

ANNUAL REPORT FY2018

Courage required

THE UNIVERSITY OF TEXAS
MD Anderson
Cancer Center

Making Cancer History®

Courage required

MISSION

The mission of The University of Texas MD Anderson Cancer Center is to eliminate cancer in Texas, the nation and the world through outstanding programs that integrate patient care, research and prevention, and through education for undergraduate and graduate students, trainees, professionals, employees and the public.

VISION

We shall be the premier cancer center in the world, based on the excellence of our people, our research-driven patient care and our science.

We are Making Cancer History®.

CORE VALUES

Caring

By our words and actions, we create a caring environment for everyone.

Integrity

We work together to merit the trust of our colleagues and those we serve.

Discovery

We embrace creativity and seek new knowledge.



A Comprehensive Cancer Center Designated by the National Cancer Institute

VISIT THE CONQUEST WEBSITE
AT WWW.MDANDERSON.ORG/CONQUEST






Photo: Wyatt McSpadden

ON THE COVER

The Adolescent and Young Adult Oncology Program was developed to provide cancer patients between the ages of 15 and 29 with guidance in the areas of genetics, oncofertility, psychosocial support and survivorship. The program helped Rice University student Jacob Liang continue pursuing his degree while being treated for cancer.

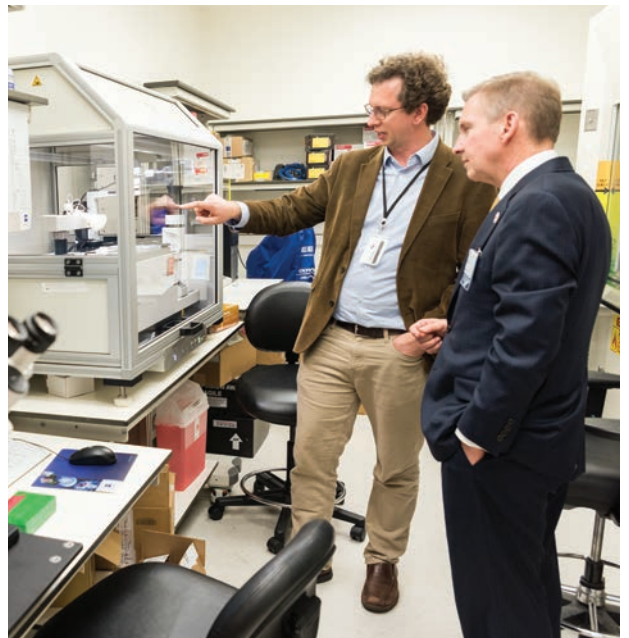
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#endcancer

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Clockwise from top: MD Anderson President Peter WT Pisters, M.D., has been in perpetual motion since his first day — and night — on the job. In the past year-plus, he has committed much of his time to visiting the institution's Texas Medical Center (TMC) and Houston-area locations such as the new MD Anderson League City (with The University of Texas System Chancellor James Milliken), research labs and facilities on the TMC campus, and many more. Pisters, himself a surgeon, has spent time in operating rooms with surgical teams, nurses and doctors providing care on inpatient floors, and with employees at events such as the announcement of the institution's jersey partnership with the Houston Dynamo.



MD Anderson President Peter WT Pisters, M.D., joins employees in celebrating a successful year of accomplishments.

One year. #oneMDAnderson

The number “one” is a significant and dynamic symbol of The University of Texas MD Anderson Cancer Center and all that we stand for. From our No. 1 ranking as the nation’s top center for cancer care by U.S. News & World Report to our one goal to end cancer in Texas, the nation and the world, the number “one” has permeated thousands of conversations and described hundreds of accomplishments throughout my first year’s return to MD Anderson as president.

In the past year, our providers ranked among the top 1percent of providers nationally. We joined forces with the Houston Dynamo to become the first season-long, cause-related jersey partnership in the history of Major League Soccer. One of our own, Jim Allison, Ph.D., chair of Immunology, was awarded the Nobel Prize in Physiology or Medicine.

We are #OneMDAnderson. We are 20,000 cancer fighters strong. Together, our “one” goal is to eradicate this disease for hundreds of thousands of patients and their families, for whom a cancer diagnosis is a frightening reality. Suddenly, they are confronted with a new normal, one filled with stress and anxiety about their health, their future and their finances. The truth is, courage is required to take on cancer.

Each and every day we see our patients display an enormous amount of mettle and resolve as they face treatment. We see the compassion and caring of their loved ones. We also see the joy, excitement and hope that come with success in beating the disease.

Our doctors, scientists, nurses, trained staff and committed employees are bold as well.

Over the past year, I’ve been grateful for the opportunity to listen and learn from many of you — more than 5,000+ to date! I’ve toured and visited more than 220 areas across our Texas Medical Center campus, our Houston-area locations and beyond. At each stop, I’ve asked employees, volunteers and donors the same question: “What are you most proud of?”

The answer has always been the same. A resoundingly strong answer: “My team.”

No matter the division, the department or focus area, our teams’ collaborative goal to end cancer propels us forward and strengthens our ties with one another as #OneMDAnderson. I couldn’t be prouder to see our institution come together like never before to advance world-class cancer care for our patients, accelerate groundbreaking cancer research, drive innovative approaches to preventing cancer and provide phenomenal educational

opportunities for future leaders in cancer care.

Sadly, we lost a vital member of the MD Anderson team and a true giant in cancer care when the institution’s third president, John Mendelsohn, M.D., passed away in January. Under Dr. Mendelsohn’s leadership, the institution experienced astonishing growth and improvement that enabled it to become one of the world’s finest cancer centers.

We are inspired by his dedication and accomplishments, and we are devoted to continuing his work. We will miss him dearly.

Within the pages of this report, you’ll find many stories that highlight the courage of our people, patients and caregivers, as well as MD Anderson’s successes in the past year — many of which were made possible in one way or another by Dr. Mendelsohn’s efforts. I hope you will read these stories with pride and know that we can continue to accomplish so much more together than we can on our own. We are #OneMDAnderson and together, we truly are Making Cancer History.

Peter WT Pisters, M.D.
President



Nobel Prize winner Jim Allison, Ph.D., signs the underside of a chair in the Nobel Museum's cafe in Stockholm, Sweden, a tradition for new laureates.

Jim Allison honored with Nobel Prize

By Scott Merville

Jim Allison, Ph.D., chair of Immunology, received the Nobel Prize in Physiology or Medicine on Dec. 10 in Stockholm, in recognition of his invention of immune checkpoint blockade as a treatment for cancer.

In introducing Allison and co-winner Tasuku Honjo, M.D., Ph.D., of the University of Kyoto in Japan, Swedish immunologist Klas Kärre reviewed the pair's contributions:

"Your groundbreaking research has added a new pillar in cancer therapy. It represents a new paradigm for treatment, not directly targeting the cancer cells, but rather releasing the brakes of the immune system. Your seminal discoveries constitute a landmark in the fight against cancer, for the benefit of numerous patients and all humankind."

Allison and Honjo were then presented their Nobel medals and plaques by King Carl XVI Gustaf of Sweden.

Allison, by the mid-1990s, had completed crucial work in the biology of T cells, the targeted warriors of the adaptive immune system. This basic science research led to the identi-

fication of the T-cell ignition switch — a molecular gas pedal that accelerates T-cell activation — and a molecular brake that stops immune response.

"He tested the very bold idea of releasing the brake pedal by using antibodies to trigger T-cell reactions against cancer," said Kärre, a member of the Nobel Committee for Physiology or Medicine. "He began by curing cancer in mice. Then he worked step-by-step to develop this therapy for humans. He called it 'checkpoint inhibition.' In the first clinical studies of malignant melanoma, some patients responded dramatically — even in patients with the disease all over their bodies, the metastases shrank away and disappeared."

That drug, ipilimumab, known commercially as Yervoy, became the first checkpoint inhibitor to be approved by the Food and Drug Administration. Honjo's research was instrumental in developing a second checkpoint blockade drug. The two types of drug are approved to treat 10 types of cancer, and clinical trials for additional cancers are underway.



King Carl XVI Gustaf of Sweden, right, presents Allison with the Nobel Prize medal.

“I would like to dedicate this talk to the many students and fellows who have trained with me and really done the work that I’ll be talking about over the years,” Allison said on Dec. 7 to open his Nobel Lecture. “And also to the doctors and the patients who were involved at no small risk to themselves in the early clinical trials. And finally to my partner in life and science, Dr. Padmanee Sharma, with whom much of the work I’m going to show you was done in collaboration.”

Sharma, professor of Genitourinary Medical Oncology and Immunology at MD Anderson, and Allison lead the institution’s immunotherapy platform, which is dedicated to extending the reach of cancer immunotherapy to more patients through research.

Platform discoveries, for example, led to the opening of a combination immunotherapy clinical trial for prostate cancer, a disease that proved resistant to the approach.

“I think that what we’re going to see in the future is that checkpoint blockade is going to become a part of essentially all therapies,” Allison said to close his lecture. “That might be in combination with radiation or chemotherapy or many other things in the kinds of tumors that don’t respond to checkpoints by themselves.

“The good news is we know the basic rules. There’s still some frustrations in glioblastoma and pancreatic cancer, for example, which haven’t responded yet. We need to get the response rate as close to 100 percent as we can. I’m optimistic we’ll succeed if we keep going.”



Allison arrives at the Nobel Prize ceremony with Padmanee Sharma, M.D., Ph.D., professor of Genitourinary Medical Oncology and Immunology.

“John Mendelsohn was one of the greatest visionaries in the field of cancer medicine, and one of the greatest opponents cancer has ever faced. He was both the architect and the builder behind the advancement of what we now know as personalized cancer medicine.”

— Peter WT Pisters, M.D., *president of MD Anderson*



As president of MD Anderson, John Mendelsohn, M.D., oversaw an era of enormous growth in the institution's facilities, staff and prestige.

The legacy of John Mendelsohn, M.D.:

MAKING CANCER HISTORY

John Mendelsohn, M.D., was an internationally acclaimed leader in medicine and a scientist whose research helped pioneer a targeted cancer therapy.

As MD Anderson's third president, serving in that capacity from 1996 to 2011, he inspired significant achievements in research and patient care and directed substantial growth in staff, programs, facilities and philanthropy. Mendelsohn was a visionary, researcher, pioneer, leader, ambassador, educator, architect and fundraiser who boldly oversaw MD Anderson's growth into a world-class cancer center.

Mendelsohn died Jan. 7 at his home in

Houston. The cause of death was glioblastoma, an aggressive brain cancer with which he had been diagnosed 15 months earlier. He was 82.

His impact and imprint have forever advanced the fight against cancer.

“MD Anderson had the great fortune of being led by John Mendelsohn for 15 years, and the strides made under his direction were nothing short of remarkable,” says Peter WT Pisters, M.D., president of MD Anderson. “In addition to impressive achievements, both as a scientist and as a leader, John was a role model and inspiration to so many. He has left an indelible mark on this world, and

he will be fondly remembered and greatly missed.”

During Mendelsohn's tenure, the institution's revenue increased from \$726 million to \$3.1 billion, and its facilities grew from 3.4 million square feet to 15.2 million square feet. The number of employees and patients served doubled and private philanthropy increased almost tenfold, with more than \$2 billion raised. In each of his last five years as president, MD Anderson was named the top cancer hospital in U.S. News & World Report's annual “Best Hospitals” survey. He retired on Aug. 31, 2018.

Photo: MD Anderson archive



Mendelsohn and Robert Mosbacher Sr., second from left, celebrate the birthdays of former President George H.W. Bush (75) and Barbara Bush (74) at Milestones and Miracles in 1999. The event raised more than \$10.2 million. Bush was chair of the Board of Visitors from 2001-03.

Innovations in patient care

Mendelsohn strengthened the institution's focus on innovations in research-driven patient care, and built a research program that emphasized the translation of scientific findings to improve patient care and prevention strategies.

Innovations in care were both cultural and functional. He reorganized care around the patient rather than the department, enhancing collaboration with cross-functional teams. He engaged employees in building a powerful culture around core values of "Caring, Integrity and Discovery," and he inspired all with the powerful tagline of "Making Cancer History."

Dramatic expansion of research

During his tenure, research expenditures jumped more than fourfold, from \$121 million in 1996 to \$547 million in 2010. MD Anderson became the nation's leading recipient of grants from the National Cancer Institute, greatly increased institutional research funding from clinical operations and boosted external funding via philanthropy.

The University of Texas Research Park on the institution's south campus enabled the development of the Red and Charline McCombs Institute for the Early Detection and Treatment of Cancer, as well as MD Anderson's largest fundraising campaign, Making Cancer History®: The Campaign to Transform Cancer Care, which generated more than \$1.2 billion in philanthropic commitments that have since fueled significant advances in patient care and research.

Committed to education

As president, Mendelsohn oversaw a prolific expansion of MD Anderson's educational programs, and emphasized quality training for future physicians and scientists, nurses and allied health professionals. His dedication resulted in the cancer center becoming a degree-granting institution that confers degrees in biomedical sciences and allied health disciplines.

During his tenure, the institution also established research partnerships and formed teaching affiliations with institutions in Europe, the Middle East, Asia and South America.

A pioneer of targeted therapy

In the early 1980s, Mendelsohn and his University of California, San Diego School of Medicine colleague Gordon Sato, Ph.D., pursued a highly personalized approach to cancer treatment by developing antibodies to interfere with specific molecules found inside of and on the surface of cancer cells, effectively blocking cancer growth. Their research led to the targeted therapy drug cetuximab (Erbix), which eventually was approved by the Food and Drug Administration for treating advanced colon cancer and head and neck cancer.

By stopping cancer growth, targeted therapies often work in combination with other treatments, such as surgery, chemotherapy or radiation, to effectively remove, shrink or destroy tumors.

Mendelsohn and Sato are widely known

Continued on page 8

"His approach to everything he did was: Ask questions. Observe carefully. Find out how to make someone or something better."

— Eric Mendelsohn

"The nobility of John Mendelsohn's cause inspired him, and that in turn inspired others. His was a purpose-driven life, and he lived it to the fullest."

— Wayne Gibbens,
chair of the Board of Visitors'
Government Relations Committee

Philanthropy

During Mendelsohn's time as president, annual private philanthropy increased almost tenfold to more than \$175 million. The total amount of private philanthropy during his tenure exceeded \$2 billion.

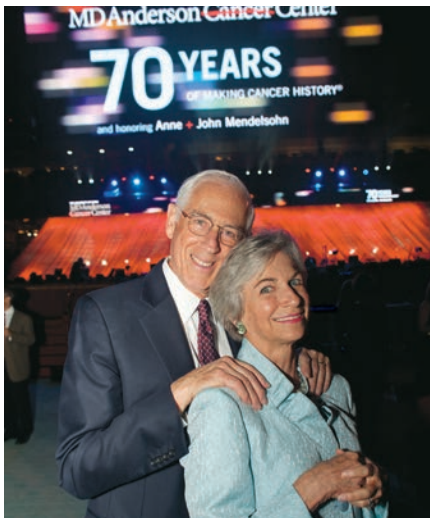
Campaign initiatives

- Cynthia and George Mitchell Basic Sciences Research Building: \$75 million
- George and Barbara Bush Endowment for Innovative Cancer Research: \$50 million
- South Campus Research Initiative: \$135 million
- Making Cancer History: The Campaign to Transform Cancer Care: \$1.215 billion

Major gifts

- 2001:** George and Cynthia Mitchell: \$20 million
- 2002:** Commonwealth Foundation for Cancer Research, Mr. and Mrs. William H. Goodwin Jr.: \$15 million
- 2004:** Estate of Caroline Wiess Law: \$25 million
- 2005:** Charline and Red McCombs: \$30 million
- Peggy and Lowry Mays: \$20 million
- 2007:** T. Boone Pickens Foundation: \$50 million
- 2008:** Dan L. Duncan Family Foundation: \$35 million
- 2011:** Khalifa bin Zayed Al Nahyan Charity: \$150 million

Photo: F. Carter Smith



John and Anne Mendelsohn were married for 60 years.

as the physician-scientists who shaped the landscape for today’s research into precision medicine.

A love of family and the arts

Soon after starting medical school, Mendelsohn met his future wife, Anne Charles. They were deeply in love for nearly 60 years of marriage and she played a huge role in his life’s work.

The Mendelsohns spent 15 years living in La Jolla and raising their three sons, and creating a lifestyle engaged in culture and the arts. Mendelsohn was passionate about classical music, with a special appreciation for Wagner operas, which he listened to late into the evening at his home office. The Mendelsohns filled their family homes with books, bedside tables disappearing beneath the stacks.

“Dad was so very, very alive, and all who encountered him felt it,” son Jeffrey Mendelsohn said during a memorial service for his father at the Lillie and Roy Cullen Theater at the Wortham Center in Houston. “The look in his eyes as he delighted in conversation, in music, art, science and in caring for people.”

They also explored the uniqueness of each place they lived. In California, Mendelsohn loved to run barefoot on the beach, play tennis and take the family backpacking in the Sierras and the high desert. An often-repeated quote from his uncle, Rabbi Victor Reichert, on living a happy, fulfilling life was to “take a long walk, read a good book and make a new friend.”

Mendelsohn is survived by his wife, Anne, their sons Andrew and his wife, Tina, of London, England; Eric and his wife, Isabel, of Summit, New Jersey; and Jeffrey of San Francisco; and eight grandchildren.

Mendelsohn’s impact on MD Anderson

Named President of MD Anderson

- The phrase “Making Cancer History” is first used.

1996

The Albert B. and Margaret M. Alkek Hospital, the institution’s second inpatient tower, opens.
- The Bellaire Radiation Treatment Center becomes MD Anderson’s first Houston-area location outside the Texas Medical Center.

1998

The institution’s first international partnership, MD Anderson Madrid, opens, giving patients access to clinical trials close to home, and allowing specialists at each center to exchange expertise in clinical care and basic science research.
- MD Anderson confers its first 13 baccalaureate degrees in five allied health disciplines.

1999

The institution begins awarding advanced degrees jointly with The University of Texas Health Science Center at Houston to students at the Graduate School of Biomedical Sciences.
- A 126-room expansion of the Rotary House International Hotel is completed.

2000

FDA approves Erbitux for treating advanced colorectal cancer. It was later approved for head and neck cancer.
- Under Mendelsohn’s leadership, space for research expands with the opening of the George and Cynthia Mitchell Basic Sciences Research Building, which houses nearly 70 laboratories studying molecular genetics, epidemiology, biochemistry, molecular biology and brain cancer research.

2001

The Woodlands location and the Fort Bend Radiation Treatment Center open.
- Mendelsohn guides the opening of the Lowry and Peggy Mays Clinic, designed to help meet increasing demands for outpatient care and services.

2002

A commitment to prevention research builds what is now the Dan L. Duncan Building to house the Division of Cancer Prevention and Population Sciences and establishes the Duncan Family Institute for Cancer Prevention and Risk Assessment.
- Initial five-year accreditation from the Commission on Colleges of the Southern Association of Colleges and Schools is received.

2004

Precision radiation treatments begin at the Proton Therapy Center. Construction began in 2003.
- The 21-floor T. Boone Pickens Academic Tower opens.

2005

Expansion of Alkek Hospital creates space for 320 more hospital beds.
- Returns to MD Anderson to co-lead the Sheikh Khalifa Bin Zayad Al Nahyan Institute for Personalized Cancer Therapy.

2006

Completes tenure as president, and takes a six-month sabbatical to refresh his scientific skills with researchers at Harvard and MIT.
- Faculty Center is renamed the John Mendelsohn Faculty Center.

2008

Awarded a share of the Tang Prize in Biopharmaceutical Science.
- Elected as a fellow of the American Academy of Arts and Sciences.

2011

Retires from MD Anderson Aug. 31.
- 2012**

Named MD Anderson’s President Emeritus following a unanimous vote by the UT System Board of Regents.
- 2013**
- 2018**

Courage required

Cancer.

It's a word that elicits strong reactions and evokes a wide range of emotions: Fear and hope ... uncertainty and determination ... anger and strength. This mysterious, complex disease takes many forms, and it often takes us by surprise. It takes courage to confront a diagnosis and push through treatment. That doesn't mean being unafraid. Courage can't exist without fear. What's important is that patients empower themselves and deflate that fear by seeking out experts who can map out the best possible route to life after cancer. The best guides are the trailblazing doctors, scientists and expert staff at the nation's No. 1 cancer center.

Daring to do more

MD Anderson's innovative and creative approaches to cancer treatment are leading to breakthroughs and improved outcomes for patients like Justin Serrette. From combination immunotherapy and CAR T-cell therapy, to adoptive cell therapies that are full of promise for the future, the institution's health care professionals are using the latest advances to help patients. This dedication to improving quality of life extends beyond treatment and is the focus of many programs that complete the circle of cancer care.



JUSTIN SERRETTE's lymphoma is in remission thanks to a CART-cell clinical trial. Read more on page 22.

The right combinations unlock the power of immunotherapy

By Ron Gilmore

There's no question that immunotherapy — the treatment pioneered by MD Anderson's Nobel Prize-winning chair of Immunology, Jim Allison, Ph.D. — has earned a place among the pillars of cancer therapy.

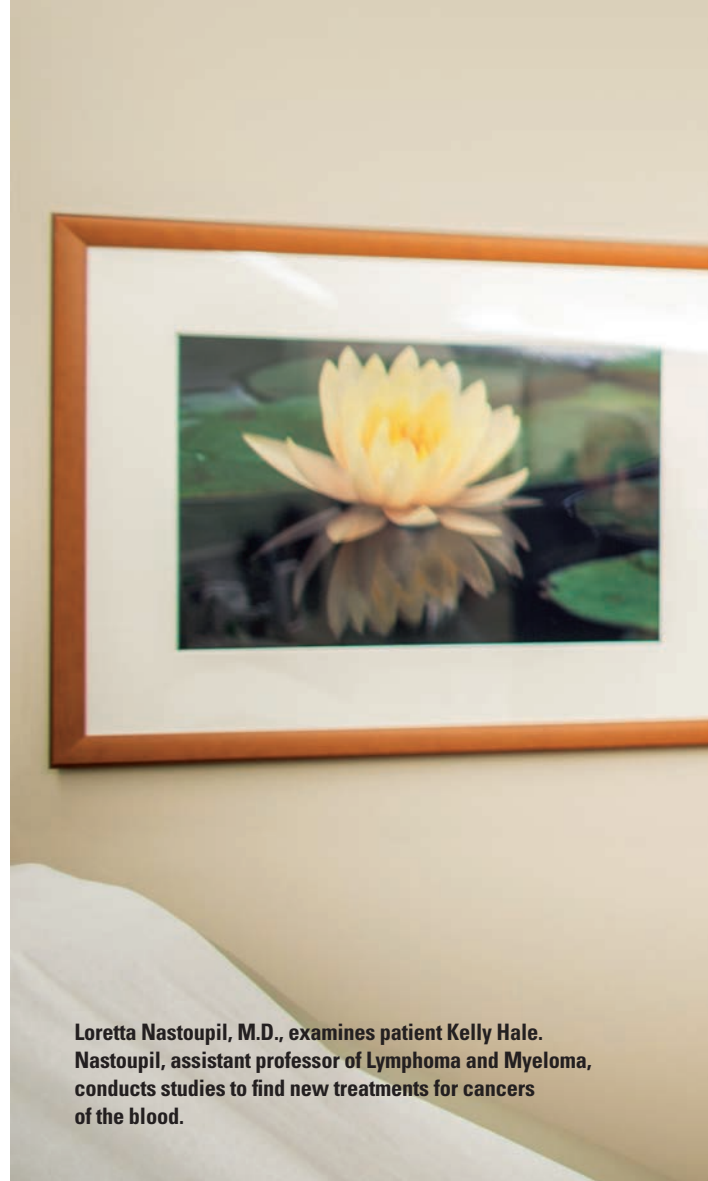
The treatment releases a brake on the immune system, which frees disease-fighting T cells, to locate and attack cancer. Immunotherapy has produced remarkable results in cancers such as non-Hodgkin lymphoma, acute lymphocytic leukemia (ALL), melanoma and lung cancer. But it doesn't work for everyone, and it can have varied results.

That's why MD Anderson researchers — in particular blood cancer experts — are conducting clinical trials of immunotherapy in combination with chemotherapy, antibody-based treatments and even other immunotherapy drugs.

FDA approves leukemia drugs

This past November, oncologists in the Leukemia department played a key role in clinical trials that led to the Food and Drug Administration's approval of two drugs — glasdegib and venetoclax — for the treatment of acute myeloid leukemia (AML) in patients not eligible for intensive chemotherapy.

Glasdegib was approved following studies led by Jorge Cortes, M.D., and venetoclax was approved following trials led by Marina Konopleva, M.D., Ph.D.; Michael Andreeff, M.D., Ph.D.; Courtney DiNardo, M.D.; and Naval Daver, M.D.



Loretta Nastoupil, M.D., examines patient Kelly Hale. Nastoupil, assistant professor of Lymphoma and Myeloma, conducts studies to find new treatments for cancers of the blood.

Understanding and overcoming resistance

“Most immunotherapies are aimed at enhancing the patient's existing immune system to ‘see’ and eliminate cancer cells, or by removing or overcoming barriers to this natural process,” says Loretta Nastoupil, M.D., assistant professor of Lymphoma and Myeloma. “There may be several reasons why these therapies sometimes fail. Understanding the mechanisms of resistance and potential strategies to overcome them is the focus of many efforts underway at MD Anderson.”

MD Anderson's Leukemia, Stem Cell Transplantation and Cellular Therapy departments, and the Pediatrics division, also are conducting numerous combination immunotherapy trials for blood cancers that include AML, chronic lymphocytic leukemia (CLL), myelodysplastic syndrome (MDS) and ALL.

Farhad Ravandi, M.D., professor of Leukemia, is conducting a first-in-human study of the immunotherapy drug AMG 330 for relapsed or refractory (non-responsive to treatment) AML. The drug binds to a protein named CD33 that's on the surface of tumor cells, and to a protein named CD3 that's on the surface of T cells, and acts as a bridge bringing the cells close together, allowing the T cells to recognize and trigger an



attack. The goal is to reduce the size of the tumor and slow the progression of the disease.

Early findings show that two of the patients treated had a complete response with recovery of blood counts after only one treatment cycle. These results are promising, but Ravandi cautions that the testing of AMG 330 is still in its early stages.

Strength in numbers

Guillermo Garcia-Manero, M.D., professor of Leukemia, is studying the use of nivolumab or ipilimumab in combination with azacytidine to treat MDS, and is leading several MDS immune checkpoint therapy trials.

Through an alliance with Bristol-Myers Squibb, Garcia-Manero's MDS study reported 68 percent of patients remained alive one year following treatment with a combination of azacytidine with ipilimumab. After a median follow-up of 20 months, the median survival for the azacytidine and ipilimumab group still had not been reached, which is important to note, Garcia-Manero says. Response rates were also higher than expected with single-agent azacytidine.

Some of the most promising combinations for patients with follicular lymphoma combine the drugs rituximab and

About the Moon Shots Program

Many immunotherapy combination trials at MD Anderson are part of the cancer center's Moon Shots Program™, a collaborative effort to accelerate development of scientific discoveries into treatments that save patients' lives.

Beginning with six Moon Shots™, the program was expanded in 2015 for a total of 13 disease-focused initiatives. The Moon Shots Program also established 10 platforms that provide unique expertise, technical support and novel infrastructure to support the program's team-science approach to finding effective treatment and prevention approaches.

The program already has yielded notable discoveries across the spectrum of cancer care, including prevention, early detection and treatment, and has inspired philanthropic support totaling \$464 million.



Guillermo Garcia-Manero, M.D., professor of Leukemia, is studying a combination drug regimen for the treatment of myelodysplastic syndromes.

lenalidomide. Nathan Fowler, M.D., and Michael Wang, M.D., both with the Lymphoma and Myeloma department, pioneered this treatment, as well as ibrutinib combined with rituximab for treatment of mantle cell lymphoma. In addition, Jason Westin, M.D., has explored a triple-drug therapy using rituximab, lenalidomide and ibrutinib prior to chemotherapy for a form of diffuse large B-cell lymphoma.

Amping it up and collaborating for results

Most combination immunotherapy clinical trials involve two drugs. Some MD Anderson researchers, including Daver, an associate professor of Leukemia, are taking things a step further with three-drug trials. Daver is testing triple therapy for relapsed or refractory AML.

Through an alliance with Pfizer Inc., established through MD Anderson's Strategic Industry Ventures department, cancer researchers are being matched with multi-year, multi-disciplinary funding via the pharmaceutical industry. This alliance supports Daver's testing of azacytidine with nivolumab and ipilimumab, an immunotherapy drug. The Pfizer alliance also includes multi-therapy trials for solid tumor cancers, an effort led by Aung Nain, M.D., associate professor of Investigational Cancer Therapeutics.

"We generally prefer clinical trials with combination therapy in myeloid malignancies like MDS and AML, as

single-agent immune checkpoint therapy has shown little success," Daver says.

He also oversees a study funded through an alliance with Bristol-Myers Squibb in which a triple therapy combining two immune checkpoint inhibitors with azacytidine has shown promising results for relapsed or refractory AML.

Natural killer cells and non-Hodgkin lymphoma

Elizabeth Shpall, M.D., and Katy Rezvani, M.D., Ph.D., professors of Stem Cell Transplantation and Cellular Therapy, developed a technology to grow natural killer (NK) cells from umbilical cord blood. These cells fight invaders in the body, including bacteria, viruses and cancer. Pharmaceutical company Affimed N.V. is using this technology to develop drugs to treat non-Hodgkin lymphoma.

Low-dose chemo and immunotherapy drugs

An evolving area of treatment that marries low-dose chemotherapy with immunotherapy drugs is showing promise for blood cancers, particularly for patients with newly diagnosed or relapsed/refractory Philadelphia chromosome-negative acute lymphoblastic leukemia (Ph-negative ALL). The outlook for these patients is poor and a transplant with stem cells from healthy donors remains the primary treatment.

However, a study of newly diagnosed patients by Leukemia department faculty members Elias Jabbour, M.D., and Nicholas Short, M.D., showed that a combination drug named inotuzumab ozogamicin produced promising results when combined with the drug blinatumomab and a low-dose chemotherapy regimen named mini-hyper-CVD.

Jabbour and Koji Sasaki, M.D., also with the Leukemia department, studied patients with relapsed Ph-negative ALL and found the combination of inotuzumab ozogamicin — with or without blinatumomab — and low-intensity chemotherapy is effective.

Determining what works

Knowing what combination of immunotherapies and other treatments are likely to be successful is a matter of how the body works, and perhaps a bit of serendipity.

"Tumor biology drives many decisions when deciding on optimal combination strategies," Nastoupil says. "A little luck also is involved. Many times we'll combine single agents together when we know the effectiveness and safety of individual drugs. Our rationale is that the combination will enhance the drug's effectiveness."

Nastoupil says the goal is to increase the number of patients likely to achieve a durable remission without impacting their quality of life because of side effects.

"The best way to predict outcomes," she says, "is to study the biology of the tumor, understand the mechanism of action of the drug and have some preliminary data suggesting the combination will work."

"We have great hope that combination approaches will continue to show promise as we further our understanding about tumor biology to predict a better outcome," Nastoupil says.



From diagnosis to remission in three months

Kelly Hale is in remission after participating in a clinical trial testing a two-drug combination for follicular lymphoma.

Getting back to business is a top priority for this entrepreneurial mom

By Ron Gilmore

Kelly Hale didn't have time to be sick. With four active teenagers and a business to run, she was grateful that within three months of being diagnosed with follicular lymphoma, she was able to get back to the activities she loves.

The 52-year-old entrepreneur, who owns Multitudes, a women's clothing and jewelry boutique, and who has a passion for antiques and home renovation, knew it was a "tell-tale sign" when she didn't feel well enough to continue work on the 100-year-old house she and her family are restoring.

In fact, Hale hadn't been feeling well for nearly two years before learning in early October 2017 she had the disease, which is a slow-growing B-cell non-Hodgkin lymphoma.

During that time, she experienced low energy, thirst, itching and night sweats. A routine mammogram two months earlier revealed

enlarged lymph nodes, and a biopsy was taken. The test revealed follicular lymphoma.

Hale knew immediately where she would go for treatment.

"My father had been treated successfully for esophageal cancer at MD Anderson, and I was so impressed with the treatment and care," she says. "I put calls into three cancer facilities, but MD Anderson responded immediately."

Hale had an appointment scheduled at the cancer center "within 30 minutes of calling," and she was offered standard chemotherapy or enrollment in a clinical trial.

"I didn't want to look sick. I didn't want to lose my hair," she says. "I opted for the study, although some family members were saying 'hold on a minute.'"

She joined a clinical trial led by Loretta Nastoupil, M.D., assistant professor of Lymphoma and Myeloma, who is researching new treatments for blood cancers. The Phase II study included treatment with a combination

therapy of obinutuzumab and lenalidomide for follicular lymphoma patients who haven't yet been treated for the disease. The four-year study, which aims to enroll 90 patients, had started just six months before Hale entered.

Obinutuzumab is an FDA-approved monoclonal antibody that binds to a protein on cancer-causing B lymphocytes or B cells, triggering an attack by the patient's immune system that kills the B cells. The FDA-approved immunotherapy agent lenalidomide causes cancer cell death and has been used successfully to treat inflammatory disorders and cancers such as multiple myeloma and myelodysplastic syndromes.

"I had a textbook response with very few side effects," says Hale, who lives in Waxahachie, about 30 miles south of Dallas. "Since then, I have had three PET scans and continue to be in remission. I'll soon cut back my visits to MD Anderson for infusions to every two months."

Kentucky patient with advanced AML gets back to fishing and his family

Given just weeks to live, he's now in remission after a combination therapy

By Ron Gilmore

Clemmie Cox, 74, was four years into retirement when he was confronted with a challenge he didn't see coming. The former maintenance worker at the Fruit of the Loom factory in Campbellsville, Kentucky, learned he had advanced acute myeloid leukemia, or AML, and likely had just weeks to live.

"My thoughts were, well, we were Christians and I was ready to go home and be with God if that was what the good Lord wanted," he says. "But my family asked me to fight, so I did."

Cox, who would rather have been putting in the garden or snagging brim in his favorite central Kentucky fishing spots, found himself 900 miles away at MD Anderson, where he was quickly enrolled in a clinical trial. Overseen by Naval Daver, M.D., associate professor of Leukemia, the trial combines the immunotherapy drug nivolumab with the standard chemotherapy drug azacytidine.

The septuagenarian had been having health issues — bruising and shortness of breath — but it wasn't until he was referred for a sleep test in January 2018 that Cox learned he was jerking his legs at night. Although he'd not yet been diagnosed with cancer, his physician recommended he go to a cancer center for a bone marrow test.

Doctors in Kentucky quickly referred Cox to MD Anderson where they knew he'd get the kind of therapy he needed.

Cox went to Baptist Health Cancer Center in Lexington, Kentucky, and he was diagnosed with advanced AML. Doctors there quickly referred him to MD Anderson, where they knew he'd get the kind of therapy he needed.

"I saw Dr. Daver and he told me I had just six to 12 weeks to live — it was that far along," says Cox. "My kidneys were already shutting down, and I had an infection, so he treated me before recommending I enroll in the clinical trial for nivolumab and azacytidine."



Photo: Nick de la Torre

A combination of immunotherapy and chemotherapy have sent Kentucky native Clemmie Cox's leukemia into remission.

Cox spent 52 days as an inpatient, and nearly three months total in Houston. During this time he learned he was in remission, something he never dreamed would happen.

"Dr. Daver said I was holding my own," he says. "I'll need to continue to come back for treatment, and I don't know if I'll ever be fully as healthy as I was, but I'm thankful for the treatment I received at MD Anderson."

Today, Cox enjoys yard work, noting that

he "takes care of the outside of the house" while his wife "takes care of the inside." He also fishes and spends time with his two children, both dentists, and his two grandchildren.

One thing the Blue Grass state native took away from his bout with cancer was how his attitude changed.

"When you first start treatment, you may despair," he says, "but the further you get, the more you want to fight your disease."



Meghan Meyer, a clinical research nurse in Leukemia, says the long-term relationships she builds with patients, like Karen Russell, who are enrolled in clinical trials are 'the best part of my job.'

Research nurses guarantee all goes according to plan

By Linda Gilchrist

Meghan Meyer is like most nurses — compassionate, hardworking and organized. But that's only the beginning of the many skills and attributes she uses in her job as a clinical research nurse in Leukemia.

"Most people don't know what a research nurse does," says Meyer. "It's a role that requires specific training and know-how." Put simply, research nurses ensure that clinical studies designed to test new cancer treatments run smoothly and that participating patients are safe and fully informed.

Meyer mainly works with clinical trials for myelodysplastic syndrome, or MDS — a rare group of disorders that occur when the body no longer makes enough healthy blood cells. About one-third of patients progress to acute myeloid leukemia, a rapidly growing cancer of the bone marrow cells.

Meyer's clinical trial team, headed by Guillermo Garcia-Manero, M.D., professor of Leukemia, is a tight-knit group that bonded from the get-go.

"We meet weekly to discuss the status of each patient," she says, "and we share information about how to best maintain quality of life for potential patients in these trials."

Every clinical trial follows a very specific plan called a

protocol. It's the duty of research nurses to manage the protocols' clinical and operational details. These include recruiting patients for trials, educating them about the details of the study and guiding them through the consent process, as well as following each patient's progress and coordinating their follow-up care after the study ends.

"My team is working on 19 active protocols, with another seven in the pipeline in various stages of development," Meyer says. "Organization is everything."

Interacting with patients is the best part of her job, adds Meyer, who joined MD Anderson two years ago after graduating from Florida Gulf Coast University and starting her career as a nurse.

"My role allows me to connect with patients for many months, or even years," she says. "The relationships we build are especially rewarding. When I took a position in research, I worried I'd miss being at the bedside, but I quickly realized a research nurse's role is centered around what I enjoy most about the profession."



From left, research assistant Natalie Miroballi and graduate student Farah Hasan examine T cells growing on a culture plate, while Junmei Wang, an instructor in Melanoma Medical Oncology Research, takes a closer look at T cells under the microscope.

Immunology student wants to improve the memories of cancer-fighting T cells

By Ina Fried

Farah Hasan is excited about the promise of her field of immunology research at MD Anderson Cancer Center.

“Immunotherapy is exciting because, unlike traditional drugs, the immune system can change, similar to the way that viruses, bacteria and cancer can change to avoid being killed by treatments, so immunotherapy is closer to fighting fire with fire,” she says.

Advanced Placement Biology in high school first captured Hasan’s interest in science. She went on to major in biology for her undergraduate degree and planned to go to medical school. Then her plans changed.

“I realized that I was more interested in learning about and understanding diseases than in diagnosing and treating them,” says Hasan, now a fourth-year student in the Immunology Ph.D. degree program at the MD Anderson UTHealth Graduate School of Biomedical Sciences.

“I took an introductory immunology class in college, and I took a course on vaccines that got me thinking about the

“The more you learn about it, the more you realize how incredibly complex the immune system is.”

— Farah Hasan, *Ph.D. program student*

practical applications of immunology,” she recounts. “The more you learn about it, the more you realize how incredibly complex the immune system is. Learning about the immune system and the interplay between it and pathogens, as well as cancer, enables scientists to develop strategies for leveraging the immune system in treating disease.”

After college Hasan worked in a vaccine and cell therapy laboratory on clinical trials of immunotherapies for cancer and HIV. She came to MD Anderson to further develop her expertise.

“One thing that struck me about MD Anderson is the



Miroballi and Hasan retrieve frozen T cell cultures from liquid nitrogen storage.

collaborative atmosphere and interest in innovation and openness to new ideas,” she says. “I was drawn to the graduate program here in part because the faculty are approachable and genuinely interested in students’ development.”

Upon meeting Cassian Yee, M.D., professor of Melanoma Medical Oncology and Immunology and now her research advisor, and others in his lab, Hasan was immediately comfortable and thought they would work well together.

“He has a good sense of humor but also wants his trainees to be their best. I appreciate that he treats me like a colleague in training — he takes my ideas seriously and gives me the autonomy and resources to pursue them while still helping me develop and refine them. Over time this support has helped build my confidence as an independent scientist and thinker,” she says.

The lab focuses on T cells, a type of white blood cell that plays a key role in the immune system. These cells can be used to make a treatment called Adoptive Cellular Therapy (ACT), which involves the isolation and growth of cancer-specific T cells that are infused into patients. These T cells can go to tumor sites, kill cancer cells and potentially provide a long-lasting protective response.

“This protection against recurrence relies on the creation of ‘memory’ T cells that remain in the body long-term, even after the cancer is eliminated,” Hasan says. “If these memory cells are successfully created, the patient could, theoretically, not have to receive continuous treatment. My research focuses on making a particular kind of memory T cell that stays in the tissues to act as a frontline defender.”



Postdoctoral fellow Zhenhuang Yang inspects T cells genetically engineered to attack tumors.

GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

427

Students

10

Master of science

59

Ph.D.

88

**Degrees awarded
in FY18**

11

**Specialized
Master of Science
(S.M.S.)**

8

M.D./Ph.D.

Photo: Adolfo Chavez III



“It was a blessing to be able to have access to this procedure. This therapy did its job and the doctors helped save our daughter’s life.”

—Lesley White, Kaylyn’s mother

Kaylyn White shares a hug with her mom, Lesley, at MD Anderson Children’s Cancer Hospital after receiving CAR T-cell therapy.

Re-engineering a young patient's cells to eliminate cancer

By Katrina Burton

Kaylyn White was an active and happy 12-year-old until bone and joint pain stopped her in her tracks. When she started losing weight and experiencing random nosebleeds, her mother knew something was wrong.

"We saw the energy drain out of her," says Lesley White. "She was in so much pain."

After several visits to local doctors, including referrals to a physical therapist and rheumatologist, a complete blood count test revealed Kaylyn had an extremely low level of white blood cells. She was rushed to the emergency room at MD Anderson Cancer Center and soon after was diagnosed with high-risk acute lymphoblastic leukemia (ALL). Kaylyn received her first dose of chemotherapy just days before Christmas in 2017. After four weeks of treatment, a bone marrow evaluation showed her leukemia was resistant to chemo. Doctors classified her disease as refractory (treatment resistant) B-cell ALL.

"We know this lack of response to chemo translates into a poor prognosis," says Sajad Khazal, M.B., Ch.B., assistant professor of Pediatrics.

Just months before Kaylyn's diagnosis, the Food and Drug Administration approved the groundbreaking cancer treatment known as chimeric antigen receptor (CAR) T-cell therapy. With this technology, a patient's disease-fighting T cells are extracted from the patient's blood, reprogrammed to recognize and attack cancerous B cells, multiplied in the lab, and then infused back into the patient. The treatment, named Kymriah, was hailed as a major advance in treating patients 25 years of age and younger who are diagnosed with refractory B-cell ALL.

While Kaylyn's cells were harvested — which typically takes four to six weeks — she remained in the hospital and continued chemotherapy so her cancer wouldn't spread. Just 30 days after being infused with her amped-up T cells, tests showed no evidence of disease. Her leukemia was in complete remission.

"It was a blessing to be able to have access to this procedure," Lesley White says. "This therapy did its job and the doctors helped save our daughter's life."

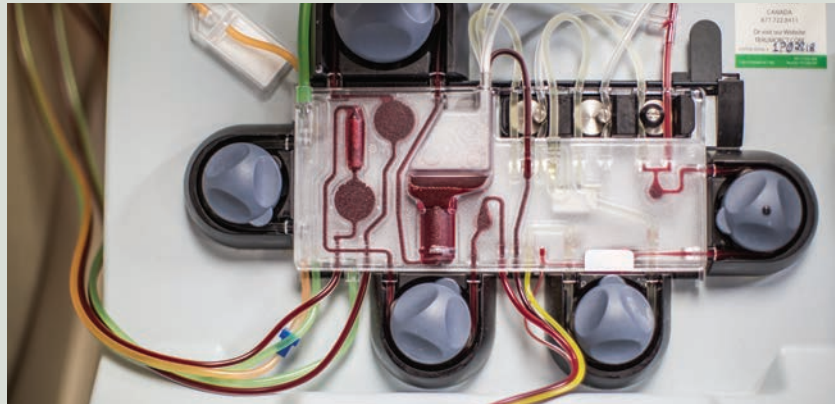


Photo: Nick de la Torre

CAR T-cell therapy begins with apheresis, a special kind of blood draw where certain blood components are removed and the remaining blood is returned to the patient. In this case, the patient's T cells are removed and then shipped to a lab.

Comprehensive guidelines for pediatric patients

Almost one year after the FDA approved CAR T-cell therapy for children with ALL, researchers from MD Anderson's CAR T-cell therapy-associated Toxicity (CARTOX) program and the Pediatric Acute Lung Injury and Sepsis Investigators Network (PALISI) published CAR T-cell therapy guidelines for pediatric patients.

The guidelines draw from lessons learned by experts from various fields, such as pediatric intensivists, pharmacy and neurology experts, and translational immunotherapy researchers, to identify early signs and symptoms of treatment-related toxicity, and detail ways to manage it in order to improve patients' outcomes and experiences.

"While CAR T-cell therapy has cured 90 percent of patients that standard therapy would not have saved, safe administration requires trained staff

across a variety of disciplines," Mahadeo says. "It's important that all providers from a variety of fields are trained to recognize toxicities to ensure prompt treatment to save lives. Most of the toxicities, if caught early, are treatable."

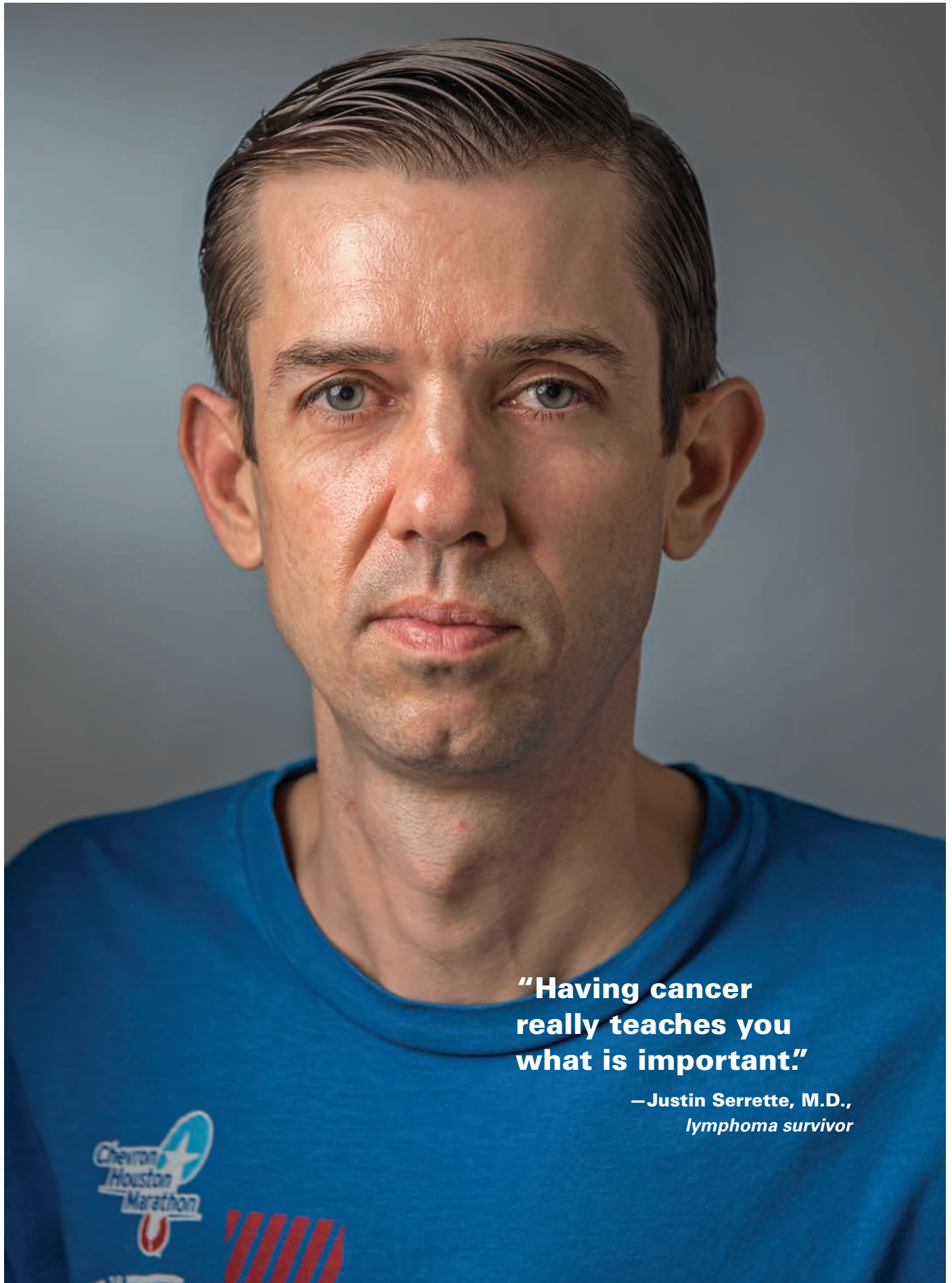
CAR T-cell therapy has resulted in some unique and severe toxicities that can affect the cardiac, respiratory and neurological systems. Medical vigilance by a diverse multi-disciplinary team, as well as the proper clinical infrastructure, are required to ensure the best outcome, Mahadeo says.

Though the guidelines were developed in response to FDA approval of CAR T-cell therapy for ALL pediatric patients, Mahadeo says they will positively impact future CAR T-cell therapies for other forms of cancer. He and his team also are exploring CAR T cells that target fungal and viral infections.

For patients like Kaylyn whose cancer does not respond to standard treatment, CAR T-cell therapy may be the last resort. MD Anderson Children's Cancer Hospital began offering the treatment in March 2018.

"In my opinion, this therapy is the most phenomenal thing to happen in leukemia since chemotherapy," says Kris Mahadeo, M.D., section chief and medical director of Pediatric Stem Cell/Cell Therapy.

Photo: Wyatt McSpadden



**“Having cancer
really teaches you
what is important.”**

**—Justin Serrette, M.D.,
lymphoma survivor**

When the healer needs healing

CAR T-cell therapy gives pediatrician-marathoner a new lease on life

By Ron Gilmore

Justin Serrette's life has changed dramatically since his boyhood days in Henderson, Louisiana, a small town on the edge of the Atchafalaya Swamp where locals fished for sac-au-lait and drove to Breaux Bridge each May for the Crawfish Festival.

Along the way, Serrette became a physician, got married and became a father, ran marathons and, in early 2017, was diagnosed at age 36 with low-grade follicular lymphoma by his primary-care physician.

Not long after, he came to MD Anderson where a second biopsy revealed he also had triple-hit diffuse large B-cell lymphoma, a particularly aggressive and often deadly form of non-Hodgkin lymphoma. Although he received standard chemotherapy, his cancer did not respond and he was placed on a waiting list for a CAR T-cell therapy clinical trial.

"My diagnosis essentially stole a year of my life," Serrette says. "The day I went in for my second biopsy, my life was put on pause for the next eight months. I started chemotherapy immediately and stopped working at my job at The University of Texas Medical Branch where I am a pediatrician."

Serrette and his family moved in with his mother-in-law

who helped with child care as he went through three rounds of treatment. At first, his tumor shrank. But then it quickly grew back in the third week following treatment.

"Within a few weeks of being told that chemotherapy was not working and that I most likely had about six months to live, I began the process of entering the CAR-T trial."

Serrette began CAR T-cell therapy treatment in August 2017 and experienced some severe but expected side effects such as fever, nausea and low blood pressure. He recovered quickly and went into remission where he remains today.

Although he had dropped in weight from 140 to 118 pounds, Serrette decided to run a marathon, a passion he had pursued for more than 10 years. In January 2018, he ran and finished the Chevron Houston Marathon, the same month he returned to work full time.

"The run itself was tough. After losing 25 pounds of mostly muscle, I was very weak," he says. "I ran five minutes at a time with a one-minute break throughout the race and finished with a time of 4:50:58. It was very slow for me, but I was just happy to get through it and finish it."

The physician, father and marathoner did not stop there.

“Even as a doctor, the logistics of navigating the medical system blew me away. Luckily, MD Anderson made it easy for us.”



After starting CAR T-cell therapy to treat his lymphoma, Justin Serrette, M.D., went into remission and decided to run a marathon.

In December 2018, he ran a marathon in Honolulu, the nation’s fourth largest. In January 2019, he again ran the Chevron Houston Marathon, finishing more than an hour faster than the previous year.

Serrette’s illness has changed his views as a physician, giving him a new perspective on how patients deal with major health problems.

“I try to make sure now that my patients truly understand what is ahead of them because it is easy for health care professionals to assume they understand the complexities of their situation,” he says. “Even as a doctor, the logistics of navigat-

ing the medical system blew me away. I cannot imagine how difficult it must be for someone who does not have a medical background. Between making appointments, finding your way around a medical center and dealing with insurance, there are so many opportunities to get confused and miss things. Luckily, MD Anderson made it easy for us.”

Serrette adds that his experience as a cancer patient opened his eyes about how he was using his time.

“I have cut back on some of my activities to spend more time with my family,” he says. “Having cancer really teaches you what is important.”



Photo: Nick de la Torre

Misha Hawkins consults with patient Robin Bartels, who traveled from his hometown of Munich, Germany, to receive CAR T-cell therapy.

Driven nurse helps start CAR T-cell trials

By Linda Gilchrist

Misha Hawkins holds the distinction of being the first cell-therapy coordinator in MD Anderson's Lymphoma and Myeloma department, where she works with patients who are enrolled in clinical trials that focus on CAR T-cell therapy.

This promising method of battling cancer takes immune cells — those cells that fight invaders like viruses, bacteria and cancer — from a patient's bloodstream, then reprograms them to recognize and attack a specific protein found in cancer cells. The souped-up immune cells are then reinfused into the patient's bloodstream where they attack and destroy tumor cells. The Food and Drug Administration approved the treatment in October 2017.

"I take care of patients from referral to 30 days after infusion," Hawkins says.

"As my department's first cell-therapy coordinator, I was tasked with getting the program up and running," Hawkins says.

This involved administrative duties such as creating the cost estimate for treatment, working with the hospital's legal department on patient consent forms and consulting with the pharmacy to ensure the proper drugs were on hand.

Hawkins also created an educational guide

The keys to CAR T

CAR T-cell therapy changes a patient's own T cells so they are able to recognize and attack cancer.

Step 1: A patient's T cells are removed and sent to a lab to be genetically engineered.

Step 2: In the lab, scientists modify the T cells so they produce a protein (called a receptor) that recognizes another protein (called an antigen) on the surface of cancer cells. This allows them to identify and attack the cancer.

Step 3: Modified T cells are multiplied by the hundreds of millions and infused back into the patient to fight the disease.

for patients and established a communications network that encompassed all the interdisciplinary teams that provide services to CAR T-cell patients at MD Anderson.

"Because I was the first person in this role, I established the structure and the day-to-day workflow for delivering this therapy when it was introduced at MD Anderson," Hawkins says. "It's continuing to evolve."

Hawkins first came to MD Anderson after graduating with a bachelor's degree in nursing from The University of Texas Medical Branch at Galveston. She worked as a charge nurse on the lymphoma floor, and today works with many of the same doctors she worked with then.

She's a "second-career" nurse. Her first job was with a law firm where she worked as a project coordinator and honed the organizational skills needed in her current position. Earning a master's degree in nursing administration from The University of Texas at Arlington helped further sharpen her skills.

MD Anderson's first CAR T-cell patient received an infusion from Sattva Neelapu, M.D., professor of Lymphoma and Myeloma, and continues to do well.

Hawkins stays in touch with the patient and his family.

"Family support is so important when you're dealing with cancer," she says. "It can make the road to recovery a little less bumpy."

Hawkins, who has 2- and 6-year-old sons, credits her late mother for instilling in her the motivation that has led to her success.

"She was very driven and very strong. I do have a lot of her ambition and passion," she says. "My mom died right when I found out I was pregnant with my first son. I see so much of her in him. My husband and I joke that he's been here before."

Connecting teens and young adults with support services specific to their needs

By Katrina Burton

Jacob Liang was a Rice University freshman who had just celebrated his 19th birthday and was preparing for final exams when he started experiencing extreme fatigue and night sweats.

When his symptoms worsened, Liang sought help from his doctor. A PET scan revealed the young man had stage 3 Hodgkin lymphoma.

Liang began treatment at MD Anderson in the spring of 2018, receiving multiple rounds of chemotherapy to combat the disease.

“It was tough going through treatment and keeping up with classes, especially the weeks when I was getting chemo,” says Liang, a biochemistry major. “My course load was heavy and required my full attention.”

Fighting hard to continue classes

Meanwhile, his mom, Pamela Liang, scrambled to gather paperwork needed so Rice could grant him temporary disability accommodations. Liang was able to stay in school and work through the summer to complete his freshman year, finishing with a 3.6 grade point average. But his cancer treatment eventually took its toll, making it difficult for him to concentrate.

Liang was concerned his chemotherapy would impact his ability to perform well academically. But he did not want to withdraw from the university because he would lose his scholarship.

Valuable support for young adults

While meeting with a social worker at MD Anderson, Liang was referred to the newly launched Adolescent and Young Adult (AYA) Oncology Program. The program was developed to support cancer patients ages 15 to 29 at any point during their cancer care, from diagnosis through treatment and on into survivorship.

More than 7,000 adolescents and young adults are treated at MD Anderson each year. The AYA program is designed to improve the patient experience, quality of life and long-term survival for this unique population.

“Adolescents and young adults have unique needs, and it is extremely important that we focus on how cancer and cancer treatment affect every aspect of their lives,” says Michael Roth, M.D., associate professor of Pediatrics and co-director of the AYA program. “A cancer diagnosis and treatment complicate things, impacting patients’ ability to succeed in school and in the workplace.”

Program helps with unique struggles

Through the AYA Program, patients like Liang have access to guidance and support services in the areas of genetics, oncofertility, psychosocial support and survivorship. They receive a comprehensive evaluation from a multidisciplinary team that includes a medical provider, social worker and vocational counselor.

With help from the program’s vocational counselor, Sandra Medina-George, Liang was able to receive advice on his best options to continue pursuing his degree while taking fewer classes, but still keep his scholarship.

“As a parent of a young adult cancer survivor, it was helpful to learn about the unique struggles they face, and how to



Rice University student Jacob Liang says the Adolescent and Young Adult Oncology Program helped him succeed in school while battling cancer.



Emily Harper, 29, received career counseling at MD Anderson after surviving cancer as a teen. She now works in the food industry.

better support them,” says Pam Liang. “As a pediatrician, I see parents of young adults with cancer or other special needs struggle to find adult specialists who are comfortable caring for their children. I’m glad that I can refer my patients to MD Anderson’s AYA program once their pediatric oncologists transition them.”

Helping patients find their happy place

More than 7,000 adolescents and young adults are treated at MD Anderson each year. Access to services through the AYA program are designed to improve the patient experience, quality of life and long-term survival for this unique population.

For 29-year-old cancer survivor Emily Harper, the AYA program is helping her change career paths. Fourteen years ago, Harper was diagnosed with a primitive neuroectodermal tumor — a rare tumor that typically develops in children and young adults under the age of 25.

After her treatment at MD Anderson, she went to college and pursued a career as a radiation therapist. For many years, she had a hard time finding information and support services specifically for adolescents and young adult cancer survivors. She also was diagnosed with depression during this time.

A change was necessary

Although she loved working in the health care field, the stress and hectic schedule were difficult to manage. Not long after its launch, Harper sought career counseling through the AYA program. Now she is happily pursuing a career in the food industry, a different but rewarding field.

“I am happy to know that through the AYA Program, other survivors will have an opportunity to talk with someone about

their struggles early in the process,” Harper says. “It’s also nice to see all the support services in one place, and to be around survivors who are similar in age.”

Finding a place to fit in

John Livingston, M.D., assistant professor of Pediatrics and co-director of the AYA program, has for many years worked with adolescents and young adults being treated at MD Anderson. He often has heard those patients say they don’t feel like they fit in with the younger pediatric patients or with the older adult patients.

“Most AYAs feel isolated in hospitals and clinics, so it was important for us to develop a space solely dedicated to this population,” Livingston says. “We are fortunate to offer a full range of services through the program, and we are planning to develop an AYA outpatient care center that will include its own high-tech waiting room, exam rooms and large group space specifically tailored to AYAs.”

High demand for AYA services

In the first three months of the program, more than 200 unique patients sought genetic counseling, education and career advice, options for preserving fertility after treatment, and psychosocial counseling to help with emotional distress, self-esteem, body image, health behaviors and other issues.

“We are excited to support this population diagnosed with cancer by providing age-appropriate psychosocial and supportive care services from professionals with AYA expertise,” Roth says. “We hope to develop a model for the optimal care for AYAs diagnosed with cancer by meeting all of their unique needs in a comprehensive clinical program.”

Less time spent recovering means **MORE TIME TO SPEND LIVING LIFE**

By Jill Russell, Ph.D.

“The recovery from my first surgery in Dallas was difficult,” recalls Bridgette Fleming, who underwent laparoscopic colon surgery in late March 2018 to treat her colon cancer.

“After the surgery, I was on hydrocodone around the clock for two weeks. My doctor told me it was important to gain weight, but the surgery messed up my taste buds, and nothing tasted good.”

Previous CT scans had shown uncharacterized spots in her liver, so Fleming traveled to Houston in April to get a second opinion.

“My doctors at MD Anderson discovered that the cancer had metastasized to my liver, and recommended chemotherapy.”

A much better recovery

In May, Fleming moved to Spring, just outside of Houston, to live with her aunt and uncle while undergoing treatment. Chemotherapy alone was not enough to treat the liver lesions, so Fleming underwent what is known as an open central hepatectomy this past October.

“This is a rare procedure because of the magnitude of the surgery,” says Ching-Wei D. Tzeng, M.D., Fleming’s surgeon, in describing the 6-hour operation that left her with an 11-inch incision on her abdomen.

This time, however, her postoperative experience was dramatically different.

“I was really worried about the recovery, but I was surprised that even after a major abdominal surgery, I only had to use the pain pump twice a day for a few days. I didn’t need any narcotic pills,” she says. “My hospital room had aromatherapy, and the lavender smell really helped me relax and fall back to sleep at night.

“When I left the hospital three days after the surgery, I was worried about getting to my second-floor bedroom at my aunt and uncle’s house, but I didn’t have any trouble navigating the stairs.”

The power of enhanced recovery

Fleming’s use of opioid pain medication, her hospital stay and her recovery time all



Photo: Wyatt McSpadden

Bridgette Fleming’s hospital stay and recovery time were minimized, thanks to the Enhanced Recovery Program.

were minimized thanks to MD Anderson’s Enhanced Recovery Program (ERP). The cancer center first implemented the ERP model in 2012, and now 19 teams incorporate the five principles of enhanced recovery: patient education and engagement, multimodal opioid-sparing analgesia, rational fluid therapy (ensuring patients receive the correct amount of intravenous fluids), risk-adjusted pathway

based postoperative care, and rapid rescue from postoperative complications.

The ERP motto is “back to self, back to family, back to life and back to work.” Two weeks after her surgery, Fleming was looking forward to enjoying the cool fall weather and walking around her neighborhood, which had been unthinkable two weeks after her colon surgery.

Care teams meet regularly to learn from each team member's experience and continually optimize and improve the program.

Collaboration is key to ERP's success

Vijaya Gottumukkala, M.D., professor of Anesthesia and Perioperative Medicine and ERP co-lead at MD Anderson, describes the program as “patient-centric, recovery-focused, outcome-based, efficiency-driven, multidisciplinary care in the acute care setting, where all clinicians work together as a team around the patient's needs.”

“Instead of each group working in silos, we work as a team to get the patient back on track as safely, efficiently and quickly as possible,” Gottumukkala says.

The care teams follow standardized ERP protocols that minimize variation in practice. For the success of the program, it's necessary that all team members agree to their roles in the protocol. Effective and timely communication is essential, so the care teams meet regularly to learn from each team member's experience and continually optimize and improve the program.

Expanding to UT System and beyond

MD Anderson's ERP model has been remarkably successful, allowing the Division of Surgery to lower the average length of stay from 7½ days to 4½ days — a major shift in surgery time frames.

“The ERP model, in my opinion, is the most important surgical intervention in the past 30 years,” says Thomas Aloia, M.D., associate professor of Surgical Oncology and ERP co-lead. “No other intervention has been implemented with this level of benefit, and without causing harm,” says Aloia, who also heads the Surgical Oncology department's Institute for Cancer Care Innovation, where the ERP program is housed.

Because of the success of the ERP, MD Anderson has received a \$835,000 quality grant from The University of Texas System to help implement ERP in colorectal surgery programs at multiple hospitals within the system.

“Every patient is in recovery of some kind,” says Aloia. “The goal is to expand the ERP model throughout the institution, to other UT System hospitals, to our cancer network partners and, ultimately, throughout the nation.”



Photo: Wyatt McSpadden

Surgeon Chin-Wei D. Tzeng, M.D., performed Fleming's open central hepatectomy in October 2018.

Meet some of the team members

THE SURGEON

Ching-Wei D. Tzeng, M.D.

Assistant professor, Surgical Oncology

The ERP emphasizes collaboration among all members of the health care team. The day before a surgery, the surgeon checks in with the anesthesiologist to determine what nerve block will be used during the procedure to numb the area of the body that will be operated on. This is crucial to avoiding use of narcotics after the operation, which can slow down the patient's gastrointestinal tract and prevent early intake of food and early ambulation — two important discharge criteria.

“In a traditional model of surgery, there is a lot of variation in practice, but ERPs provide clear protocols so that the entire health care team is on the same page,” Tzeng says. “Nurses and advanced practice providers know when patients can advance to solid foods and how to limit intravenous fluids.”

Similar patients are grouped together in the same unit so that the team is not spread out over the hospital. This physical proximity also helps promote communication.

“Ten years ago, this concept was called ‘fast-track,’ and the emphasis was on the cost-effectiveness and benefits for the hospital,” Tzeng says. “But at MD Anderson, the ERP model is about the benefits for the patients — for example, decreasing complications,

facilitating return to normal life and helping patients proceed with lifesaving cancer treatments. Because we care about patient-centered outcomes, the ERP model has to be the standard of care.”

THE ANESTHESIOLOGIST

Jose Soliz, M.D.

Associate professor, Anesthesiology and Perioperative Medicine

The ERP helps patients maintain excellent pain control while minimizing the use of opioid medications. MD Anderson's reduction of opioid use by 70 percent in some ERPs is truly remarkable. The ERP model emphasizes anesthesiologists' role as perioperative physicians who are involved in a patient's care before, during and after surgery.

“We tailor anesthetics to minimize symptom burdens, to reduce intraoperative opioid use and to increase functional recovery,” Soliz says. “For example, we use non-narcotic medications and nerve blocks, in addition to general anesthetics to reduce intraoperative and postoperative opioid use. This results in better pain control, fewer side effects and better recovery.”

For Soliz, one of the most important aspects of the ERP model is the ability to tailor treatments for each patient. For example, in the ERP for pancreatic surgery, patients are



The ERP model emphasizes the vital role anesthesiologists such as Jose Soliz, M.D., play in a patient's care before, during and after surgery.

stratified according to their risk of developing pancreatic fistulas after surgery. Patients at low risk move through the process faster than patients at high risk. Adapting the program for these patients in this way has reduced the median hospital stay from 10 days to six days.

THE NURSE

Luisa "Dee" Gallardo
*Executive director,
Quality, Safety and Research
for Nursing*

Within the ERP model, Gallardo says "nurses are at the sharpest end of patient care delivery, applying their clinical expertise to

all ERP patients through collaborative relationships.

"The ERP platform encourages patients to actively participate in activities that promote their well-being," explains Gallardo, who serves as the nursing division's executive leader for the program. "The ERP provides standardized algorithms designed to assist nurses as they work to progress patients along the road to recovery."

For example, a nurse could choose from multiple opioid-sparing strategies such as aromatherapy, breathing techniques, warm compresses or meditation to manage symptoms. The nurse teaches patients cop-

REDUCING HOSPITAL STAYS AND OPIOID USE

from 7.5 to 4.5 days

**Reduction in average length of stay
by the Division of Surgery**

up to 70%

**Reduction in opioid use
by some ERP teams**

ing techniques that can be applied during admission and post-discharge, ultimately contributing to reductions in hospital readmissions and lower complication rates.

"Being part of a collaborative team that returns patients to their preoperative functional state in a shortened time frame is both rewarding and energizing," Gallardo says.

THE DIETICIAN

Timothy Coleman
Dietician, Clinical Nutrition

The ERP also prioritizes early food intake and nutritional preparation for surgery and for healing. In the traditional recovery model, patients aren't allowed to eat anything after midnight the night before surgery, and aren't allowed to eat after surgery until bowel function returns. This means patients' bodies aren't properly fueled for healing.

In the ERP model, patients can eat solid food up to six hours before surgery and can have clear fluids up to two hours before surgery. The ERP model also encourages patients to eat solid foods as early as possible after surgery. Traditionally, dietitians are consulted only at the discretion of the surgeon — usually to address postoperative complications. With the ERP, the dietician meets with the patient before surgery and makes recommendations to improve the patient's nutritional status.

"We talk about carbohydrate loading, hydration, adequate protein intake and weight stability," Coleman says. "We normally see patients immediately after surgery and help them with symptoms. For example, if they have post-operative nausea, we might recommend against spicy or greasy foods; we recommend bland foods, small frequent meals and plenty of fluids. Another good strategy is serving cooked foods cold to help with nausea."

Coleman was involved in developing the protocols of MD Anderson's ERPs.

"Sometimes nutrition is pushed to the side in the face of acute issues, but the ERP model integrates all components as equally important. I definitely feel like a valued part of the team."



Paul Morris, M.D., chief of Surgery at The Queen's Medical Center, had rarely seen a tumor as large as the one that threatened Shinkyong Chang's life.

Cancer Network team shows spirit of aloha with surgical collaboration

By Michael Hardy

In early 2018, an X-ray revealed an apple-size tumor growing inside Shinkyong Chang's chest. The discovery of the growth, which was pressing up against several of the so-called great vessels carrying blood to and from Chang's heart, led to a diagnosis of thymic carcinoma — a rare type of cancer found on the outside of the thymus gland.

Paul Morris, M.D., the chief of Surgery at The Queen's Medical Center in Honolulu, had performed operations on patients with thymic carcinoma before, but rarely had he seen a tumor this large, and he wasn't sure if it was too late to operate on the 45-year-old Hawaii resident. So, he reached out to oncologists at MD Anderson for a consultation on the case.

Certified expertise

That ability to consult with MD Anderson experts is a valuable advantage for Morris and the doctors at Queen's Cancer Center and other certified members of MD Anderson

Cancer Network®. When the need arises, questions and case details can be shared with MD Anderson cancer experts who review the cases and provide guidance.

This is all done electronically through the MD Anderson Physicians Network® — a quality management and best practices organization that delivers cancer management services to Queen's and 16 other health systems and hospitals that benefit from certified-member status in the network.

"Any patient who comes to The Queen's Cancer Center and sees a certified physician can gain access to this peer-to-peer collaboration, which is basically a second opinion," says Morris, a former resident at MD Anderson.

Have skills, will travel

Within days, Morris received a call from MD Anderson thoracic surgeon Reza Mehran, M.D., who believed surgery might be possible after a round of chemotherapy. However,

Morris would first have to disconnect Chang's brachiocephalic vein, which drains blood from the brain, and likely perform a heart bypass.

"I said, 'Wow, I've never done that type of surgery,'" Morris recalls. "I was not knowledgeable on how to disconnect that vein and reroute it, so I told Dr. Mehran that I'd need to send Ms. Chang to Houston so he could perform the surgery there."

That trip to Houston wouldn't be necessary.

To save the patient from the trouble of traveling, Mehran offered to fly to Honolulu and perform the surgery himself. He still had the Hawaii medical license he earned 15 years ago, around the same time he obtained licenses in Texas, California and Florida.

"For some families it is difficult to come all the way here," explains Mehran, a professor of Thoracic and Cardiovascular Surgery. "Rather than bring Ms. Chang and her family here, and putting them through that financial burden, I decided I'd just go to them."



MD Anderson surgeon Reza Mehran, M.D., went to Honolulu to assist in Chang's surgery.

Clinical integration is key to success

Last October, Mehran, Morris and a team of doctors and nurses assembled in an operating room at Queen's for the 5-hour surgery to remove the tumor.

"It was very tense, very delicate," Morris says. "All the great vessels were in danger during the surgery."

At one point the team had to use a heart bypass machine to avoid fatal blood loss.

"With this kind of surgery, if something goes wrong, the patient can die on the table," Mehran says.

The surgeons safely cut out the cancerous tissue, leaving only a raisin-size bit of residual tumor on one of Chang's arteries, which can be controlled with radiation. Within a week, she was back home with her family, and her prognosis is excellent. Morris attributes the outcome to Mehran's willingness to fly to Hawaii for the surgery.

"If Ms. Chang had to travel to Houston, it would have been a new city, strange faces. It would have been a wonderful surgery, but it would have been difficult for her."

Peace of mind for patients

Morris also is thankful for the opportunities for collaboration that the cancer network makes possible.

"It really provides physician satisfaction knowing that we can call on the world experts and ask them about the best care for our patients," he says. "And patients love the fact that they got an opinion from the doctors in Houston."

For his part, the Canadian-born Mehran enjoyed the opportunity to take his medical expertise on the road, just as he once did as a medical officer in the Canadian Armed Forces.

"I'm an ex-military guy, and this reminded me of the medical missions I've done around the world. It was just an extremely rewarding experience."

Alliances expand reach, add diversity to clinical trials

By Michael Hardy

The Queen's Medical Center in Honolulu was founded in 1859 by Queen Emma and King Kamehameha IV, rulers of what was then the Kingdom of Hawai'i. Today, Queen's is the largest private hospital in the state, with a Level I trauma center and more than 500 acute-care beds.

Its comprehensive cancer care program, known as The Queen's Cancer Center, treats more than 2,500 new patients every year, the most of any hospital in the Pacific Rim. That level of expertise and long history of clinical excellence in cancer care, combined with the hospital system's geographic area, made Queen's a great fit as a certified member of the MD Anderson Cancer Network.

A certified member since 2015, Queen's benefits from MD Anderson's unrivaled expertise by following the institution's renowned treatment guidelines and multidisciplinary approach. It's one of 17 health systems and hospitals in 15 states that share a certified-level relationship with MD Anderson in the cancer network, which was created to help advance the mission of eliminating cancer beyond Houston to communities across Texas, the nation and around the globe.

And the mutual benefits of the unique relationship extend beyond the clinic. Cancer patients arrive at Queen's from every corner of the Pacific Rim, making it an invaluable resource for clinical trial collaborations with MD Anderson researchers.

In the past year, Queen's has partnered with MD Anderson in launching four clinical trials

The mutual benefits of the unique relationship extend beyond the clinic. Cancer patients arrive at Queen's from every corner of the Pacific Rim, making it an invaluable resource for clinical trial collaborations with MD Anderson researchers.

that focus on multiple cancer types, including breast and ovarian cancer. The diversity of the patient population that Queen's serves results in studies that are more comprehensive.

"Queen's represents an important part of our portfolio, because of their patient profile," explains Robert Coleman, M.D., professor of Gynecologic Oncology and Reproductive Medicine and the executive director of Research for the cancer network. "They serve a lot of Pacific Islanders, which we really don't treat often at MD Anderson."

Coleman and other leaders oversee the network's research team, which is responsible for protocol review, integration and strategic management of all clinical research for network members. MD Anderson's collaboration with Queen's offers a glimpse of the kind of research partnerships that are possible through the cancer network.

THE MD ANDERSON CANCER NETWORK BY THE NUMBERS



*Current as of Feb. 8, 2019

Photo: Nick de la Torre



Breast cancer patient Shannon Schroeder, left, visits with nurse practitioner Jenni Hess at MD Anderson League City.

Building on a commitment to bring the best cancer care to more people

By Jill Russell, Ph.D.

“At the end of May 2018, I was diagnosed with HER2+ breast cancer,” recalls Shannon Schroeder. “My doctor referred me to MD Anderson.”

However, when she called MD Anderson in the Texas Medical Center to make an appointment, she learned the first available opening was a month away.

“I have three small kids. I couldn’t wait a month to begin treatment.”

Schroeder didn’t have to wait. She was able to schedule an appointment for five days later at MD Anderson League City, one of the cancer center’s many locations throughout the Greater Houston Area.

After her care team ran tests to determine the best treatment course, Schroeder began six months of chemotherapy to shrink the tumors in her left breast and in her lymph nodes. Thanksgiving 2018 marked the completion of step one in her treatment plan.

“I’m thankful that I never felt nauseated. My kids never saw me get really ill, just tired and sleeping a lot,” Schroeder says.

Step two was surgery this January, followed by six to 12 weeks of radiation treatment. An upcoming reconstruction surgery will complete the process.



Photo: F. Carter Smith

Treatment rooms are designed for comfort and feature large windows with natural lighting.



Photo: Adolfo Chavez III

A linear accelerator at MD Anderson League City zaps tumors with high-energy beams of cancer-killing radiation while sparing nearby healthy cells.

Located in a new four-story, 200,000-square-foot facility, MD Anderson League City is home to a first-of-its-kind clinical collaboration with The University of Texas Medical Branch (UTMB Health). The partnership between the two UT health organizations provides more convenient local access to specialized, multidisciplinary cancer diagnostics and care, as well as routine checkups, cancer screenings and survivor follow-ups for residents in and around the growing region.

For Schroeder, that convenience stretches to the East Texas town of Kountze, where she lives.

“Even though League City is about the same distance from me as the Texas Medical Center, it is so much easier to go to League City,” she says. “There’s much less traffic, and I don’t have to deal with finding and paying for parking in Houston.”

Those factors and her care team’s dedication to her care and quality of life helped make it possible for Schroeder to continue working throughout her chemotherapy. For example, she says her nurse navigator, Diana Vasquez, was instrumental in helping schedule appointments so that no time was wasted during her visits.

“I feel like my doctors and nurses are family,” Schroeder says. “I can talk to them about anything, and I know that they’ll listen to what I have to say. My nurses even come to find me during my five-hour chemotherapy sessions to chat and help me pass the time.”

Schroeder adds that the design of the new facility itself helps amplify the staff’s positivity. Floor-to-ceiling windows allow natural light to fill the lobby, and the employees seem to carry that sunshine throughout the building, she says.

“Cancer treatment can be so stressful, so we try to make it easier by making it local and surrounding patients with familiar faces,” says Jenni Hess, Schroeder’s nurse practitioner.

“Shannon and I have normal conversations beyond diagnoses and treatments. We talk about her kids, family, and job, and I think this helps her know that I see her as an individual, not as a patient number or statistic.”

Houston-area locations expand

MD Anderson services are offered around the Houston area, from a surgical clinic in Memorial City to breast imaging and diagnostic services at selected Memorial Hermann locations.

Four locations — League City, Katy, The Woodlands and Sugar Land — offer the institution’s renowned multidisciplinary care as well as a range of supportive services and access to clinical trials. Currently, about 15 percent of new patients start their care at one of these locations.

To meet the growing demand for comprehensive, conveniently located care, MD Anderson is expanding the size of its facilities and the services provided at these four areas.

The first permanent facility formally opened this past fall in League City. It’s five times the size of the Bay Area location it replaced and features expanded services, including medical oncology, radiation oncology, surgical oncology, diagnostic pathology and labs, pharmacy, infusion therapy, multidisciplinary clinics, pain management, nutrition and social work. New services at the League City location include a full complement of radiology services such as mammography, CT, combined PET/CT, MRI and other technologies.

A new, greatly expanded West Houston facility will replace the Katy location this year. Replacements for The Woodlands and Sugar Land locations are in the works..

Photos: Nick de la Torre



Volunteer Sandra Mitro is a native of Colombia who helps Spanish-speaking patients during their hospitalization.

'I know what it takes, and I want to do more'

Volunteer also is a caregiver to husband with multiple myeloma

By Ina Fried

What started with her husband's diagnosis of multiple myeloma — a kind of blood cancer — has turned into 260 hours of volunteering at MD Anderson Cancer Center by Sandra Mitro.

When her husband Fred was diagnosed in 2016, Mitro had been laid off from her job during a downturn in the oil and gas industry in Houston. Over the following nine months, with frequent trips to MD Anderson for Fred's chemotherapy treatments and checkups, the couple decided to delay Mitro's return to work, allowing her to assume the role of primary caregiver.

"But I started finding myself with some spare time, and Fred, thank God, was not having strong side effects from his treatment," Mitro remembers.

She applied online as a volunteer, passed the background check, completed the volunteer onboarding process and was assigned to the Sarcoma Clinic. Working there one morning a week, four hours at a time, she greets people, brings them coffee or warm blankets and visits with them. If the patients have been waiting for a while, she checks on the clinic's progress and reports how much longer they should expect to wait.

By summer 2017, Fred's chemo was completed, and he qualified for the next step in his treatment plan. The protocol called for a stem cell transplant to replace unhealthy blood cells with healthy ones and to help restore his immune system.

"Prior to beginning the stem cell transplant, they tell you as a caregiver that you need to prepare yourself to be in the hospital with your family member between three and seven weeks," Mitro says. "We had eight very bad days out of a total of 21, but then, like rebooting a computer, everything started working again."

During the stem cell transplant, Mitro took a break from her volunteer work. Afterward, she went back to the volunteer supervisor and said, "Give me something else where I can be in contact with caregivers. I know what it takes, and I want to do more."

A native of Colombia, Mitro is bilingual and was assigned to international patients whose primary language is Spanish. Now, in addition to her work in the Sarcoma Clinic, she visits international patients and their caregivers in the patients' rooms. When she introduces herself as a caregiver, they have many questions about the patient experience and navigating within the hospital and in Houston.

"This is a win-win," she says.

Mitro is grateful that her husband is currently in partial



Sandra Mitro is thankful for her husband Fred's partial remission from multiple myeloma.

VOLUNTEERS MAKE AN IMPACT

1,099

Onsite trained volunteers

2,034

Offsite myCancerConnection
trained survivor volunteers

117,993

Volunteer hours in FY2018

remission, generally doing well, and that they live in Houston near MD Anderson, unlike the international patients who are far from home.


"It makes me so happy to share with our patients," she says. "Every time I volunteer, I leave the hospital with a full and happy heart."

Answering the toughest questions

At MD Anderson, scientists and oncology experts pursue answers that allow them to better understand the nature of cancer and improve treatments through basic, clinical, translational and prevention research. And these investigations aren't confined to the laboratory. Discoveries made by the institution's clinical trials program — one of the largest of its kind in the world — are leading to breakthroughs for patients like Lauryn Criswell. Through forward-thinking efforts, the cancer center also is working to reduce and ultimately eliminate disparities that lead to greater incidence of cancer and cancer deaths among many socially and economically disadvantaged populations.



ALL MELANOMA LYMPHOMA RETINOBLASTOMA LEUKEMIA BRAIN NEUROBLASTOMA GLIOMAS CML OSTEOSARCOMA DIPG MEDULLOBLASTOMA SARCOMA WILMS TUMOR

get cancer too 

LAURYN CRISWELL'S energy skyrocketed when she joined the Children's Cancer Hospital's ProFit Program. Read more on page 50.

Photo: Wyatt McSpadden



**“When they took
the tumor out ...
it was all dead cells.
The tumor had all
been killed.”**

**—Lori Shults,
*triple-negative breast cancer survivor***

An if-then approach tailors therapy for triple-negative breast cancer

By Clayton Boldt, Ph.D.

Growing up, Lori Shults had no idea she shared a hometown with the man whose work would one day save her life.

Shults was born in Alice, Texas — the same small town where Nobel Prize-winning immunologist Jim Allison, Ph.D., grew up. Allison, MD Anderson's chair of Immunology, pioneered checkpoint blockade immunotherapy, which frees the immune system to attack cancer. His research led to the 2018 Nobel Prize in Physiology or Medicine.

Without immunotherapy, it's possible Shults wouldn't be alive today.

A scary diagnosis

In April 2017, a then-38-year-old Shults noticed a lump in her breast, which she had checked out by her gynecologist. Without much concern, her doctor recommended a mammogram.

"I could tell from the mammography tech's demeanor that things weren't good," Shults says. "When they sent the radiologist in to talk to me, I thought, 'Uh oh.'"

After a biopsy, doctors confirmed Lori had stage II triple-negative breast cancer, an aggressive form of the disease that doesn't rely on the hormones estrogen and progesterone or the protein HER2, which fuel the growth of most breast cancers.

"Triple-negative sounds horrible. The name itself. So it's pretty scary to hear those words," says Shults, a teacher in the Central Texas town of Geronimo.

Moon Shot momentum

Unsatisfied with her local oncologist's treatment plans, she went to MD Anderson and met with Stacy Moulder, M.D., professor of Breast Medical Oncology and co-lead of MD Anderson's Breast Cancer Moon Shot™.

"After I talked with Dr. Moulder, I felt a lot better," Shults says. "She explained what triple-negative meant — that it was not responsive to those hormones. It made me feel more relieved to understand what the disease involved."

Moulder also explained that triple-negative is not a single disease, but rather a catch-all term for any breast cancers missing those receptors.

The Breast Cancer Moon Shot is part of MD Anderson's Moon Shots Program™, a collaborative effort to accelerate the pace at which scientific discoveries are translated into clinical advances that save patient's lives.

Through the Moon Shot™, MD Anderson clinicians and researchers are working together to discover more effective treatment strategies, guided by each patient's tumor, that lead to cures for more patients.

Standard care for early-stage, triple-negative breast cancer is a pre-surgical chemotherapy combination of doxorubicin and cyclophosphamide, known as AC. In 35 to 40 percent of patients, this results in a complete response.

Treatment guided by each patient's disease

"Unfortunately, over half of patients will not respond to chemotherapy," Moulder says. "We want to understand why



Lori Shults is cancer free after participating in a clinical trial combining chemotherapy with an immune checkpoint inhibitor.

some tumors are sensitive to chemotherapy, and we need to identify effective targeted therapies for the rest of our patients.”

To do that, Moulder leads an innovative Moon Shot trial called ARTEMIS.

When enrolling in ARTEMIS, patients undergo a biopsy and begin standard chemotherapy. While they’re being treated, the Moon Shot team works with the Cancer Genomics Laboratory and APOLLO, both Moon Shots platforms, to perform detailed analyses of the tumors.

If ultrasound imaging shows a tumor has responded, the patient continues with chemotherapy until surgery. Then, researchers are able to study the tumor and learn why it responded.

If chemotherapy doesn’t seem to work, the patient is offered the opportunity to participate in one of several other trials linked to ARTEMIS, based on their tumor’s unique characteristics.

Saving patients from unnecessary treatment

“With ARTEMIS, our patients don’t have to wait for molecular profiling results to start treatment,” Moulder says. “We can start their therapy, and by the time we need to make a decision about next steps, we have the information we need. And patients that respond aren’t subjected to any unnecessary targeted therapies.”

When offered the chance to participate in the trial, Shults didn’t hesitate.

“The way it was explained, it sounded like you couldn’t

go wrong,” she says. “That made me feel much more relieved, that I would get the standard of care. And if that didn’t work, the treatment would be something more targeted to my needs.”

She proceeded under the care of David Ramirez, M.D., assistant professor of Breast Medical Oncology. Unfortunately, after four cycles of chemotherapy, Lori’s tumor hadn’t responded.

Responding to immunotherapy

However, the analysis of her tumor suggested she might benefit from immunotherapy. She took the opportunity to participate in a trial combining chemotherapy with an immune checkpoint inhibitor against PD-L1, a protein on some cancer cells that helps them hide from immune attack.

She began her immunotherapy treatment in August of 2017. By December, things had improved dramatically.

“When they took the tumor out with my mastectomy, it was all dead cells. The tumor had all been killed,” says Lori.

She had a complete response from immunotherapy, thanks to the personalized care offered by the Breast Cancer Moon Shot.

“To know that MD Anderson was doing everything they could to find a cure, or a treatment that would be successful, really meant a lot to me,” Shults says. “It made me feel a lot better, it comforted me when I was pretty worried in the beginning.”

Today, Lori remains cancer free and is thankful for the hometown hero that made her treatment possible.

A daily pill could replace chemo for some breast cancer patients

PARP inhibitors continue to show promise for those with early-stage disease and BRCA mutations

By Anissa Anderson Orr

AT the time of her diagnosis with triple-negative breast cancer in March 2017, Vicky Lawrence was living a full life in her hometown of Columbia, Mississippi, dividing her time among teaching high school, singing in her church choir and enjoying her grandchildren.

Her five children urged her to take a break and seek treatment at MD Anderson instead of locally. Lawrence agreed, though she admits to having doubts about venturing far from home.

“I said, ‘Oh, that doesn’t even make sense for me to travel all that way, to go that far. And besides, the time involved and having someone to travel with me . . .’ And my kids, they said, ‘Mama, we’ll make sure it happens.’”

At MD Anderson, Lawrence qualified for a clinical trial led by Jennifer Litton, M.D., associate professor of Breast Medical Oncology. The trial allowed Lawrence, who’d tested positive for the BRCA genetic mutation that’s linked to breast cancer, to take the PARP inhibitor talazoparib daily as a first-line treatment. The front-line therapy for many BRCA-related cancers is chemotherapy followed by surgery.

PARP inhibitors work by blocking a protein known as PARP that fixes damaged DNA inside cells. Blocking PARP’s repair action may help prevent cancer cells from repairing their damaged DNA, causing them to die.

Talazoparib had produced remarkable results in a small pilot study previously conducted by Litton for patients with early-stage breast cancer and BRCA 1 and 2 mutations. The drug shrank tumors in all 13 patients enrolled in the pilot study, anywhere from 30 to 98 percent, with a median reduction of 88 percent. Some tumors disappeared completely.

Based on the results, Litton expanded the study, and Lawrence enrolled in the extension. For six months, she took talazoparib once daily, followed by ultrasounds every two months to check on the status of the tumor in her left breast.

“Every time, my tumor had reduced significantly. That was very encouraging to see,” she says. “At the end, when I had my double mastectomy, the report was that there were zero cancer cells left in my breast tissue.”

Throughout her treatment, Lawrence says she felt few side effects, and she was able to continue life at a normal pace.

“The treatments didn’t prevent me from working. Instead, I went on with my everyday life. I sang in the choir, went to Daughters of the American Revolution chapter meetings and played with my grandbabies,” she says. “It just didn’t slow me down.”

Litton shared the results of the extension trial at the 2018



Photo: Nick de la Torre

Jennifer Litton, M.D., associate professor of Breast Medical Oncology, leads the PARP inhibitor study.

More than half of the women in the study who took the drug once a day prior to surgery had no evidence of disease at the time of surgery.

American Society of Clinical Oncology Annual Meeting last June. The study found that more than half of the 20 women in the study who took the drug once daily prior to surgery had no evidence of disease at the time of surgery.

“It was the first trial of its kind showing that a single, targeted therapy was able to eradicate the tumor in the breast by the time of surgery,” Litton says.

Based on the trial’s success, a larger, Phase II, single-arm trial of talazoparib with a similar design is now open and recruiting patients. Litton is the principal investigator.

PARP inhibitors also have shown promise as a treatment for metastatic cancer. Litton’s recently concluded EMBRACA study found that talazoparib extended progression-free survival and improved quality-of-life measures over chemotherapy for patients with metastatic breast cancer and BRCA mutations. The trial paved the way for the Food and Drug Administration’s approval of the drug for metastatic cancer in October.

“If we can better identify a group of people who benefit from this medication and avoid chemotherapy when it’s not necessary and get the same outcomes, that would certainly be helpful for the patient,” Litton says.

The chances of getting or surviving cancer shouldn't depend on where a person lives

By Claudia Feldman

A middle-aged woman feels persistent pain in her lower abdomen and knows it could be a sign of ovarian cancer. But she lives in rural Texas — hours from the nearest cancer center.

A middle-aged man, a city dweller, knows about barriers to medical care. He has all the symptoms of prostate cancer, but every doctor he has called delivers the same message. No health insurance, no treatment.

An older Asian woman faces a different roadblock. She hesitates to mention her breast lump to friends or even her husband. At her age, in her culture, cancer is an embarrassment and a shame.

Lorna McNeill, Ph.D., chair of Health Disparities Research at MD Anderson Cancer Center, hears similar stories every day. Eliminating inequities in cancer treatment — be they triggered by race, poverty, geography, gender, sexual orientation or cultural training — is the monster goal of her department.

“I’m not talking about factors that are inherently genetic, but differences in the social fabric of our lives,” McNeill says. “It’s our job to study the causes of these disparities, then try to do something about them. We want everyone to have the same low chances of getting cancer and the same good outcomes.”

From her office in Pickens Academic Tower, McNeill ticks off just a few of her department’s projects, present and future:

To reduce cancer risks in Houston’s Hispanic community, Larkin Strong, Ph.D., assistant professor of Health Disparities Research, is promoting physical activity and healthy eating as a path to weight loss.

“Obesity contributes to a lot of different cancers,” McNeill explains. “As we make great strides in lowering mortality rates, obesity is increasing and blunting that progress.”

McNeill also points to a correlation between poverty and obesity.

“The more money people have, the more likely they are to be normal weights.”

For the Asian women feeling isolated and ashamed by breast cancer, Qian Lu, M.D., Ph.D., associate professor of Health Disparities Research, helps them work through their traumatic experiences with a writing project



Photo: Adolfo Chavez III

Lorna McNeill, Ph.D., chair of Health Disparities Research, wants to eliminate inequities in cancer treatment.

similar to journaling. One woman wrote in her prompted essay, “I don’t want to occupy too much of my mother’s time to make her worry. My husband takes care of me every day ... how can I tell him how bad I feel to burden him and make him sad?” But by the end of the exercise, the woman clearly felt better. She concluded, “Thank you, Dr. Lu, for providing me this writing experience to make me feel warm and supported. You are the only person I can share my feelings with.”

A new addition to the health disparities team, Surendranath Shastri, M.D., M.B.B.S., Dr.PH., hopes to help low-income women self-test for human papillomavirus, or HPV, which can lead to cervical cancer. In the U.S., women with health insurance get pap smears, McNeill says. For those in developing countries without such resources, Shastri suggests a much cheaper diagnostic test that involves a visual inspection of the cervix after the application of contrast chemicals such as vinegar or iodine. At a cost of just 30 cents each, these inexpensive tests highlight precancerous lesions if they exist.

Other projects of deep interest to McNeill

include a win-win research collaboration with the University of Houston that’s aimed at reducing cancer rates and increasing survivorship within traditionally underserved populations. The project, called UHAND, pairs UH students and junior faculty with mentors from MD Anderson, UH and community organizations to provide them with hands-on research experience.

McNeill’s department also is working to ensure that a proportionate number of minorities participate in clinical trials, which often offer the best hope in cancer treatment. For a variety of reasons, however, African-Americans, Hispanics, Asians and women are poorly represented.

The department still has much work to do, McNeill says. But she is inspired daily by her Jamaican grandmother, who died of breast cancer at 52 and left behind a husband and nine children.

“She was very poor, and at that time and place, if you got cancer, you died of cancer,” McNeill says. “I just wish she could see me now.”



Camille Atkins understands the importance of advocating for her own health and the health of others, says Shaun Caldwell, director of the program in Health Care Disparities, Diversity and Advocacy, where Atkins is pursuing a bachelor's degree.

Program promotes **EQUALITY AND JUSTICE** for all patients

By Claudia Feldman

Camille Atkins was working diligently in her community college science class when her teacher threatened to cut all her lab grades by 50 percent.

The problem?

Atkins has cerebral palsy and limited use of her limbs. She'd been doing the lab work by giving an assistant step-by-step instructions.

"You're not going anywhere," the teacher told Atkins, who uses a battery-powered wheelchair. "You don't stand a chance in these physically challenging sciences."

Atkins, now 26, makes a point of remembering that incident and other cruel and foolish things people have said to her over the years.

"My arms and legs don't work like everybody else's, but I have my mind," Atkins says. "And my voice."

She uses both to best advantage while working toward a Bachelor of Science degree in Health Care Disparities, Diversity and Advocacy. Located in MD Anderson's School of Health Professions, the program provides students with the knowledge and skills needed

to advocate for patients from diverse backgrounds and cultures.

Program director Shaun Caldwell describes Atkins as a star.

"Camille understands not only the importance of advocating for her own health, but how to also help others. She's a fighter; she will fight for her patients. And she has such an empathetic heart."

Atkins was born 26 years ago on the outskirts of Houston. She was a beautiful baby, blonde with blue eyes, and an early talker, her mother, Julie Atkins, remembers.

"But she couldn't meet physical goals and milestones. She couldn't crawl or sit up on her own."

The little girl attended public school, made friends easily and earned top grades. But there were more than a few frustrations. Occasionally, teachers told her to try harder to walk, not realizing she'd done her best and was exhausted. There were the occasional aides who failed to take her to the restroom on time. One year the school staff suggested she stay home the last week of school — the week with all the

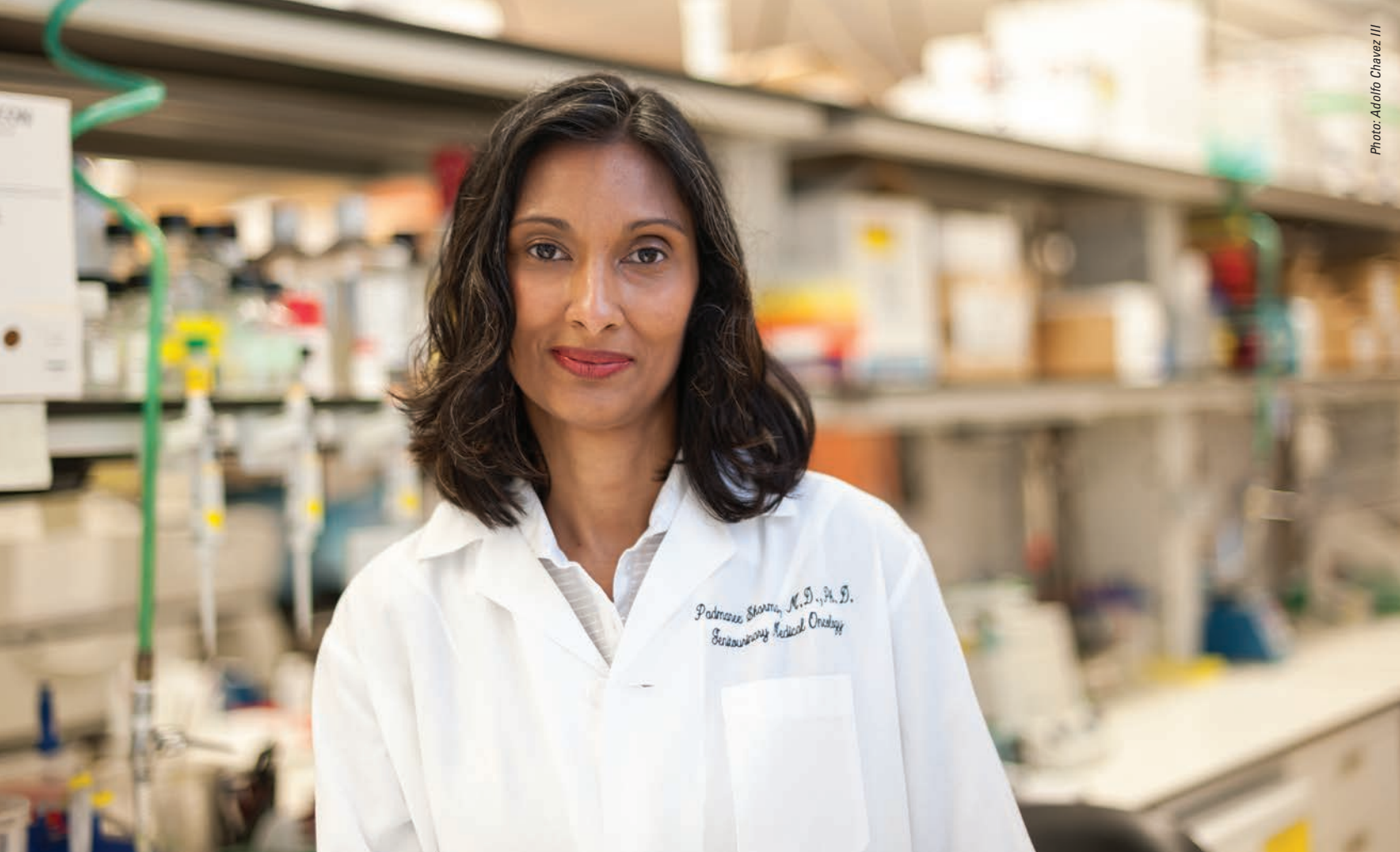
parties — because they didn't think they had time for her. When Atkins was in sixth grade and old enough to vent, her principal told her she was a "disappointment."

Those types of challenges continue today. Atkins tries to deal with each crisis as it comes and move on. She knows that each lesson learned will be helpful when she graduates and starts working as a patient advocate, who helps patients' voices be heard.

"When life throws you a wheelchair, make lemonade," Atkins says. "I do get angry when someone discriminates against me, but at the end of the day, it makes me a better professional. My goal is to promote equality and justice for all."

Atkins, a part-time student, hopes to graduate and find a job in two years. Also, she's planning a wedding — she and Daniel Maya, who also has cerebral palsy — are getting married next June. They're looking forward to a church ceremony, a big party and, eventually, children.

"I've had people tell me we're crazy," Atkins says. "But hey, life is challenging. I say, bring it."



The work of Padmanee Sharma, M.D., Ph.D., professor of Genitourinary Medical Oncology, focuses on using the immune system to fight cancer.

Immunotherapy research leader receives the Rogers Award

Padmanee Sharma, M.D., Ph.D., was named the 2018 recipient of the Julie and Ben Rogers Award for Excellence in Research at MD Anderson Cancer Center.

The annual award, which recognizes those who consistently demonstrate excellence in their work and dedication to MD Anderson's mission to end cancer, rotates annually among the areas of patient care, research, education, prevention and administration.

Since joining MD Anderson in 2004, Sharma has dedicated herself to finding a cure for cancer through clinical trials and laboratory research. Her research includes identifying and characterizing immune-stimulating molecules and checkpoints as well as understanding response and resistance to treatment.

Drawing on her training as a clinician-scientist and an immunologist, the professor of

Genitourinary Medical Oncology, who also has an adjunct appointment as professor in Immunology, oversaw the creation of the immunotherapy platform of the Moon Shots Program™ in 2012. The platform, which is led by Sharma, Jim Allison, Ph.D., and Patrick Hwu, M.D., provides support for more than 100 immunotherapy clinical trials of drugs that unleash an immune system attack on a variety of cancer types.

For Sharma, the key to understanding the dynamics between immune response, tumors and their surrounding environment has been in-depth analysis of patients' tumors before and after treatment with immune checkpoint

therapy, an approach she pioneered in two clinical trials that is now a key element of the immunotherapy platform.

Those trials — in bladder and prostate cancer — established the vital role of the immune-stimulating ICOS molecular pathway promoting tumor destruction in one type of checkpoint therapy. These findings opened ICOS stimulation as a new potential target for immunotherapy, and clinical trials are underway.

Another platform project led Sharma and colleagues to successfully propose a checkpoint blockade combination clinical trial for prostate cancer — a disease that has so far resisted immunotherapy.

As a result of the platform's success, the Parker Institute for Cancer Immunotherapy at MD Anderson was established in 2016 with an initial commitment of \$35 million from the Parker Foundation to advance the field

of cancer immunotherapy and develop novel therapies. Sharma and the Nobel Prize-winning Allison have collaborated on combination immunotherapy research for the treatment of several cancers.

“Dr. Sharma is an exceptional physician-scientist whose work successfully bridges the gap between clinical oncology and tumor immunology,” says associate vice president of Women and Minority Faculty Inclusion Elizabeth Travis, Ph.D., who nominated Sharma for the award. “Dr. Sharma’s research will continue to be instrumental in expanding our knowledge base to develop novel immunotherapy strategies for treating cancer patients.”

Sharma has been recognized by the Cancer Research Institute (CRI) for her innovative work in understanding factors that enhance and hinder cancer immunotherapy. She received the William B. Coley Award for Distinguished Research in Tumor Immunology at an annual meeting co-sponsored by CRI in September 2018.

Sharma was one of five Rogers Award finalists chosen from 40 nominees. The other finalists for the award were:



Simona Colla, Ph.D.

Associate professor, Leukemia

Research focus: Colla’s lab is interested in understanding the molecular mechanisms which underpin multiple myeloma and myelodysplastic syndromes (MDS).

Colla also is involved in the AML/MDS Moon Shot™, which aims to understand why patients with myelodysplastic syndromes fail to respond to standard therapies known as hypomethylating agents.

An analysis of more than 250 samples from patients with MDS, taken at different stages of disease, revealed HMAs eliminated the mature cancer cells but left stem cells alive, leading to relapse.

Colla’s group has made progress in finding drugs that may be able to target the stem cell populations, and they continue their work to advance these therapies to the clinic.



Vanessa Jensen, D.V.M.

*Chair ad interim,
Veterinary Medicine and Surgery*

Research focus: Jensen provides expert consultation and collaboration for animal model selection, experimental design and specialty area use. She created the gnotobiotic housing area for investigators to promote the conduct of microbiome studies, as well as a patient-derived xenograft suite as part of an NCI repository initiative.

As interim chair of the Department of Veterinary Medicine and Surgery (DVMS) and director of MD Anderson’s Cancer Center Support Grant’s (CCSG) largest core resource, the Research Animal Support Facility (RASf), Jensen is responsible for the overall operations of DVMS and RASf with a staff of 11 faculty veterinarians, 148 husbandry, health care, pathology laboratory, materials management, and administrative staff. The DVMS and RASf activities directed by Jensen support the research activities of more than 300 principal investigators.



Sattva Neelapu, M.D.

Professor, Lymphoma and Myeloma

Research focus: Neelapu’s research involving the CD19-targeting chimeric antigen receptor (CAR) T-cell therapy has shown that 42 percent of patients with aggressive large B-cell lymphoma remained in remission at 15 months following treatment with axi-cel.

The study, named ZUMA-1, also reported measurable responses in 82 percent of patients and complete responses in 54 percent. Fifty-six percent were alive at 15 months following therapy. A follow-up analysis of patients enrolled in the study revealed 51 percent were still alive two years post-treatment.



Nakia Spencer

*Institute associate scientist IV,
Center for Co-Clinical Trials*

Research focus: Investigators in Therapeutics Discovery’s Center for Co-Clinical Trials work at the crossroads of preclinical testing and validation of new drugs, which leads to a better understanding of how the drugs that are developed work and who will benefit most from them.

In her role as an associate scientist, Spencer performs patient-centric therapeutic discovery research and contributes to the advancement of a diverse portfolio of drug discovery and development projects. She works with tumor models derived from patients treated at MD Anderson, and institutional data sets to identify patients in need of innovative treatment options.

For the past five years, she has been part of a team that has advanced a program from a biology concept into a novel therapeutic agent. The team members have used MD Anderson resources and expertise to identify specific cancers that are vulnerable to the agent and defined subsets of patients they predict will respond to the drug, which is set to enter first-in-human Phase I clinical trials this year.

In addition to her work in the lab, Spencer has volunteered as a patient advocate in the Stem Cell Transplant Unit for the past six years.

“I find volunteering at MD Anderson is the piece of the puzzle that makes my job complete,” says Spencer. “It’s an indescribable feeling to know that I’m working to save lives through my research, but it’s even more rewarding to interact with the patients I’m fighting for. The stories I hear and the emotions I feel provide me the comfort and realization that I’m serving my life’s purpose.”

About the Rogers Award

Regina Rogers, a senior member of the MD Anderson Cancer Center Board of Visitors, established the Julie and Ben Rogers Award for Excellence in 1987 in honor of her parents, the late Julie and Ben Rogers, both active supporters of the institution.

Ben Rogers served on the MD Anderson Cancer Center Board of Visitors from 1978 until his death in 1994.

Uncovering enemies of lung cancer immunotherapy

Research provides insight into treatment resistance and how to overcome it, improving outcomes for patients

By Scott Merville

Drugs that free the immune system to attack cancer have provided durable responses for about 20 percent of lung cancer patients, presenting a pair of challenges to researchers:

- Identifying patients before treatment who will benefit from immune checkpoint blockade drugs.
- Extending effective immunotherapy to more patients.

MD Anderson researchers have identified two factors that separately thwart cancer immunotherapy, providing new targets to improve treatment. One is a genetic mutation that could help guide treatment decisions.

“These findings are a major step toward more personalized immunotherapy, where we identify targets for specific groups of patients, and tailor treatment strategies for them, just as we did with molecular targeted therapy,” says John Heymach, M.D., Ph.D., chair of Thoracic/Head and Neck Medical Oncology.

How immunotherapy is blocked

Both research papers reveal factors that foil treatment with anti-PD-1 or anti-PD-L1 drugs, which block the PD-1 off-switch on immune system T cells, freeing them to attack tumors.

Researchers found a genetic mutation that produces a “cold” tumor environment, with very little penetration of the tumor by T cells. Another team discovered a protein on tumors that shuts down immune response in a “hot” tumor that has attracted an immune system attack.

Both teams identified drugs that potentially can target these suppressors of immune response when combined with anti-PD-1 immunotherapies.

Each project received vital early funding through the Lung Cancer Moon Shot™ of MD Anderson’s Moon Shots Program™.

CD38 — stopping a T cell assault

One team found that treating with anti-PD-1 immunotherapy triggers a coun-

terattack by a surface protein found on the tumors of some patients that stifles the immune system’s assault.

Their research details how the protein, called CD38, reaches out to disable attacking immune system T cells and points to a variety of drugs that could counter CD38’s defenses.

“We’ve shown that CD38, historically best known as a surface protein on immune system cells and a therapeutic target in multiple myeloma, plays an active role on solid tumors, shutting down immune response in immunologically ‘hot’ tumors that are undergoing immune attack,” says senior author Don Gibbons, M.D., Ph.D., associate professor of Thoracic/Head and Neck Medical Oncology.

“There are a number of ways we might translate these findings in the clinic because there are three categories of drugs under development that aim at targets we’ve identified,” Gibbons says. “We’re working on that now.”

The team analyzed gene expression in mice treated with anti-PD-L1 antibodies whose tumors developed resistance after five

to seven weeks, and found that only CD38 was prominently expressed.

They discovered that attacking T cells and the resulting inflammatory environment produce substances that activate CD38 on the tumors.

CD38 drives adenosine production, which connects to receptors on the T cells to suppress their activity.

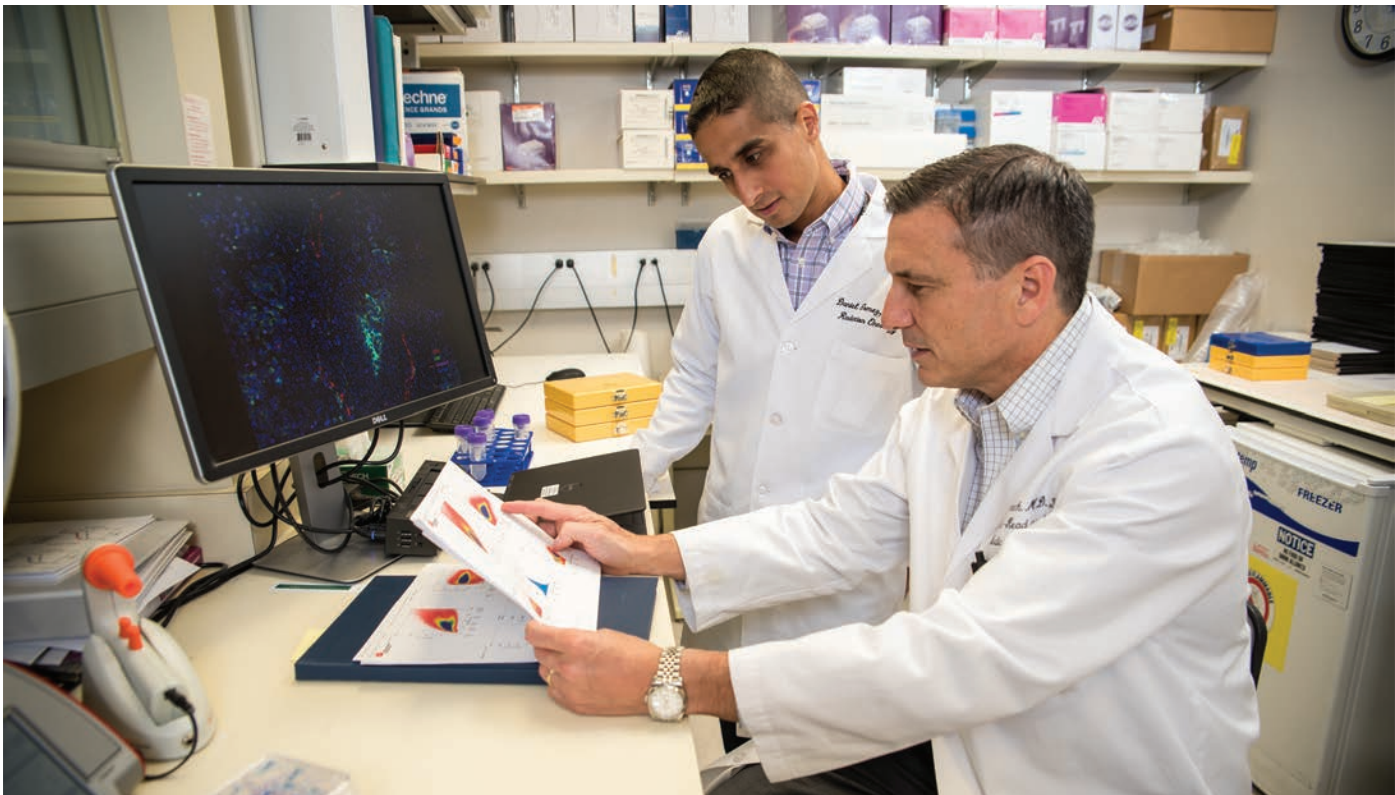
The researchers found CD38 present on human tumors in 15 percent and 23 percent of early-stage lung cancer patients in two cohorts comprising 793 patients.

Combination overcomes resistance

Treating mice with a combination of anti-PD-L1 and an anti-CD38 antibody stifled both the original tumor and those that had spread to other organs. Adding anti-CD38 to mice after their tumors developed resistance to anti-PD-L1 agent enhanced the activity of attacking T cells and reduced two types of cells that inhibit immune response.



MD Anderson researchers are creating more personalized immunotherapy by tailoring treatment strategies to specific groups of patients.



Photos: Adolfo Chavez III

John Heymach, M.D., Ph.D., and Daniel Gomez, M.D., left, are combining immunotherapy with radiation and surgery to target drug-resistant tumors.

Their data suggests the CD38 resistance mechanism could be present in other cancers.

“We’re studying other tumor types now,” Gibbons says.

One Phase I clinical trial underway at MD Anderson pairs a CD38 inhibitor with an anti-PD-1 antibody for advanced lung or prostate cancer patients whose tumors have previously responded but progressed on immunotherapy.

STK11/LKB1 mutations hamper immune response

Another team found that a gene called STK11, which is mutated or deleted in a third of non-small cell lung cancer patients, fosters an immunologically “cold” tumor microenvironment, with minimal penetration of tumors by T cells, rendering anti-PD-1/PD-L1 drugs ineffective.

“We’ve identified what we think is the most prevalent genomic driver of a cold tumor microenvironment and primary resistance to anti-PD-1 immunotherapy in non-small cell lung cancer,” says lead author Ferdinandos Skoulidis, M.D., Ph.D., assistant professor of Thoracic/Head and Neck Medical Oncology. “Our results suggest that a single molecular mechanism downstream from STK11/LKB1 mutations accounts for a large percentage of patients whose tumors resist immunotherapy.”

Anti-PD-1 immunotherapy

One category of immune checkpoint blockade drugs blocks activation of PD-1, a checkpoint protein on T cells that turns them off. The drugs provide durable responses in about 20 percent of non-small cell lung cancer patients. Antibody drugs either block PD-1 directly on T cells or inhibit the PD-L1 ligand found on tumors and other tissues that turns on PD-1.

Multi-institution effort

Researchers previously identified patients with mutations in both the tumor-suppressing STK11/LKB1 and the cancer-promoting KRAS genes as a distinct group. Working with colleagues at other cancer centers through a Stand Up to Cancer dream team grant, they tracked down the impact of the mutations.

Analysis of 174 patients treated at MD Anderson, Memorial Sloan-Kettering Cancer Center and Dana-Farber Cancer Center showed that only 7.4 percent of those with both STK11/LKB1 and KRAS mutations responded to anti-PD-1 therapy. Response rates in other

groups ranged from 28.6 to 35.7 percent.

Median overall survival for the STK11/LKB1 and KRAS group was only 6.4 months, compared to 16 months each for the other two groups.

The team conducted an unbiased genomic analysis of 924 tumors from Foundation Medicine to identify genes that drive the absence of PD-L1 expression in tumors. Absence of PD-L1 is an indicator of a “cold” tumor.

They found STK11/LKB1 to be the only significantly enriched gene in tumors that both lacked PD-L1 and also had a high burden of mutated genes — usually a sign of vulnerability to immunotherapy because abundant mutations provide multiple targets for T cells.

A follow-up analysis of 66 patients treated with PD-1/PD-L1 inhibitors at MD Anderson confirmed the impact of STK11/LKB1 on response to treatment.

The team is working to better understand how the mutation specifically causes cold tumors and is exploring drug combinations to overcome resistance.

Skoulidis notes that STK11/LKB1 mutation status could become a biomarker for guiding treatment, used in combination with tumor mutational burden and PD-L1 status, both of which suggest vulnerability to immunotherapy, but are not conclusive indicators of patient response.

Photo: Wyatt McSpadden



Five-year-old Lauryn Criswell, center, navigated cancer treatment with support from mom Danielle and sister Leia.

Exercise oncology: **GETTING FIT WITH CANCER**

Modifying diet and activity can have a huge impact on pediatric outcomes

By Katrina Burton

Watching their 5-year-old daughter Lauryn stand on her tiptoes as she rang the bell symbolizing the completion of her cancer treatment was a dream come true for Larry and Danielle Criswell.

Lauryn was diagnosed in February with pineoblastoma, a rare and aggressive tumor that develops in the pineal gland deep within the brain.

“Lauryn’s diagnosis caught us completely off-guard,” Danielle says. “We were used to an active child who was full of life, but cancer treatment took its toll.”

While undergoing chemotherapy and radiation at Children’s Cancer Hospital, Lauryn’s energy waned. She spent most of her time creating ladybug- and rainbow-themed drawings with the Children’s Art Project, which provides young cancer patients with an outlet to share their artistic talent. When she wasn’t drawing, she’d quietly play with stuffed animals or her sister Leia.

But when Lauryn became involved in the ProFit Program at the Children’s Cancer Hospital, her activity levels skyrocketed. The program brings professional and college athletes to the hospital to play fun sports with patients.

In her first ProFit event, Lauryn and other

pediatric patients were led by Olympic long-jumper Yvonne Trevino Hayek as they made their way through a mini-Olympic obstacle course.

Since then, she and fellow patients have been visited by a professional soccer team and college basketball players. Lauryn even made a winning basketball shot with help from a University of Houston Cougar basketball team member.

The ProFit Program was developed by Keri Schadler, Ph.D., assistant professor of Pediatric Research and a member of the Pediatrics Energy Balance and Integrative Medicine team.

“Studies have shown that exercise during



Photo: Nick de la Torre

Lauryn practices her dribbling skills with help from University of Houston Cougar basketball team member Chris Harris Jr.

“Studies have shown that exercise during treatment is safe, improves chemotherapy’s effectiveness, and helps patients become more physically fit.”

— Keri Schadler, Ph.D.

treatment is safe, improves chemotherapy’s effectiveness and helps patients become more physically fit,” Schadler says. “Patients like Lauryn benefit from the physical activity that comes from playing sports and engaging in other physical activities.”

Schadler also launched the SummerFit

Program with weekly personalized fitness classes for patients and their siblings. Patients were divided into classes by age and treatment type, and measured for mood, pain level and fatigue before and after classes. The data collected is part of Schadler’s ongoing research into exercise’s effect on pediatric cancer patients.

“Exercise oncology is a new and fast-moving field in pediatrics,” says Schadler, who’s leading four MD Anderson clinical trials and partnering with other institutions on two national trials. She’s also helping develop an educational program for physicians, and she is spearheading the installment of an on-site pediatric patient gym at the children’s hospital.

Danielle Criswell says faith, family and friends got them through Lauryn’s treatment, “and we’re grateful for the hospital programs that helped bring a smile to Lauryn’s face, and put the energy back in her step.”

Protecting the “future you”

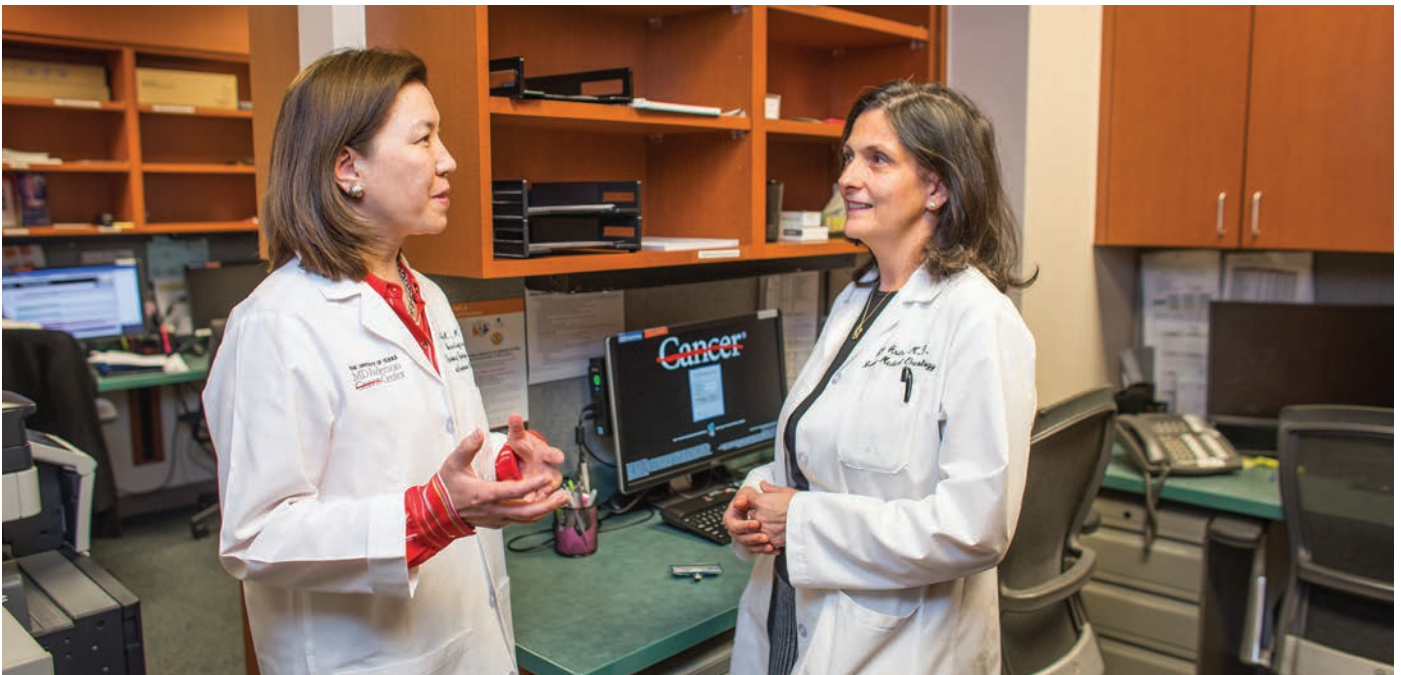
Determination and vigilance are necessary for the prevention and early detection of cancer. This requires taking an active role in ensuring we do all we can each and every day to take care of our present and future selves. That includes avoiding high-risk behavior, making healthy lifestyle choices that can help prevent many cancers and undergoing recommended screenings that can detect the disease early on. It's not always easy, but it's worth it. Genetic testing is more advanced and accessible than ever before, making it easier for people to know if they're at a greater risk for certain cancers. This powerful knowledge can lead to regular checkups to catch cancer sooner and increase the chances of survival.

RALLY
FOR
ALLI



Genetic testing allowed **ALLISON LIPPMAN-KUBAN** to stop chemotherapy and start targeted therapy aimed directly at shrinking her pancreatic tumor. Read her story on page 56.

Photo: Nick de la Torre



Karen Lu, M.D., and Banu Arun, M.D., are co-medical directors of the Clinical Cancer Genetics Program, which helps people with a family history of cancer understand their risk and make informed decisions about their health.

Help for those who are born with a higher risk of cancer

By Ronda Wendler

Most cancer cases — 66 percent according to a recent article in the journal *Science* — occur when cells abnormally mutate during the normal process of cell division. These are random, unavoidable errors caused only by bad luck, according to the paper’s authors. Another 29 percent of cancer cases are caused by environmental factors — think smoking. The final 5 percent are inherited when a faulty gene is passed from generation to generation.

An MD Anderson Cancer Center program focuses on helping members, or potential members, of this “5 percent” group.

“People who carry hereditary mutations do not necessarily get cancer, but their risk of developing the disease at some point during their lifetime is higher than average,” says Karen Lu, M.D., co-medical director of MD Anderson’s Clinical Cancer Genetics Program and a professor of Gynecologic Oncology.

The program, one of the largest of its kind in the nation, is home to genetic counselors, physicians and others who work together to

provide hereditary cancer risk assessment, genetic counseling and testing, and cancer screenings for patients and their relatives who are concerned about their personal and family history of cancer.

“We help people with a family history of cancer understand their risk,” Lu says, “so they can make informed medical decisions about their health.”

Certain factors make it more likely that cancers in a family are caused by an inherited gene, says Banu Arun, M.D., co-medical director of the program and professor of Breast Medical Oncology.

“Red flags should be raised,” she says, “if cancer occurs over several generations, like in a grandmother, mother and daughter; or if it’s diagnosed at a younger age than usual, like breast cancer in a 25-year-old; or if a family experiences multiple cases of the same types of cancer.”

Doctors may encourage these people to get tested, she says.

Patients and family members who are found to be at risk for hereditary cancers are

CLINICAL CANCER GENETICS PROGRAM BY THE NUMBERS

6,843

Patient visits in 2018

22,466

Cumulative number of patients tested for a hereditary cancer mutation

4,925

Cumulative number of patients identified with a hereditary cancer mutation

14

Genetic counselors

referred to one of MD Anderson’s high-risk surveillance clinics for assessment of their personal and family history. The clinics offer

genetic counseling and testing, personalized screening, long-term surveillance, other interventions such as chemoprevention drugs to keep cancer at bay, and prophylactic surgery to remove at-risk tissue or organs from the body before cancer occurs.

“Over the last two decades, great progress has been made in identifying the genes that predispose people to certain cancers,” says Y. Nancy You, M.D., the program’s associate medical director and an associate professor of Surgical Oncology. “With genetic counseling, testing and cancer prevention strategies, we can prevent cancer from occurring, or catch it in its earliest stage when it is most treatable.”

MD Anderson’s high-risk clinics

Breast Cancer High-Risk Screening and Genetics Clinic

Provides breast cancer screening, genetic risk evaluation and chemoprevention drugs for women at increased risk of breast cancer due to a family history of breast cancer or BRCA and other gene mutations.

Gynecologic Cancer Genetics Clinic

Offers genetic counseling and testing to women who have ovarian or endometrial (uterine) cancer and to women who have never had ovarian or endometrial cancer but have a significant family history of the disease.

High-Risk Ovarian Cancer Screening Clinic

Conducts ovarian cancer screenings that include a transvaginal ultrasound — a radiologic procedure that provides a picture of the ovaries and uterus — and a CA-125 blood test, which may indicate the presence of ovarian cancer.

Familial High-Risk Gastrointestinal Cancer Clinic

Provides services to those with a family history of colorectal cancer or GI cancer syndromes, and to those who have multiple polyps or have been diagnosed with colorectal cancer under the age of 50. At MD Anderson, all colorectal cancer patients younger than age 50 are tested for potential underlying genetic syndromes.

Endocrine Center

Sees patients with hereditary endocrine cancer syndromes, including Multiple Endocrine Neoplasia (MEN) types 1 and 2.



Photo: Wyatt McSpadden

Patrick Lynch, M.D., and his colleagues in the Familial High-Risk Gastrointestinal Cancer Clinic provide care to patients with hereditary gastrointestinal cancer syndromes.



Photo: Adolfo Chavez III

At the Endocrine Center, Nancy Perrier, M.D., sees patients with hereditary endocrine syndromes that may lead to thyroid, pancreatic or pituitary tumors.



Photo: Adolfo Chavez III

Andy Futreal, Ph.D., is conducting a collaborative research study to improve understanding of inherited blood cancers such as acute and chronic leukemia.

Nearly 100 percent of MEN1 patients will develop parathyroid tumors, 30 to 75 percent will develop pancreatic tumors and 10 to 60 percent will develop a pituitary tumor. Patients with MEN2 have a greater than 95 percent chance of developing medullary thyroid cancer in their lifetime.

Hereditary Hematologic Malignancy Clinic

Offers genetic counseling and screening to patients and families at risk for inherited predisposition to blood cancers, including acute and chronic leukemia, myelodysplastic syndrome and bone marrow failure. These

were long considered sporadic cancers and were rarely targeted for genetic counseling and research until several years ago. Patients and families are invited to participate in a collaborative research study with Andy Futreal, Ph.D., chair of Genomic Medicine, designed to improve understanding of inherited blood cancers.

Hereditary Genitourinary Malignancies Clinic

Provides services to those suspected of having a hereditary genitourinary malignancy, including kidney, bladder, prostate or testicular cancers.

Photo: Wyatt McSpadden



“To be in partial remission and on the road to recovery today is truly miraculous.”

**—Allison Lippman-Kuban,
pancreatic cancer survivor**

Genetically speaking, her cancer was a needle in a haystack

By Ronda Wendler

Only a few years ago, Allison Lippman was on top of the world. She'd just celebrated her 30th birthday, been promoted at work and met the man of her dreams.

“I thought I'd stay single for a while and focus on my career,” says Lippman, who managed a four-star hotel in Dallas. “Then I met Eric through a mutual friend, and we instantly became inseparable. Our first dinner date lasted three hours because we couldn't stop chatting.”

The couple discovered they shared a love of travel, and embarked on a magical, weeklong tour of France. But when they returned home in April 2017, Lippman began feeling ill.

“I couldn't digest food, my side hurt all the time and my energy disappeared,” she says. “I'd always been healthy and active. Something was definitely wrong.”

Visits to various doctors produced no clear answers. Maybe a food allergy was to blame, they suggested, or work-induced stress.

“I was frustrated and lost,” Lippman recalls. “I didn't know what to do or where to turn.”

She toughed it out until one night when unbearable pain landed her in the emergency room. It was there that she got the shocking diagnosis: stage IV pancreatic cancer. Lippman had a rare subtype called acinar cell carcinoma, which affects only 1 percent of all pancreatic cancer patients. It was aggressive, doctors said, and it had spread to her liver.

On her 31st birthday, Lippman met with her oncologist to discuss her treatment plan.

“All I heard was chemotherapy,” she recalls, “and I knew my hair would fall out. It was the worst birthday ever.”

Two months after she lost her curly blonde locks, Eric whisked Lippman away on a surprise day trip to Paris, Texas. At the base of the town's iconic Eiffel Tower replica with the big, red cowboy hat on top, Eric got down on one knee and proposed marriage. Lippman enthusiastically accepted.

“I tell people we got engaged in Paris,” she says.

When the couple arrived home that evening, Eric had arranged for both their extended families to be there to celebrate their engagement.

“It was absolutely amazing and I couldn't stop smiling all day,” Lippman says.

She continued chemo for seven months while planning a wedding.

“I was nauseated, weak, super skinny and bald,” she remembers, “but I was in love and happy.”

In the midst of this whirlwind, Lippman consulted a second doctor in Dallas who suggested sending tissue from her tumor to a lab for genetic testing — a practice known as comprehensive tumor profiling. If the test uncovered the genetic mutation that caused her cancer, Lippman then could be matched with a cancer drug that targets her specific mutation.

“He warned me not to get my hopes up, that it was a needle in a haystack,” Lippman recalls. “But I could see how hopeful



Photo: Adolfo Chavez III

Since joining a clinical trial of a drug named LOXO-292, Lippman-Kuban has stopped chemotherapy, and her tumors have shrunk by 50 percent.

my fiancé and family members were. I knew I had to try.”

It worked. The test revealed that a rare genetic alteration known as a RET fusion caused Lippman’s tumor. The discovery meant she could stop chemo and enroll in a clinical trial at MD Anderson, where a drug named LOXO-292 was being tested in patients with RET-fusion-induced cancer.

“Every person’s cancer is genetically different, even when it begins in the same part of the body,” says Vivek Subbiah, M.D., associate professor of Investigational Cancer Therapeutics and leader of the MD Anderson arm of the national trial. “Two people with pancreatic cancer, for example, can have tumors with genetic profiles that look nothing alike.”

These mutations can control how, or if, a tumor will respond to a specific treatment. For this reason, doctors increasingly are interested in profiling their patients’ tumors.

Since starting the LOXO-292 trial in January 2018, Lippman says, “I’ve slowly recovered my strength, gained weight and my hair has started to grow again.”

Four months after joining the trial, she married Eric, a Delta Airlines pilot, and became Allison Lippman-Kuban. On their wedding day, she removed her wig to reveal a short, pixie hairstyle.

Today, her tumors have shrunk nearly 50 percent, and she

“Every person’s cancer is genetically different, even when it begins in the same part of the body.”

— Vivek Subbiah, M.D.

no longer has to deal with the side effects of chemotherapy.

“There’s still a long road ahead, but I’m on a positive path forward,” says Lippman-Kuban. “This time last year, I was in a dark place full of uncertainty and unknowns. To be in partial remission and on the road to recovery today is truly miraculous.”

She and Eric recently moved to Houston to be closer to relatives and MD Anderson.

“My drive behind everything is my husband and my family,” says Lippman-Kuban. “I’m thankful I got the diagnosis, not them. I think it takes more strength for the family and friends watching than for the patient going through treatment.”

She’s in the midst of writing a book that she hopes will inspire others to explore all treatment options and never give up.

“Miracles do happen,” she says. “You might be the needle in the haystack.”

She’s closing the gap in genetics education for nurses

By Ronda Wendler

When Wendy Brouwer set out to learn more about how genetics and cancer converge, she had no idea the uphill battle she would face.

“I really had to dig to find a course that would give me the level of information I needed to detect patients whose genetic profiles increased their risk for cancer,” says Brouwer, a women’s health nurse practitioner in the Clinical Cancer Prevention department.

She finally located a 14-week course at the City of Hope Cancer Center in Duarte, California, but she had to wait two years for an available space.

“If I had this much trouble finding a class, then other nurses did, too. That’s when I realized that the entire nursing profession is starving for genetics education,” says Brouwer, who completed the course and is now among the less than 90 certified advanced genetic nurses in the United States.

Genomics revolution

Like most health care professionals, nurses are faced with a wealth of new information about the role of genetics in disease and health.

From the time scientists completed mapping all the genes in the human body 15 years ago, a flood of new genetic information and technology has been introduced. Nurses are required to understand and translate these concepts to patients, yet most have received little to no education about the subject.

“The average age of today’s registered nurse is 50. Genetics wasn’t formally introduced into nursing education until 2008, when most experienced nurses were at least 45 years old,” Brouwer explains. “So it’s easy to see why many have not been trained in the topic and may not feel comfortable incorporating genetics assessment and implications into a patient care plan.”

Closing the gap

To close this gap, Brouwer worked with genetic counselors to create a series of four, one-hour courses to teach nurses in Breast Medical Oncology about hereditary cancers. The Oncology Nursing Genetics Academy, as it is called, includes a basic genetics primer about how genetic mutations occur, are inherited and



Photo: Wyatt McSpadden

Wendy Brouwer, a women’s health nurse practitioner in Clinical Cancer Prevention, right, reviews genetic information with nurse manager Carol Stalzer.

can lead to cancer. Nurses also learn how to:

- gather a patient’s family history and record that information in MD Anderson’s electronic health record.
- identify patients who need genetic counseling, educate them about what to expect and teach them how to prepare for a genetic counseling appointment.
- recognize patients who should be referred to the high-risk breast clinic.

When classes were rolled out in a recent pilot program, the room was filled.

Nurses at all levels — registered nurses, advanced practice nurse practitioners, research nurses, nursing assistants, licensed vocational nurses, and even some physician assistants and social workers — attended.

During the classes, some attendees expressed a hesitancy to answer patients’ specific genetic questions, especially since direct-to-consumer genetic tests like Ancestry DNA and 23andMe are leading more patients to ask for clarification and advice.

“We tell our nurses that their role is to ‘recognize and refer’ — recognize patients

who are at high risk for cancer based on their personal or family histories, then refer them to genetic counselors,” Brouwer says.

The genetic counselors then do a complete family pedigree on these patients to determine if they meet the criteria for genetic testing.

Today, all registered nurses in Breast Medical Oncology have completed the four-class series. Results show a significant improvement in their knowledge level and an increase in the number of patients referred to genetic counselors.

Brouwer hopes the program can be expanded to other departments and to MD Anderson’s campuses beyond the Texas Medical Center.

“Nurses are the largest front-line workforce in the medical field — MD Anderson’s main campus alone employs about 3,700 oncology registered nurses,” she says. “We’re in an ideal position to obtain personal and family medical histories, and to inform physicians about patients who are at risk and need referrals to genetic counselors. With a little education, we can make a huge impact.”



The day after Cheryl Anderson, second from left, completed breast cancer radiation treatment, she joined family and friends on a three-day, 109-mile ride.

DNA analysis saved her from chemo

By Ronda Wendler

Cheryl Anderson and her husband are avid cyclists. The couple from Jacksonville, Florida, were planning a bike tour through the Black Hills of South Dakota when unexpected news threatened to derail their trip.

Cheryl was diagnosed with early-stage breast cancer.

“No one was more surprised than I,” she says. “I’ve always been health-conscious. I regularly exercise, eat right and take care of myself.”

Anderson, 69, underwent surgery to remove the tumor. She received good news — her cancer hadn’t spread.

Still, her doctor mentioned using chemotherapy to wipe out any remaining cancer cells.

“That’s when I got scared,” Anderson says. “I didn’t want to be sick or lose my hair. The cancer didn’t scare me, but the chemo did.”

Jennifer Crozier, M.D., a breast medical oncologist at Baptist MD Anderson Cancer Center in Jacksonville, recommended genomic testing.

In this procedure, doctors take tissue

from a patient’s tumor, then sequence the cancer cells’ DNA. This provides important clues about the risk of recurrence. It also helps determine which treatments, including chemo, will or will not work.

“DNA sequencing helps us determine if the breast cancer cells are actually going to respond to the chemotherapy,” Crozier says. “It’s estimated that 100,000 women in the United States will avoid chemo this year — and the toxicity associated with it — thanks to this new testing.”

Anderson is happy to be one of them.

“I was so relieved,” says the retired educator who taught at the Florida School for the Deaf and Blind. “I like to keep moving, and I knew chemo would slow me down.”

Instead of chemo, Anderson went through five weeks of radiation and experienced no side effects.

The day after her last treatment, she and her husband took off for South Dakota, where they joined 600 other cyclists for three days of riding the 109-mile George S. Mickelson Trail, a repurposed former railroad line that winds through mountains, forests and tunnels,

and across more than 100 railroad bridges.

Anderson continues to work part-time as an interpreter for the deaf. And she’s already planning her next cycling trip.

“Get the most out of life and stay positive,” she says. “Attitude is everything.”

About the partnership

As a partner member of MD Anderson Cancer Network®, Baptist MD Anderson is a co-branded, clinical extension of MD Anderson that is fully integrated with Baptist Health.

In the summer of 2018, Baptist expanded cancer care for adult patients in Northeast Florida with the opening of a new nine-story cancer center.

Input from Baptist patients and team members helped shape the design of the new center in order to deliver the best possible patient-focused experience. A clinical team and patient advisory group, in coordination with the design and construction team, made recommendations on everything from how patients move through the center, to the equipment used to make treatments as comfortable as possible.

Students learn to 'RED-FLAG' FAULTY GENES



Photo: Nick de la Torre

Ashley Garza will graduate this summer, but knows her education will continue in the constantly evolving field of genetics.

Program prepares students for careers as molecular genetic technologists

By Ronda Wendler

As a child, Ashley Garza was fascinated by television shows about science. “My friends would watch cartoons, and I’d watch National Geographic,” she recalls.

A miniature microscope, complete with slides and test tubes, was her favorite toy.

“I looked at all sorts of things under that lens,” she says. “A strand of hair, a blade of grass, you name it.”

Today, Garza is a college senior preparing to graduate from MD Anderson’s Molecular Genetic Technology Program this summer.

Housed in the cancer center’s School of Health Professions, the program trains students to operate a host of high-tech laboratory instruments and perform a variety of genetic tests on human specimens such as blood, saliva, tumors, amniotic fluid and bone marrow. By analyzing and interpreting the genetic material in these samples, Garza and other soon-to-be graduates will provide physicians with valuable information that helps diagnose, treat and monitor a patient’s condition.

“Our students learn about chromosomes and DNA, and the diseases and syndromes that result from genetic mutations,” says Irene Newsham, Ph.D., the program’s education coordinator. “By the time they graduate, they can red-flag mutated genes in a patient’s sample that are associated with specific diseases or disorders.”

Students also learn to identify genes linked to inherited conditions, which may influence family planning.

Graduates earn a Bachelor of Science degree in Molecular Genetic Technology and are eligible to take a national exam to become certified in the field. While in school, they hone their skills by working at hospitals and clinical labs that are affiliated with the program, and are well-prepared to enter the expanding molecular diagnostic workforce, Newsham says.

Garza will be the first person in her family to earn a college degree.

“I hope to set an example for my younger relatives,” she says. “It takes a lot of hard work, but it can be done.”

She recalls struggling through organic chemistry, which “almost made me switch my

**SCHOOL OF HEALTH PROFESSIONS
FY2018**

**357
Students**

**138
Bachelor of Science
degrees awarded**

**30
Master of Science awarded**

major to accounting.” But she stuck it out, and is glad she did.

“Just remember,” she says, “the rewards after graduation will be far greater than the sacrifice you make as a student.”

After completing the program, Garza knows her education won’t end.

“Genetics is a constantly evolving field,” she says. “As new discoveries are made, the molecular genetic technologist’s role will continue to change and expand.”

Photo: Adolfo Chavez III



In November 2017, MD Anderson and its community partners, along with Baytown residents, celebrated the launch of Be Well Baytown™ with the Be Well Baytown Wellness Event. Last November, the city celebrated Be Well Baytown Day to commemorate the initiative’s one-year anniversary.

Community program celebrates one year of making an impact on health

By Clayton R. Boldt, Ph.D.

It is estimated that up to half of all cancers may be prevented by making healthy lifestyle choices. Cancer prevention and control is a cornerstone of MD Anderson’s mission to eliminate cancer.

Aligned with that mission, MD Anderson established Be Well Communities™, a place-based community approach for cancer prevention and control to promote wellness and reduce modifiable cancer risk factors. Launched in 2017, Be Well Communities is an initiative of the cancer prevention and control platform, part of MD Anderson’s Moon Shots Program™. This comprehensive, community-led effort unites schools, workplaces, government agencies, health care providers and policy makers to plan and execute public health solutions to make positive, long-lasting changes in people’s lives.

Baytown, Texas, the third largest city in Harris County, was selected as the inaugural Be Well Community™, and MD Anderson collaborated with the Baytown community to

launch Be Well™ Baytown in November 2017. On November 3, 2018, the community celebrated Be Well Baytown Day to commemorate the one-year anniversary of the initiative. Be Well Baytown is an initiative of MD Anderson sponsored by ExxonMobil.

As the backbone organization, MD Anderson leads Be Well Baytown with the support of more than 16 collaborating organizations focused on the five target health areas of diet, physical activity, preventive care, tobacco control and ultraviolet radiation exposure. MD Anderson will continue to support programming through 2024, with the overall aim to mobilize the community to engage in healthy behaviors and reduce cancer risks.

Be Well Baytown is the most comprehensive community-driven initiative of its kind in Texas with a focus on cancer prevention and control. This initiative can serve as a model for other cities across Texas and the nation.

“It has been wonderful for the YMCA to be one of the driving forces behind bringing community organizations together to work towards a common goal that will benefit an

BE WELL BAYTOWN CREATES POSITIVE RESULTS

445,604

Pounds of fresh produce delivered to area families

7,500

Students and staff at Lee College in Baytown gained access to sunscreen and sun safety programming

entire community,” said Lharissa Jacobs, Community Development Executive Director for the YMCA of Greater Houston.

“The first year of Be Well Baytown has been very encouraging, as we have seen the community work together and devote themselves to improving health and wellness,” said Ruth Rechis, Ph.D., director of Be Well Communities. “We look forward to our continued partnership with the community and for the impact we will have going forward.”

Leadership

Success in the mission to end cancer requires courage from exceptional leaders. Strong leaders ask questions and are relentless learners. They lead with others in mind. They're coachable. They have emotional intelligence and interpersonal skills. They're driven. At MD Anderson, we are committed to ensuring the institution's continued success by advancing the practice of leadership and the professional development of all employees. Through the MD Anderson Leadership Institute, we are redefining what it means to be a leader by providing a defined system to cultivate and develop our leaders — now and in the future. Bringing out the best in our leadership is an investment in our most valuable resource: our people. Together, we are building an even stronger, more inclusive team.



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*current as of Feb. 8, 2019

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The MD Anderson Cancer Center Board of Visitors is an appointed board of people committed to helping MD Anderson achieve its mission of eliminating cancer. Board programs emphasize private fund development, public relations and outreach on behalf of the institution.



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Photo: F. Carter Smith



Boot Walk 2018

Gray skies and rain didn't deter thousands of MD Anderson supporters from turning out on Nov. 10, 2018, for the third annual Boot Walk to End Cancer®. The event raised more than \$2.1 million for programs that support the cancer center's patients and research.

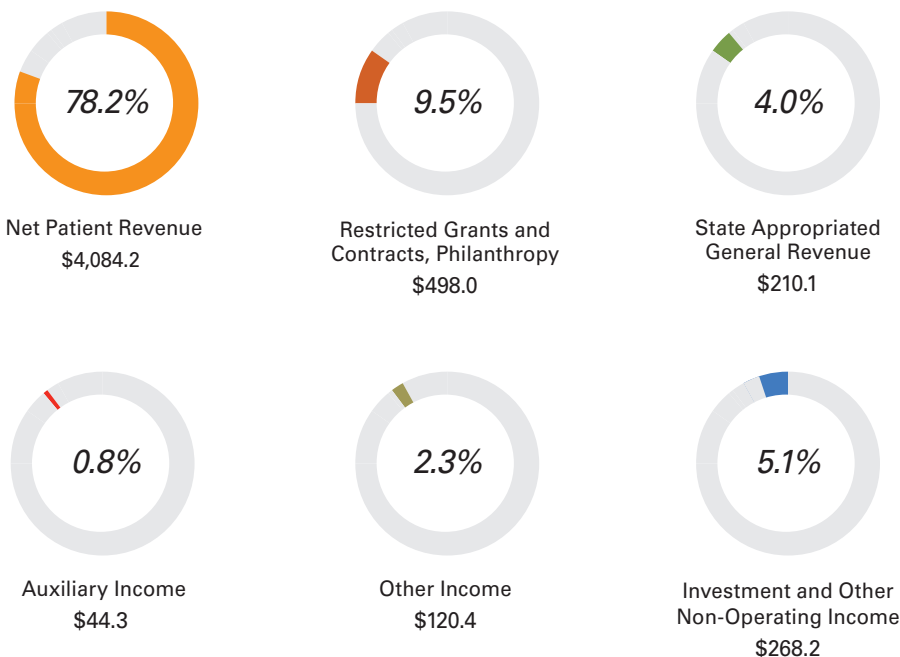
Fiscal Year 2018

Financial and statistical data
Sept. 1, 2017 - Aug. 31, 2018

Sources of revenue

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Patient Revenue					
Gross patient revenue (Includes inpatient, outpatient and professional services)	\$6,994,996,215	\$7,567,179,285	\$7,571,426,899	\$8,214,974,402	\$8,926,301,959
Deductions from gross patient revenue ¹	3,659,313,782	3,935,319,324	4,044,324,615	4,460,335,552	4,842,147,440
Net patient revenue	\$3,335,682,434	\$3,631,859,960	\$3,527,102,284	\$3,754,638,850	\$4,084,154,519
Other Revenue					
Restricted grants and contracts, philanthropy	\$421,761,275	\$402,702,183	\$466,883,217	\$491,038,777	498,042,406
State-appropriated general revenue	185,393,182	187,350,746	201,848,484	203,439,111	210,130,778
Auxiliary income ²	41,502,690	44,808,473	42,462,462	44,137,660	44,292,397
Other income ³	99,702,455	107,422,200	112,515,085	113,187,342	120,376,674
Investment and other non-operating income	328,881,907	121,624,475	129,632,830	392,901,020	268,224,779
TOTAL REVENUE	\$4,412,923,943	\$4,495,768,037	\$4,480,444,361	\$4,999,342,760	\$5,225,221,554

Sources of revenue (in millions)



¹ Amounts discounted from established rates as a result of agreements with third-party payors, including Medicare, Medicaid and insurance companies. Also includes deductions associated with indigent care and bad debt.

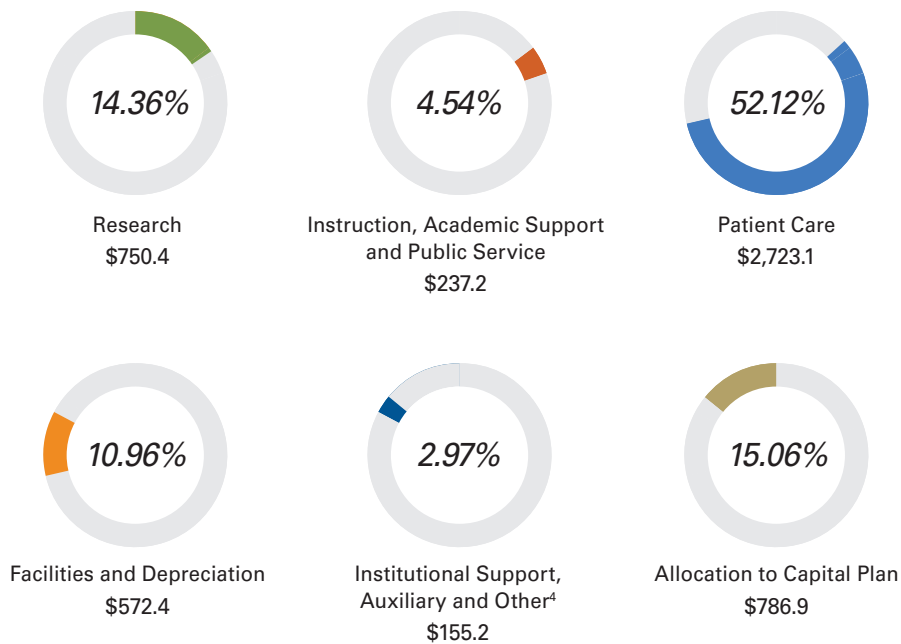
² Funds received from parking fees, valet services, dining facilities, hotel charges, gift shop sales and vending-machine sales

³ Includes tuition and student fees, Children's Art Project sales, management fees and other sources.

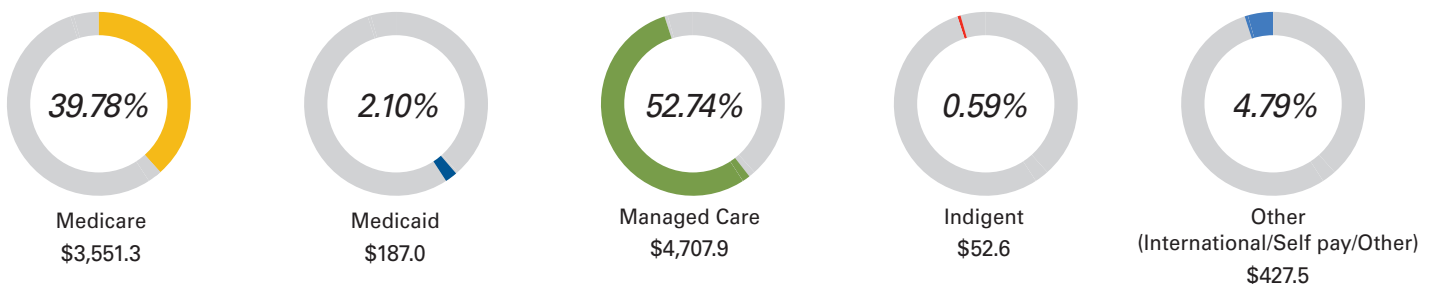
Uses of revenue

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Research	\$631,944,987	\$668,243,371	\$687,940,063	\$745,481,237	\$750,400,862
Instruction, academic support and public service	195,958,98	225,871,577	234,488,22	248,155,843	237,216,678
Patient care	2,055,617,566	2,369,972,993	2,642,145,329	2,585,835,231	2,723,124,887
Facilities and depreciation	486,793,306	508,973,014	550,277,895	563,364,679	572,430,565
Institutional support, auxiliary and other ⁴	312,865,408	155,828,553	158,060,132	157,051,220	155,161,923
Allocation to capital plan (For future projects to replace and improve facilities and technology)	729,743,695	566,878,529	207,532,714	699,454,551	786,886,639
TOTAL EXPENSES	\$4,412,923,943	\$4,495,768,037	\$4,480,444,361	\$4,999,342,760	\$5,225,221,554

Uses of revenue (in millions)



Gross revenue by payor classification (in millions)

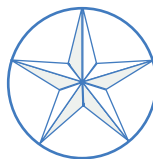
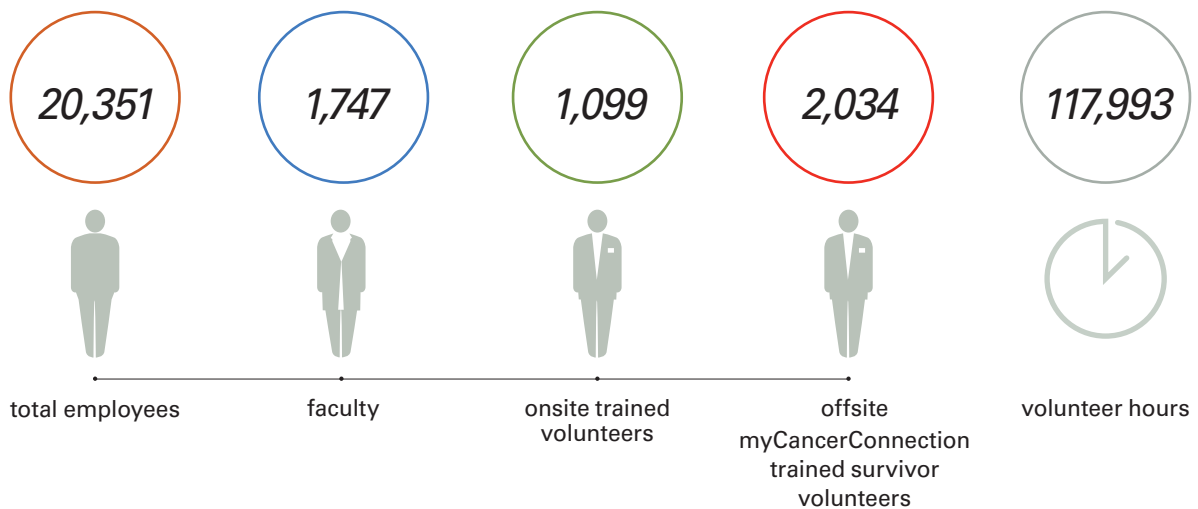


⁴ Includes support for parking, food and gift shop services, as well as general institutional support (e.g. information technology, human resources, administration, development activities, etc.)

Clinical profile

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Hospital admissions	27,761	28,167	27,391	28,793	29,118
Patient days	202,636	202,483	198,080	202,411	207,071
Average daily census	571	574	561	577	587
Average length of stay	7.3	7.2	7.2	7.0	7.1
Average number of inpatient beds	654	665	661	681	673
Outpatient clinic visits, treatments, procedures	1,363,008	1,440,684	1,404,329	1,441,403	1,458,076
Pathology/laboratory medicine procedures	12,005,766	12,334,917	12,073,679	12,700,333	13,280,436
Diagnostic imaging procedures	523,297	530,590	524,044	574,018	611,190
Surgery hours	69,506	69,987	67,936	70,460	71,462
Total active clinical protocols	1,101	1,197	1,202	1,255	1,252

Workforce



MD Anderson provided more than **\$170.4 million** in uncompensated care to Texans with cancer in FY18.*

**This figure includes unreimbursed costs of care for patients who either have no insurance or are underinsured, or whose care was not fully covered by government-sponsored health programs.*

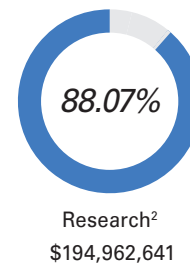
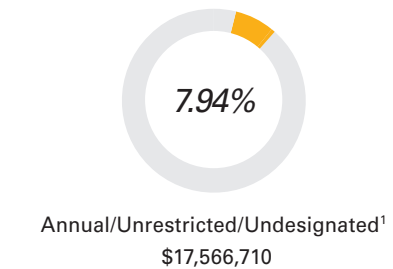
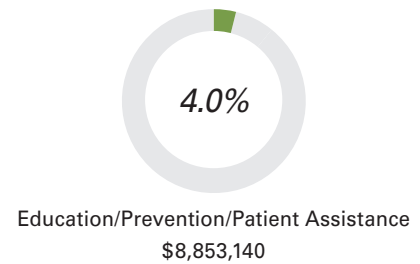
Total philanthropic gift support by type

Cash gifts	Amount
Corporations	\$11,474,499
Foundations	\$19,707,852
Individuals	\$42,715,953
Organizations	\$2,832,573
Trusts and estates	\$6,523,667
Subtotal	\$83,254,544

Pledge gifts	Amount
Corporations	\$13,015,797
Foundations	\$27,760,196
Individuals	\$23,375,012
Organizations	\$22,568,105
Trusts and estates	\$51,203,823
Subtotal	\$137,922,933

Gifts-in-kind	Amount
Corporations	\$10,558
Foundations	\$3
Individuals	\$194,410
Organizations	\$43
Subtotal	\$205,014
TOTAL	\$221,382,491

Total philanthropic gift support by purpose



¹ These dollars fund institutional peer-reviewed research.

² Donor-targeted gifts to research in all mission areas.

Sources of research expenditures

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
External funding for research					
Federal grants, contracts	\$158,986,303	\$161,170,908	\$155,043,499	\$167,061,117	\$173,899,855
Private industry grants, contracts	75,307,463	81,076,353	155,043,499	127,758,909	141,656,018
Philanthropy, foundations	147,016,586	172,412,727	166,374,314	191,181,214	171,352,085
Total external funding	\$381,310,352	\$414,659,988	\$410,872,268	\$486,001,240	\$486,907,958
State funding allocated for research					
State-appropriated general revenue	\$13,636,669	\$13,658,113	\$14,991,640	\$15,021,736	\$14,720,920
Tobacco settlement receipts	11,175,016	10,227,690	12,188,092	13,143,222	20,560,115
CPRIT	25,072,890	32,049,453	40,227,040	453,292,732	48,999,398
Total state funding	\$49,884,575	\$55,935,256	\$67,406,772	\$81,457,690	\$84,280,433
Internal funding allocated for research					
Hospital operating margins	202,607,346	198,607,568	193,071,901	187,850,299	198,667,225
Institutional grants*	102,391,157	111,374,655	115,938,206	88,864,952	93,026,768
Total internal funding	\$304,998,503	\$309,982,223	\$309,010,107	\$276,715,251	\$291,693,993
TOTAL RESEARCH EXPENDITURES	\$736,193,430	\$780,577,467	\$787,289,147	\$844,174,182	\$862,882,384

Education profile

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Clinical residents, fellows	1,276	1,507	1,693	1,693	1,775
Research trainees	1,853	1,890	1,847	1,779	1,791
Observers, visitors, special programs	452	752	838	906	831
Nursing trainees	1,238	1,352	1,499	1,506	1,440
Student programs participants	1,204	817	810	806	888
School of Health Professions students	318	303	317	339	357
TOTAL TRAINEES	6,341	6,621	7,004	7,091	7,082

*Philanthropic donations to the institution internally designated to support research and PRS funds internally allocated to support research activities.

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LOCATIONS

MD Anderson has clinical care centers in Katy, League City, Sugar Land, The Woodlands and the Texas Medical Center. Together with diagnostic centers that offer imaging and blood work in Bellaire and West Houston, a surgical office in Memorial City, and a gynecologic oncology clinic at The Woman's Hospital of Texas, MD Anderson provides a network of convenient locations to access MD Anderson's top-quality cancer care close to home. As part of the MD Anderson Oncology Program at Lyndon B. Johnson Hospital, a team of MD Anderson doctors provides cancer care to underserved Texans in collaboration with Harris Health System. The institution also has developed a network of national and international locations.

MD ANDERSON CANCER NETWORK®

www.mdanderson.org/cancernetwork

PARTNERS*

- Baptist MD Anderson Cancer Center (Jacksonville, Florida)
- Banner MD Anderson Cancer Center (Gilbert, Arizona)
- MD Anderson Cancer Center at Cooper (Camden, New Jersey)
- Scripps MD Anderson Cancer Center (San Diego)
- Summit Medical Group MD Anderson Cancer Center (Berkeley Heights, New Jersey)
- UTHealth Northeast MD Anderson Cancer Center (Tyler, Texas)
- UTHealth San Antonio MD Anderson Cancer Center

PARTNER EXTENSIONS

- Banner MD Anderson Cancer Center at McKee Medical Center (Loveland, Colorado)
- Banner MD Anderson Cancer Center at North Colorado Medical Center (Greeley, Colorado)

CERTIFIED MEMBERS

- 17 health systems and hospitals in 15 states

ASSOCIATES

- Hospital Israelita Albert Einstein (São Paulo)
- MD Anderson Cancer Center Madrid
- Vehbi Koc Foundation American Hospital (Istanbul)

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- MD Anderson Radiation Treatment Center at American Hospital (Istanbul)
- Presbyterian MD Anderson Radiation Treatment Center (Albuquerque, New Mexico)

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