyone touched by cancer finds the right path to the optimal care.

How JTCC Helps Deliver Data-Driven Cancer Care

Through precise classification of patients at diagnosis and real-time analytics, JTCC experts are:

- Empowering oncologists with real-world research-grade data.
- Enabling alternative payment models.
- Creating national outcomes benchmarks.
- Accelerating drug discovery and approval.
- Helping patients make informed decisions about their own care.

COTA has the power to improve clinical outcomes and reduce cancer-care costs. By combining deep oncology expertise with proprietary technology and analytics, big data analytics can help doctors choose the most effective treatment for each patient by exploring biomarkers and predictors of response.

As cancer care leaders, JTCC is seeking to continuously improve care quality, performance, and value. Our physicians seek to improve outcomes and help patients make informed decisions about their care by augmenting their clinical experience with real-world data.



EXPANDING ACCESS TO EXPERT CANCER CARE ACROSS NEW JERSEY'S COMMUNITIES

John Theurer Cancer Center (JTCC), New Jersey's premier cancer program, is on a mission to expand access to its internationally recognized experts so patients throughout New Jersey and beyond can receive advanced cancer care close to home.

JTCC at Jersey Shore University Medical Center

In December 2021, JTCC opened a location at Jersey Shore University Medical Center's (JSUMC) HOPE Tower, providing patients with access to adult bone marrow transplantation and cellular therapy, as well as acute leukemia care. Patients will also have access to infusion services, genomic profiling, laboratory services, surgical consultation, and advanced clinical trials — including JTCC's Phase I clinical trial program, the largest in New Jersey, which is expected to launch in 2023.

"Patients in southern New Jersey — as well as patients in Pennsylvania and Delaware — can now access our expertise without the need to travel to Hackensack University Medical Center," said Michele L. Donato, M.D., FACP, CPE, chief of the Adult Stem Cell Transplantation and Cellular Therapy Program at John Theurer Cancer Center. "Our goal is to expand access to tertiary and quaternary cancer care and improve patient outcomes throughout the state."

The program is actively performing stem cell transplantation procedures at the JSUMC location—and is expecting a significant increase for 2023.

"It's a huge relief for our patients to know that JTCC's expert physicians are now local," said Samantha DePadova, DNP, RN, ANP-C, OCN, Associate Vice President, Strategic Operations & Development, OMI Management at John Theurer Cancer Center.

"Every patient coming to Hackensack Meridian Health for oncology should be reassured that they have access to the best standard of care locally, closer to home — and to experts and clinical trials, including Phase I and cell therapies such as CAR T, when needed," said Andre Goy, M.D., physician-in-chief for Oncology at Hackensack Meridian Health. "The JSUMC expansion has been a tremendous achievement by our team, the JSUMC team and leadership, who helped to make this happen in record time. By the end of 2022, we expect to complete 10 BMT procedures and JSUMC and have performed more than 100 nurse practitioner consults since we opened in early 2022."

Partnership with St. Joseph's Health

JTCC also partnered with St. Joseph's Health to open a new infusion center at the St. Joseph's Wayne Medical Center campus in September 2022. The partnership will bring John Theurer Cancer Center expertise, clinical trials and specialists to patients in Passaic County.

Additionally, JTCC and St. Joseph's Health plan to expand into two new locations in 2023: St. Joseph's Paterson campus and a new location in Totowa.

JTCC AT JSUMC – BY THE NUMBERS

6	Bone marrow transplants performed in 2022, expecting 10 by end of year
8	Hematology-oncology experts providing advanced care at JSUMC
3	Subspecialties represented
85	Leukemia new-patient visits
1730	Patient visits at the outpatient clinic since the center's opening
1,061	Patient visits at the hospital since the center's opening
early 2023	Phase 1 and CAR T programs opening at JSUMC

ENHANCING ACCESS TO CANCER CARE THROUGH PARTNERSHIPS AND AFFILIATIONS

JTCC is committed to enhancing access to groundbreaking cancer care — including treatments, clinical trials, and technology — for patients across New Jersey's communities through partnerships and affiliations, including:

Affiliation with Lombardi Comprehensive Cancer Center at Georgetown University

JTCC is part of the National Cancer Institute (NCI)-designated Lombardi Comprehensive Cancer Center at Georgetown University. The two institutions, which began their collaboration in 2015, share a passion and expertise in research which helps to develop new therapies and understand cancer at the population level. The goal of this research collaboration is to reduce the burden of cancer in our communities — from prevention and education to improved care and outcomes. Together, we are pushing the boundaries of innovation and survivorship and moving the needle in cancer care.

While maintaining their independence, this strategic collaboration allows both institutions to leverage resources, capabilities, and expertise to accelerate discoveries in cancer research and clinical care. Their combined strength also sparks collaborations with other academic cancer centers as well as the pharmaceutical industry.

Memorial Sloan Kettering-Hackensack Meridian Health Partnership

Memorial Sloan Kettering Cancer Center and Hackensack Meridian Health have combined both organizations' unparalleled expertise in all areas of cancer care and research, as well as their commitment to excellence, to accelerate new discoveries and improve the lives of patients they jointly serve, while training a new generation of leaders in the field. The Memorial Sloan Kettering-Hackensack Meridian Health partnership aims to:

- Improve cancer care in New Jersey and beyond by providing support to patients throughout the cancer care continuum, from diagnosis through active treatment and into survivorship.
- Provide access to hundreds of clinical trials for many cancer types, including the Phase I trials that both Memorial Sloan Kettering and Hackensack Meridian Health offer.
- Deliver high-quality care that improves outcomes and value, reducing the burden that cancer places on patients and families.
- Improve the ability to prevent cancer and detect it at an early stage, while making more therapies available to more patients.

ON-SITE GENOMIC TESTING LAB USHERS IN PRECISION MEDICINE AT JTCC

DNA and RNA profiling offer insights into molecular mechanisms underlying cancer development and progression, and AI algorithms and genomics help decide on the best therapies for patients.

Genomic testing is rapidly becoming an essential component of cancer care, allowing oncologists to use precision medicine treatments targeted to each patient's specific cancer subtype and providing data that can be used to advance oncology care through research.

To provide these state-of-the-art benefits to patients and researchers, John Theurer Cancer Center and Genomic Testing Cooperative (GTC) of Irvine, California, have teamed up to establish a next-generation sequencing laboratory called Key Genomics at John Theurer Cancer Center. The lab serves all physicians within Regional Cancer Care Associates (RCCA), a network of cancer care experts in New Jersey, Connecticut, and Maryland.

DNA and RNA Profiling

Paired DNA and RNA profiling is increasingly recognized as the new standard in precision medicine. It is employed in genomics research to uncover molecular mechanisms underlying the development and progression of disease and to explore personal genotype and phenotype correlations. GTC, which uses best-in-class technologies and AI algorithms, is leading the way in the development of clinical applications for this approach.

Remarkably, the lab's genomics/NGS technology is used on both tissue and liquid biopsies, analyzing cell-free DNA (cfDNA) released by cancer cells in the bloodstream and avoiding the need for repeat invasive tissue biopsies in patients with solid tumors and bone marrow biopsies in those with hematologic (blood) cancers, such as leukemia. Oncologists can also look for very early evidence of cancer by taking a blood sample from a patient, as well as residual disease after cancer therapy (i.e. minimal or measurable residual disease) and

also at molecular changes over time — such as cells becoming resistant — which can help tailor the next therapy for patients.

The testing includes 434 genes for DNA and more than 1,400 genes for RNA for solid tumors and 177 genes for DNA and more than 1,400 genes for RNA for hematologic cancers. Liquid biopsy testing includes 275 genes. The technology continues to be refined and is now considered among the most sensitive available. It can also help measure immunological response to therapy through RNA profiling. The collaboration between JTCC and GTC will facilitate the translation of this technology to everyday patient care more quickly — not only at JTCC, but along the entire East Coast.

“As the leading cancer program in New Jersey, John Theurer Cancer Center, which offers the latest therapies including Phase I clinical trials, also embraced the most important question every patient wants answered: ‘What is my best option now?’ The impressive complexity of cancer care today, with so many new treatment options available, requires taking into consideration the remarkable variance of genetic make-up of tumors among patients. This explains why patients react differently to treatments and hence, have different outcomes,” said Andre Goy, M.D., physician-in-chief for Oncology at Hackensack Meridian Health. “With the DNA/RNA next-generation sequencing technology on site, we can test patients’ molecular differences, which will help stratify patients and customize treatment decisions — as well as monitor patients’ responses, including measuring minimal residual disease beyond imaging and standard blood work. The development of clinically actionable tests using a dual DNA and RNA signature along with artificial intelligence is key to implement precision medicine in both blood cancers and solid tumors.”

Benefits of Genetic Sequencing

The results of next-generation genomic sequencing of DNA and RNA are used to:

- Confirm a diagnosis and understand the molecular subtype of a cancer — not just what it looks like under a microscope.
- Identify drivers of cancer growth, including genetic mutations such as chromosomal translocations or fusions, that may guide the choice of targeted cancer therapies — a precision medicine approach that may not only help in the selection of the most effective therapies, but also avoid the use of less effective treatments. RNA profiling also yields more information than DNA sequencing if multiple molecular pathways are driving a cancer's growth, enabling clinicians to take aim at the cancer from a variety of angles by using a combination of targeted therapies.
- Understand the aggressiveness of a patient's cancer so doctors know how intensively they need to treat it, or if it needs to be treated at all.
- Predict a patient's prognosis and generate volumes of data on patient outcomes.
- Monitor response to therapy, allowing physicians to change to a different treatment if genomic testing shows another approach is not working.
- Detect signs of relapse earlier, before it can be seen on an imaging exam or cause symptoms.
- Refine the selection of patients for clinical trials which require participants to have certain molecular features in their cancers.
- Detect cancer earlier — an increasing need given the fact that, in 2022, two-thirds of cancer diagnoses and resulting deaths still have no available screening test.

Why Precision Medicine Matters

Only approximately one in seven patients in 2020 received what experts consider to be their best treatment option. Precision medicine aims to address the following challenges and needs in cancer care:

- With an unmanageable number of treatment options now available for many cancers, precision medicine helps clinicians find ways to stratify patients and rationalize treatment decisions.
- Removing the variance of care using data, genomics and outcome research will help rationalize treatment decisions across the Hackensack Meridian Health network.
- The future of cancer care is in diagnostics from early detection, selecting the best treatment options and preventing recurrence.
- Precision medicine will expand into genetic risk mitigation and precision prevention.
- Expanding on immune-based therapies — the fifth and game-changing treatment modality in cancer — will require researchers to identify markers that help overcome resistance and is another potential application of liquid biopsies.



PUTTING RESEARCH TO WORK FOR JTCC PATIENTS

Center for Discovery and Innovation (CDI) expands research team and enhances capabilities to help JTCC push the boundaries of novel therapies together.

The mission of the Hackensack Meridian Center for Discovery and Innovation (CDI) is to develop and translate innovations in biomedical sciences to improve clinical outcomes for cancer patients and others with life-threatening, disabling and chronic diseases.

Through a unique partnership between CDI researchers and John Theurer Cancer Center (JTCC) experts, the CDI is conducting groundbreaking research that is offering new hope to JTCC patients — today, and in the future.

Bringing New Therapies from the Bench to the Bedside

Since the CDI’s inception in 2019, it has received 57 grants from the National Institutes of Health and expanded from four labs to 25 labs, leading to the publication of more than 150 papers per year. In the last 18 months, the CDI has recruited 12 world-class cancer researchers who share the common goal of making their scientific research actionable by taking it from the bench to the clinic, focusing on immunology and cancer.



“Though cancer survival has improved thanks to numerous novel therapies during the last 2-3 decades, we focus on meeting the clinical needs of the 20 percent for whom traditional therapies don’t work,” said David S. Perlin, Ph.D., Chief Scientific Officer and Senior Vice President of the CDI. “Our goal is to develop therapies that take us from today’s regimens to the next standards of care together with JTCC.”

Collaborations Aim to Solve Clinical Problems

The CDI is collaborating with JTCC on several initiatives, including:

■ **Understanding the microbiome.** Researchers are studying the microbiome — the collection of microorganisms that naturally live on and inside the body — and how it impacts cancer susceptibility and response to treatment. Ninety percent of the cells in the human body are non-human cells, such as bacteria, fungi and viruses, and many of these cells reside in the gut.

■ **New therapies for blood cancers.** Through the CDI’s Institute for Multiple Myeloma and Lymphoma, researchers are working to develop new immunotherapies, including new cell-based treatment options, for patients with blood cancers.

■ **Preventing and treating opportunistic infections.** CDI researchers are looking for ways to improve patient outcomes by preventing and treating hospital-acquired and other opportunistic infections in immunocompromised patients, including those who are undergoing stem cell transplantation or chemotherapy at large.

■ **Early cancer biomarker identification.** CDI researchers have developed a method to find and quantify mRNA biomarkers circulating in plasma, which has the potential to be used to track and detect diseases, including cancer.

■ **Epigenetics research.** As one of the leading centers for epigenetics research in the nation, CDI researchers are studying how cells silence or activate certain genes and the impact on cancer development.

“We work closely with our cancer clinical colleagues to understand what their needs are, what they are doing in their clinical trials, and how we can support their clinical goals,” said Dr. Perlin. “What makes the CDI unique is its ability to address unmet clinical needs by bringing together, in a common ecosystem, institutional, public and private partners to solve it.”

“Working together with the CDI and Dr. Perlin’s team has been a true blessing for JTCC. Our partnership has created new opportunities for our patients, as well as talented researchers who want to take advantage of the phenomenal acceleration in innovation and science that will reshape the practice of medicine, including cancer medicine,” said Andre Goy, M.D., physician-in-chief for Oncology at Hackensack Meridian Health.

CDI – BY THE NUMBERS

25	Labs
57	NIH grants
150	Papers per year
12	World-class cancer researchers recruited in the past 18 months
3	The CDI is organized into 3 institutes: 1) Infection and cancer; 2) Immune- and cell-based therapies; and 3) Institute for Myeloma and Lymphoma
170	FTEs, including scientists and support staff

NEW HELENA THEURER PAVILION PROMOTES WORLD-CLASS SURGICAL ONCOLOGY CARE

Surgeons have access to state-of-the-art facility equipped with the latest technology from robotics to CT and intraoperative MRI.

The Helena Theurer Pavilion is a “smart hospital” that incorporates the latest technology into a modern, thoughtfully designed facility. The facility includes:

- **Six operating rooms dedicated to robotic-assisted surgery** — and each room is equipped with an advanced da Vinci robotic surgical system. One operating room will house the da Vinci SP single-port robot, which allows surgeons to perform complex procedures such as nephrectomies through a half-inch incision.
- **Intraoperative MRI capability** that allows neurosurgeons to precisely remove brain tumors without the need to leave the sterile operating room environment to obtain patient images.

- **Large monitors and video conferencing technology in each operating room**, so surgeons have improved visualization of patient images and the capability to seamlessly interact with colleagues and students.

“The Pavilion is unmatched in terms of design, technology and patient experience — and from the operating rooms to the patient rooms to the family and visitor areas, it’s an environment that promotes leading-edge care, healing and well-being,” said Howard Ross, M.D., chair of surgery/surgeon-in-chief, Hackensack University Medical Center.



Delivering Tomorrow’s Surgical Care to Today’s Patients

John Theurer Cancer Center’s oncologic surgeons use the latest, minimally invasive techniques to care for patients with breast, gynecologic, head and neck, thoracic, gastrointestinal, neurologic, skin, sarcoma and urologic cancers. Surgical innovations, accomplishments and highlights from 2022 include:

- **Urologic surgeons enhance reputation for single port surgical excellence.** Under the leadership of Michael D. Stifelman, M.D., Chair and Professor of Urology at Hackensack Meridian School of Medicine, Chair of Urology at Hackensack University Medical Center, and Director of Robotic Surgery for Hackensack Meridian Health, Hackensack University Medical Center’s urology team built upon its reputation as national and international leaders in single port robotic urologic surgery. The team shared knowledge through educational events, visits and tele-presentations for residents, fellows and colleagues and published 12 abstracts on single port surgery at the 2022 American Urological Association annual meeting.
- **Colorectal surgery expands team and utilizes robotic technology to achieve top-decile outcome rankings.** Hackensack University Medical Center has created a colorectal surgery “dream team” with extensive expertise in robotic-assisted surgery. The team, including Howard Ross, M.D., chair of Surgery/surgeon-in-chief; Steven Lee-Kong, M.D., chief of Colorectal Surgery; and Ryan Moore, M.D., have worked together to achieve national top-decile rankings for length of stay, surgical site infections and readmission rates in the 2021 report from the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP).
- **Near-infrared and robotic-assisted technology revolutionize lung biopsy procedures.** Nabil P. Rizk, M.D., MPH, MS, chief, Thoracic Surgery, Hackensack University Medical Center and co-director of Thoracic Oncology, John Theurer Cancer Center, uses near-infrared Firefly imaging along with Ion, which combines CT imaging and robotic-assisted technology, to identify and access hard-to-reach lesions during minimally invasive lung biopsies. Firefly highlights lung lesions



so surgeons can obtain quality tissue samples and Ion offers increased precision and flexibility when compared to traditional bronchoscopy.

- **Improving quality of life after gynecologic surgery.** Ami P. Vaidya, M.D., vice-chair of the Department of Obstetrics & Gynecology, co-chief of the Division of Gynecologic Oncology, and director of the Minimally Invasive and Robotic Gynecologic Surgery, uses Firefly to assess the pelvic lymph nodes during robotic-assisted endometrial cancer surgery. By finding and removing only the sentinel lymph nodes, surgeons can reduce the risk of lymphedema. Dr. Vaidya and her colleagues also use SPY camera technology and fluorescent dye to identify sentinel lymph nodes in vulvar cancer.

HELENA THEURER PAVILION BY THE NUMBERS

- 9 | Stories
- 530,000 | Square feet
- 24 | Operating rooms
- 72 | Post-anesthesia care unit beds
- 50 | Intensive Care Unit (ICU) beds
- 175 | Medical/surgical beds, including intermediate care rooms
- 6 | da Vinci robotic surgical systems, including one single port system

ROBUST BRAIN TUMOR CLINICAL TRIALS PROGRAM LEADS TO NEW DISCOVERIES CLOSE TO HOME

JTCC researchers offer promising investigational therapies and comprehensive care for patients with high-grade glioma and glioblastoma

John Theurer Cancer Center (JTCC) neuro-oncologists are offering new hope for patients with brain tumors through ongoing research and advanced clinical trials. Under the leadership of Samuel A. Goldlust, M.D., Pitkin Chair in Neuro-Oncology and Medical Director of the Brain and Spine Institute at John Theurer Cancer Center, JTCC is offering notable clinical trials, including:

- **CYNK-001 IV and IC in Combination with IL2 in Surgical Eligible Recurrent GBM With IDH-1 Wild Type (CYNK001GBM002).** In collaboration with four other leading brain tumor centers, JTCC is the only site on the East Coast offering this trial for patients with recurrent glioblastoma. The trial will assess the safety and efficacy of cellular/immunotherapy treatment with genetically engineered natural killer cells delivered intravenously and intratumor at the time of surgery.
- **A Phase 2b Clinical Study With a Combination Immunotherapy in Newly Diagnosed Patients With Glioblastoma – the ImmuneSense Study.** JTCC researchers will assess the progression-free survival and overall survival of patients who are treated with an autologous drug that is created from tumor cells at the time of surgery and customized to the genetic changes unique to each patient's tumor.

- **Study of DSP-0390 in Patients with Recurrent High-Grade Glioma.** JTCC researchers were the first in the country to administer DSP-0390, a novel drug that interrupts cholesterol metabolism — an important molecule in the development of new tumor cells.

In addition to presenting abstracts at the American Society of Clinical Oncology (ASCO) and Society for Neuro-Oncology (SNO) annual meetings, JTCC has collaborated with the Hackensack Meridian Center for Discovery and Innovation (CDI) and colleagues at the National Cancer Institute (NCI)-designated Georgetown Lombardi Comprehensive Cancer Center on recent papers, including:

- **“Tetrodotoxin for Chemotherapy-Induced Neuropathic Pain: A Randomized, Double-Blind, Placebo-Controlled, Parallel-Dose Finding Trial.”** *Toxins (Basel)*. 2021 Mar 25;13(4):235. doi: 10.3390/toxins13040235. [PMID: 33805908].

JTCC was the lead research site for this novel, supportive-care treatment for chemotherapy-related neuropathy — a major quality-of-life issue for patients with cancer.

- **“Temozolomide-Induced Guanine Mutations Create Exploitable Vulnerabilities of Guanine-Rich DNA and RNA Regions in Drug-Resistant Gliomas.”** *Sci Adv*. 2022 Jun 24;8(25):eabn3471. doi: 10.1126/sciadv.abn3471. Epub 2022 Jun 22. [PMID: 35731869].

In collaboration with colleagues from the NCI-designated Lombardi Comprehensive Cancer Center at Georgetown University, JTCC researchers identified targetable vulnerabilities for temozolomide-resistant glioblastoma.

- **“Allele-Specific DNA Methylation is Increased in Cancers and its Dense Mapping in Normal Plus Neoplastic Cells Increases the Yield of Disease-Association Regulatory SNPs.”** *Genome Biol*. 2020 Jun 29;21(1):153. doi: 10.1186/s13059-020-02059-3. [PMID: 32594908].

In collaboration with colleagues from the CDI, JTCC researchers studied mapping of allele-specific DNA methylation as a post-genome-wide association study (GWAS) strategy for localizing regulatory sequence polymorphisms (rSNPs).

- **“Association of Autologous Tumor Lysate-Loaded Dendritic Cell Vaccination With Extension of Survival Among Patients With Newly Diagnosed and Recurrent Glioblastoma: A Phase 3 Prospective Externally Controlled Cohort Trial.”** *Genome Biol*. 2020 Jun 29;21(1):153. doi: 10.1186/s13059-020-02059-3. [PMID: 32594908].

“Our cutting-edge clinical trials program is designed to bring the forefront of scientific discovery close to home in New Jersey,” said Dr. Goldlust. “In addition to promising investigational therapies, JTCC complements this innovation with the most advanced radiation, medical and surgical technology available.”

ADVANCING THE FUTURE OF CANCER CARE

JTCC's future plans include initiatives to expand patient access research, knowledge, and educational opportunities.

John Theurer Cancer Center is rewriting the future of cancer care — throughout New Jersey and beyond — through expansion, implementation of new technology, and research and clinical innovations. Cancer care will undergo profound changes in the next 10-15 years, and cancer medicine will help lead the reinvention of healthcare delivery. JTCC's vision is aligned with such opportunities, which include:

- Expansion of precision medicine and new therapeutic options. We believe cancer care will see the expansion of precision medicine, using genomics and data to define each patient's best option at any given time. Anti-cancer therapies will continue to replace traditional chemotherapy, using targeted therapies and expanded immunotherapy options to overcome immunoresistance. T-cell engaging therapies such as CART and cell therapies may provide durable benefit in responders, and potentially a cure.

- Preemptive approach to cancer care. We will also have a shift toward more pre-cancer molecular medicine applications, such as genetic risk mitigation and early detection/intervention. This preemptive approach will also apply in preventing cancer recurrence through the management of MRD and potential immune-based therapies.

With the goal of bringing leading-edge cancer therapies to today's patients and improving the cancer care of tomorrow, JTCC is pursuing various future initiatives, including:

- Developing an International Program, which will connect residents of other countries with JTCC experts who can provide complex cancer care and new options when needed most.
- Creation of a pilot program for Brain Health and Cancer, to address the neurological impact of cancer and cancer treatments, improve quality of life for patients and survivors, and optimize their outcomes.
- Expanding translational research to benefit JTCC patients through partnerships with the Center for Discovery and Innovation (CDI) and industry, non-profit and government sponsors.
- Enhancing the availability of clinical trials using AI to match patients in need with the best trials.
- Expanding our genomics endeavors and building upon our best-in-class genomics DNA/RNA signatures using AI/machine/deep learning, including liquid biopsies, while adding immune-based signatures and developing actionable signatures that can be used to help patients well beyond JTCC's walls.
- Providing top-quality educational opportunities through innovative, team-based approaches that mirror the future of health care — including a new hematology/oncology fellowship program in 2023.



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ABOUT JOHN THEURER CANCER CENTER AT HACKENSACK UNIVERSITY MEDICAL CENTER

Hackensack Meridian John Theurer Cancer Center at Hackensack University Medical Center is recognized as one of New Jersey's premier cancer centers by *U.S. News & World Report*. They are also the largest and most comprehensive center dedicated to diagnosis, treatment, management, research, screening, and preventive care as well as survivorship of patients with all types of cancers. The 16 specialized divisions covering the complete spectrum of cancer care have developed a close-knit team of medical, research, nursing, and support staff with specialized expertise that translates into more advanced, focused care for all patients. Each year, more people in the New Jersey/New York metropolitan area turn to John Theurer Cancer Center for cancer care than to any other facility in New Jersey.

John Theurer Cancer Center is part of the NCI-designated Lombardi Comprehensive Cancer Center at Georgetown University. Housed within a 781-bed not-for-profit teaching, tertiary care, and research hospital, John Theurer Cancer Center provides state-of-the-art technological advances, compassionate care, research innovations, medical expertise, and a full range of aftercare services that distinguish John Theurer Cancer Center from other facilities. The center recently expanded to Jersey Shore University Medical Center, serving patients in southern New Jersey and parts of Pennsylvania. Toms River Regional Cancer Center and Saint Joseph's Health are affiliated with the cancer center.

For additional information, please visit JTCancerCenter.org.