

BUILDING ON SUCCESS

UNIVERSITY OF KENTUCKY **MARKEY CANCER CENTER**
ANNUAL REPORT 2017



UNIVERSITY OF KENTUCKY
MARKEY CANCER
FOUNDATION



HealthCare
MARKEY CANCER CENTER
An NCI-Designated Cancer Center

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Markey by the numbers

Front cover: The UK Markey Cancer Center is expanding its services across the UK HealthCare campus to better serve the needs of cancer patients. In 2017, Markey opened the new Precision Medicine Clinic as well as the 11th floor of the UK Albert B. Chandler Hospital Pavilion A, a dedicated cancer care location that will provide patients with the latest advances in treatment in an environment carefully designed to promote healing.

Back cover, top: Markey radiation oncologist Mahesh Kudrimoti, MD, (left) guided Barry Warner (right) through a rigorous treatment plan for throat cancer that included 35 radiation sessions. Warner is now a seven-year cancer survivor.

Back cover, bottom: Gerhard Hildebrandt, MD, a blood and marrow transplantation hematologist at Markey, talks with students in teacher Erika Carter's classroom. Hildebrandt treated Carter at Markey after she was diagnosed with leukemia.





UK Markey Cancer Center Director B. Mark Evers, MD; UK Markey Cancer Foundation Chair Sally Humphrey; and UK Markey Cancer Foundation President and CEO Michael Delzotti stand together on the 11th floor of the UK Albert B. Chandler Hospital Pavilion A, Markey's new state-of-the-art cancer care floor opening in December 2017.

THE UK MARKEY CANCER CENTER IS BUILDING ON SUCCESS

Four years ago, the University of Kentucky Markey Cancer Center became the first and only cancer center in Kentucky designated by the National Cancer Institute.

NCI designation is a tremendous honor, one that recognizes the life-saving cancer care we're providing right here in Kentucky. But it also serves as motivation, a daily reminder to all of us at Markey that although we've made progress in the fight against cancer, our work is not done.

In order to achieve our goal of significantly reducing cancer incidence and mortality in Appalachia by 2020, we must build on our success. In 2017, we've done just that.

This past year, we've expanded our services here in Lexington and across the region, giving more patients and families access to world-class cancer care. With the philanthropic support of the UK Markey Cancer Foundation, we've brought some of the best and brightest cancer experts to Kentucky to help fight the disease. And we've continued to pursue the latest cancer treatment breakthroughs and discoveries through collaborative, innovative research.

Our work hasn't gone unnoticed. In August 2017, we were ranked as one of the Top 50 cancer centers in the United States by *U.S. News & World Report*, an achievement that recognizes our role as the state and region's pre-eminent cancer center. We were also designated by *U.S. News* as high-performing in Colon Cancer Surgery and Lung Cancer Surgery, which speaks to our mission to treat the cancer types that affect Kentuckians the most.

By adding new locations to the Markey Cancer Center Affiliate and Research networks, we've continued to expand our expertise across the region from the eastern parts of Appalachia to Western Kentucky.

Here in Lexington, our clinical and research footprint has expanded by more than 40 percent – 75,000 square feet – since our NCI designation in 2013. Much of that growth has happened in 2017. We opened our new Precision Medicine Clinic, an exciting expansion of our research efforts that is giving patients access to early-stage clinical trials. And in December 2017, we'll take patient care to a new level as we open a dedicated state-of-the-art cancer care floor in UK Albert B. Chandler Hospital Pavilion A.

Together, these achievements speak to the comprehensive, life-saving care we're providing every day here at Markey. And they also speak to our unwavering dedication to never stop pushing forward in the fight against cancer.

Because in Kentucky, where cancer is at its worst, we're always looking for new ways to be at our best.

B. Mark Evers, MD
Director, UK Markey Cancer Center



SUPPORTING MARKEY IN THE FIGHT AGAINST CANCER

It's hard not to be inspired when you talk to Dr. B. Mark Evers about his vision for the UK Markey Cancer Center.

It's a vision that includes big-picture goals that will impact cancer care across Kentucky in the years to come. But it's also a vision that focuses on the deeply personal cancer experience of each patient and family who comes through Markey's doors.

At the University of Kentucky Markey Cancer Foundation, we have the privilege of helping Dr. Evers make this vision a reality.

By championing Markey across the state and region, we bring more people to the table who are interested in helping us fight this deadly disease and in giving Dr. Evers and his team the resources they need to make a difference.

This year, the Foundation's 2,700 donors have supported Markey's mission with more than \$6 million in funding. Our efforts have helped Markey recruit the brightest minds in cancer care to Lexington and have supported the new cancer care floor opening in December 2017 at UK Albert B. Chandler Hospital. In addition, support from the Foundation has created a nurse navigator position at Markey that will help personalize each patient's experience and make their journey through treatment a little easier.

Our fundraising focuses on the here and now and also on what's possible in the future. This year, for example, we started Markey Women Strong, a philanthropic effort that allows women philanthropists to support women researchers in their search for the next great cancer-care breakthrough.

Cancer incidence and mortality rates in Kentucky are higher here than anywhere else in the country – almost everyone in our state has been affected by the disease in one way or another. Although cancer has taken its toll on the Commonwealth, it has also united us in our mission to support the life-saving work happening at Markey: To help Dr. Evers and his team achieve their bold goals.

To make Markey the place where Kentucky comes to fight cancer.



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Sally Humphrey
Chair, UK Markey Cancer Foundation

Michael Delzotti, CFRE
President and CEO, UK Markey Cancer Foundation

NATIONAL RECOGNITION EMPHASIZES MARKEY'S VITAL ROLE IN TREATING CANCER IN KENTUCKY

In August 2017, the UK Markey Cancer Center was ranked by *U.S. News & World Report* as one of the Top 50 cancer centers in America – another accomplishment in a growing list of achievements that, together, paint a picture of the high-quality comprehensive cancer care provided at Markey.

NATIONALLY RANKED CANCER CENTER

Markey was included in the Top 50 – coming in at No. 50 – while remaining the top hospital for cancer care in the state of Kentucky. Additionally, UK Albert B. Chandler Hospital was ranked as the No. 1 hospital in the state.

Markey has consistently been designated as high-performing by *U.S. News & World Report* for many years. Still, the move up into the national rankings is indicative of Markey's continued emphasis on providing exemplary care as the state's only National Cancer Institute (NCI)-designated center.

Markey was also designated as high-performing in Colon Cancer Surgery and Lung Cancer Surgery, two recognitions that reinforce the center's commitment to treating the cancer types that affect Kentuckians the most, said Markey Director B. Mark Evers, MD.

"We see 50 percent of our patients coming from Eastern Kentucky, which has some of the highest rates of cancer in the country – particularly lung cancer and colon cancer," Evers said. "So the Markey Cancer Center is vitally important to our region."

COMMITMENT TO HIGH-QUALITY PATIENT CARE

The *U.S. News & World Report* ranking is the latest in a long line of accomplishments that speak to Markey's excellent patient care.

In addition to being the state's only cancer center designated by the NCI, Markey also achieved three-year accreditation renewal in 2017 from the Commission on Cancer (CoC) of the American College of Surgeons. CoC accreditation demonstrates a cancer center's commitment to high-quality cancer care.

As part of UK HealthCare, Markey and its nurses have also achieved Magnet status – the highest honor awarded by the American Nurses Association for nursing excellence and patient-centered nursing care.

SUBSPECIALTY RECOGNITION

Additionally, several subspecialty areas within Markey's breadth of service have also been recognized for high-quality care, including radiation medicine and imaging, breast cancer care, and cellular therapy.

In 2017, the American College of Radiology accredited UK Radiation Medicine in all nine of its focus areas, a recognition that Markey and UK HealthCare are committed to providing excellent medical imaging and radiation treatment.

UK was accredited in Radiation Oncology, Computed Tomography, Nuclear Medicine, Magnetic Resonance Imaging and Ultrasound, while the UK Comprehensive Breast Care Center was accredited in Mammography, Breast Ultrasound, Breast MRI and Stereotactic Breast Biopsy. The Breast Care Center was also named a Breast Imaging Center of Excellence.

The Breast Care Center also achieved accreditation by the National Accreditation Program for Breast Centers, which recognizes the center's efforts to provide the most efficient and effective care for patients with diseases of the breast.

In addition, Markey's Hematology and Blood & Marrow Transplantation Program has been accredited by the Foundation for the Accreditation of Cellular Therapy, or FACT, since 2009. FACT accreditation is for bone marrow transplant programs that demonstrate excellence in the care and treatment of patients with blood disorders such as leukemia and lymphoma.

CONTINUING SUCCESS

Evers stresses that the center's many recognitions and accolades are important only because of what they mean to Markey's patients and their families.

"We do all of this because we want to end cancer and help as many patients as possible until a cure is found," Evers said. "As our recognition and influence continue to grow, Markey will be in a better position to treat and cure the patients we serve."

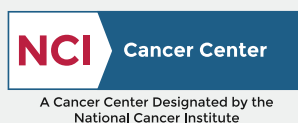
The next – and perhaps most challenging – goal for Markey is achieving Comprehensive Cancer Center status from the NCI. As a Comprehensive Cancer Center, Markey would join an elite class of cancer centers around the country and be held to an even higher standard of care.

Evers acknowledged the challenge, but said he's confident that past achievements and the progress happening at Markey right now has put the center on the path toward continued success.

"I know that we are capable of holding ourselves to our own high standards, and now is the time to prove it," he said. "I believe we are among the best."



The UK Markey Cancer Center was ranked as one of the Top 50 cancer centers in the country according to *U.S. News & World Report*, while remaining the top hospital for cancer care in the state of Kentucky. Additionally, UK Albert B. Chandler Hospital was ranked as the No. 1 hospital in the state.



EXPERTS ACROSS UK HEALTHCARE HELP CLAUDIA HALL CONQUER A COMPLEX COLORECTAL CANCER DIAGNOSIS

Because she was battling a cold and trying to prepare for her daughter's college graduation party the next day, Claudia Hall considered skipping the appointment for her annual checkup with her gynecologist in May 2014. The Lexington resident figured she could reschedule the appointment in a week or two. But after finding out the next best appointment time for her was nearly three months away, she decided to go ahead with the checkup.



With the help of an expert team from UK HealthCare and the UK Markey Cancer Center, Claudia Hall is cancer-free and enjoying the things she loves, like playing with her "granddog," Kona.

"I said, 'No, I don't want to let that go that long,'" Hall said. "And I tell you that because it saved my life."

At the appointment with UK HealthCare OB-GYN Wendy Jackson, MD, Hall underwent the usual tests and checks, including a digital rectal exam, generally performed on female patients over the age of 40. The exam revealed some troubling news: a large mass in Hall's rectum.

A SURPRISING DIAGNOSIS

Jackson made an appointment for Hall to see UK Markey Cancer Center colorectal surgeon Sandra Beck, MD, the following week.

After several rounds of testing, Hall had a diagnosis: squamous cell carcinoma, a type of skin cancer that can occur anywhere in the body. The news came as a shock to the otherwise healthy, fit mother of two who had no family history of colorectal cancer and had received a clean colonoscopy just three years before.

"I was pretty much asymptomatic," Hall said. "The only problem I had was sort of a pain on the right side of my hip."

At Markey, Hall underwent one chemotherapy infusion, a round of oral chemotherapy and 30 radiation treatments over the course of six weeks, all in an effort to reduce or eliminate her tumor prior to surgery.

COMPLICATED TUMOR REQUIRES TEAM EFFORT

The tumor's location made it tricky to determine whether its point of origin was the colon or cervix, but it was fortunate that the tumor had not spread elsewhere in her body, Hall said.

However, the disease had affected such a large area of her gastrointestinal tract that much of that tract couldn't be salvaged. After she had recovered from radiation, Hall was scheduled for a complex

combined surgery to remove all the areas where the tumor had been, including the entire rectum, anus and the back of the vaginal wall.

Beck and Markey gynecologic oncologist Rachel Miller, MD, removed the diseased areas, while UK plastic surgeon James Liau, MD, reconstructed the vaginal wall using skin and muscle from Hall's abdominal wall.

"This surgery is not very common, but we often do combined procedures for complicated tumors like this at UK," Beck said. "It's great for us to have all the experts in these fields to be able to provide this level of care for our patients."

"I was doing everything right, and it just happens sometimes. But I'm very thankful I didn't skip that appointment that day, because I've often wondered what would've happened if I'd waited."

– Claudia Hall

As a result of her extensive treatment, Hall is now in remission and has been cancer-free for more than two years. The surgery has left her with one major side effect, though: a permanent colostomy, which is an opening in the body (known as a stoma) that connects the colon to the surface of the abdomen.

Dealing with such a major alteration to the body can be hard for many patients, but Hall is eternally optimistic – and realistic – about her lifelong need for the device.

"It's been life-changing," she said. "But I'm blessed. I'm grateful for it, because without it, I can't live."

PATIENTS ARE PART OF THE TEAM, TOO

The team aspect of Hall's care is important – in total, six different specialists and their respective staffs cared for Hall throughout her treatment.

From Jackson's initial discovery and referral to the chemo prescribed by Markey medical oncologist Philip DeSimone, MD, and the radiation schedule given by radiation oncologist William St. Clair, MD, to the combined surgeries performed by Beck, Miller and Liau, Hall experienced a range of care that only the most advanced medical centers in the country can provide.

Beck emphasized to Hall that as the patient, she was also a big part of the team.

"Initially when I went to see her – I'll never forget this – she said, 'We are a team here,'" Hall recalled. "I'm your coach and you're my quarterback."

These days, life has largely returned to normal for Hall, who still maintains an active lifestyle. She and her husband regularly boat on Lake Barkley, and she enjoys cooking, exercising and watching after her "granddog," Kona. She stresses the importance of being proactive in your own healthcare, saying that knowing about any potential health risks is far better than not knowing.

"I was doing everything right, and it just happens sometimes," she said. "But I'm very thankful I didn't skip that appointment that day, because I've often wondered what would've happened if I'd waited."

MARKEY EXPANDS ITS SIZE AND SCOPE TO MEET THE NEEDS OF ITS PATIENTS

As the UK Markey Cancer Center has grown in patient volume, so has the need for new clinical space and for research facilities to further the treatments of tomorrow.

NEW INPATIENT SPACE DESIGNED TO PROMOTE HEALING

In December 2017, Markey will open a new dedicated cancer care floor in the UK Albert B. Chandler Hospital Pavilion A. The inpatient floor includes the Darley Blood & Marrow Transplantation Unit, a 32-bed unit for bone marrow transplant and patients with blood cancers. The floor is also home to the James and Gay Hardymon Patient Care Unit, a 31-bed unit for medical and surgical oncology patients.

To position nurses at the patient's bedside and reduce the time away from patient care, each

patient room has a nurse work station right outside the door.

Additionally, all patient rooms in Pavilion A are private and have the same size and design. Large windows provide natural light and outdoor views, an important factor for patients who may require lengthy inpatient stays.

Patients on this floor will have access to both oncology rehabilitation and integrative medicine.



The new dedicated cancer care floor in Pavilion A of UK Albert B. Chandler Hospital includes relaxing waiting areas (left), comfortable patient rooms that include built-in sleeper sofas for families (middle), and a business center.

PRECISION MEDICINE CLINIC GIVES PATIENTS ACCESS TO EARLY CLINICAL TRIALS

The new Precision Medicine Clinic is dedicated to providing patients with increased access to novel, early-phase clinical trials. Patients enrolled in these studies will receive their clinical care from a multidisciplinary team of faculty and staff experienced in clinical trials and oncology drug development.

Many of these early phase clinical trials will be investigator-initiated trials from Markey physician-scientists, as well as national clinical trials sponsored by the National Cancer Institute and Early Therapeutic Clinical Trials Network. Leading-edge trials like these are usually only available to patients treated at NCI-designated cancer centers such as Markey. In addition to UK HealthCare

physicians, community physicians from across the Commonwealth will be able to refer patients to Markey for these unique trials and treatment options.

Clinical pharmacologist Jill Kolesar, PharmD, a professor in the UK College of Pharmacy and a nationally known expert in oncology pharmacogenomics and the implementation of clinical trials, serves as director of the Precision Medicine Clinic.

"This center provides trials that aren't available anywhere else in Kentucky," Kolesar said. "It truly benefits the entire state by providing access to the newest cancer treatments. Referring community physicians will be able to keep their patients here

in Kentucky instead of sending them to other facilities far from home."

Located on the second floor of UK Chandler Hospital Pavilion H, the center includes two exam rooms and four infusion bays for chemotherapy. Kolesar anticipates the clinic will see up to six patients a day and 300 unique new patients annually.

For more information on the Markey Cancer Center Precision Medicine Clinic, call 859-323-7750.

NEW RESEARCH FACILITY WILL FOSTER INNOVATIVE RESEARCH COLLABORATION

In 2015, UK secured funding and broke ground on a special new research facility dedicated to addressing the most pressing health disparities in the state, including cancer, diabetes, heart disease and drug abuse. The \$265 million facility is scheduled for completion in spring 2018. Half of the funding for the facility is coming from the state of Kentucky; half is coming from university resources, including private gifts.

With Kentucky home to the highest overall cancer incidence and mortality rates in the country, the new facility will provide a place for labs dedicated to the eradication of this devastating disease. It will also focus work and attention on health disparities in Appalachia, a region with some of the most pronounced rates of cancer in the country.

An innovative aspect of the facility's mission will be to foster multidisciplinary research across numerous fields, including basic and clinical healthcare, public health, behavioral sciences, agriculture outreach and extension, and economics and engineering. Experts from these areas will work collaboratively in close proximity to develop solutions to complex problems such as cancer.

"Markey is distinctly positioned to help solve the cancer problem in Kentucky," said Markey Director Mark Evers, MD. "Being an NCI-designated cancer center means being a leader in research as well as clinical care and outreach, and this new facility is yet another example of how our work can improve the health of our state."

A new research facility, scheduled to open in 2018, will bring together multidisciplinary research teams to address the most pressing health disparities in Kentucky, including cancer.



UK RESEARCHERS WIN PRESTIGIOUS NIH AWARD TO STUDY THE LINK BETWEEN CANCER AND OBESITY

The statistics are staggering: Kentucky has disproportionately high incidences of both cancer and metabolic disorders – leading the nation in cancer deaths and ranking in the Top 10 for highest obesity rates in the country. While scientists have long known of a direct link between obesity and cancer, the need for further research has become a priority in the interest of keeping Kentuckians healthy.



Kate Zaytseva, PhD, (right) works with Naser Jafari, a postdoctoral scholar in her lab. Zaytseva is part of the first group of investigators at the UK Center for Cancer and Metabolism.

This need is being answered by the UK Center for Cancer and Metabolism, or CCM. Led by Daret St. Clair, PhD, and Binhua “Peter” Zhou, PhD, the CCM harnesses UK’s institutional strengths in cancer and advanced metabolomics tools to focus on the underlying mechanisms linking dysfunctional metabolism to cancer.

The CCM is funded by a prestigious Centers of Biomedical Research Excellence (COBRE) grant from the National Institutes of General Medical Sciences, part of the National Institutes of Health.

The \$11.2 million grant, awarded in April 2017, will fund the CCM over the next five years.

The COBRE grant and establishment of the CCM has put UK researchers in an excellent position to discover scientific breakthroughs that could yield potentially life-saving treatments for people across Kentucky.

UK Markey Cancer Center Director B. Mark Evers, MD, said the CCM is instrumental in Markey’s fight against cancer in the Commonwealth.

“Nowhere in the country is it more important to have this level of cancer research underway,” Evers said. “Kentuckians face a unique set of health issues, but Markey is distinctly positioned to help solve the problem. Being a National Cancer Institute-designated cancer center means being a leader in research as well as clinical care and outreach. This funding will allow us to translate our findings into potential new therapies for cancer patients from Kentucky and beyond.”

MAKING STRIDES IN CANCER METABOLISM RESEARCH

In the CCM, four junior investigators, mentored by teams of clinicians and scientists from a variety of disciplines, departments and colleges at UK, each lead major projects investigating an aspect of cancer metabolism.

“The Center for Cancer and Metabolism helps UK researchers to identify the mechanism underlying the dysregulation of metabolism and cancer development,” Zhou said. “Ultimately, this line of investigation will lead to development of innovative therapeutics to prevent cancer for the benefit of patients and their families in Kentucky.”

Each CCM project leads investigators into new territory to develop exciting new treatments. Travis Thomas, PhD; Yadi Wu, PhD; Ren Xu, PhD; and Kate Zaytseva, PhD, were the CCM’s first group of investigators, with Xu “graduating” from the program in the summer of 2017 after receiving independent grant funding to continue his research.

Thomas is analyzing the role of vitamin D in protecting patients against muscle wasting. To fight basal-like breast cancer, Wu is studying serine biosynthesis pathways to develop an effective therapy combining metabolic drugs and epigenetic inhibitors, which slow cancer’s development. And Zaytseva is developing selective therapies to prevent or reduce colorectal cancer metastasis, the leading cause of death from colorectal cancer-related tumors.

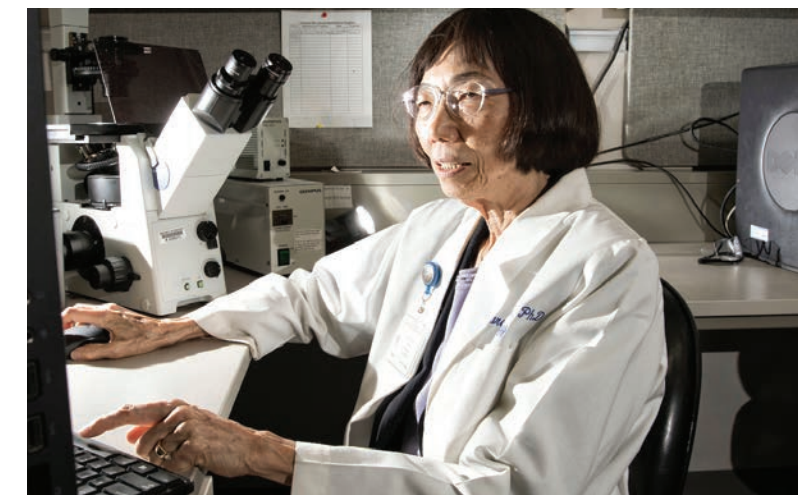
To replace Xu’s project, Luksana Chaiswing, PhD, was selected to join the CCM as a project lead investigator studying radiation-resistant prostate cancer, aiming to enhance radiation therapy as a more effective procedure.

CREATING A CULTURE OF COLLABORATION

Xu’s project focused on defining the role of ROR α in suppressing breast cancer progression and metastasis. Thanks to Xu’s role in the CCM and the support of his mentors, his findings were published in the *Journal of Cell Science*, and an R01 grant proposal based on the project was funded by the NCI.

“The CCM provided substantial help in generating preliminary data, developing the proposal and preparing the application,” Xu said. “In fact, Drs. St. Clair and Andrew Lane are co-investigators on my R01 application.”

That kind of collaboration is exactly why the CCM was an appealing recipient of the COBRE grant, St. Clair said. Earning COBRE grant funding is intensely competitive, both institutionally and nationally. After nearly a year of preparation, UK’s submission was reviewed in June 2016. Upon review, it received a nearly perfect score and was among the leading submissions received for review in 2016.



Daret St. Clair, PhD, is a co-leader of the UK Center for Cancer and Metabolism, a research program that focuses on the underlying mechanisms that link dysfunctional metabolism and cancer.

“Having the kind of environment where learning and collaboration are placed at the forefront is why we were chosen for this grant, and we hope to continue that throughout the life of this center,” St. Clair said.

“It will also enable us to reach out to new and talented researchers who want to come to UK to become new project leaders and continue the work we’re doing.”

Q&A WITH DR. KIP GUY, CANCER RESEARCHER AND DEAN OF THE UK COLLEGE OF PHARMACY

Kip Guy, PhD, joined the University of Kentucky in late 2016 as dean of the College of Pharmacy. Having come to UK from St. Jude Children's Research Hospital, Guy has focused much of his research endeavors on pediatric cancers, including ependymoma, leukemias and medulloblastoma.

We sat down with Guy to talk about his interest in cancer research, what he's working on now and why he's excited about collaborating with researchers at the UK Markey Cancer Center.

What excites you about working with Markey?

The University of Kentucky is an incredible place with a strong and vibrant cancer center in Markey. The UK College of Pharmacy is one of the strongest colleges in the country, if not the world.

This presents tremendous opportunities to push back the frontiers of cancer medicine – personalized medicine, new therapeutic approaches and understanding just how well existing treatments work.

In addition, UK and Markey are right in the middle of an area with high health disparities, particularly in cancer. The combination of a strong academic enterprise and a hospital system point us to exciting opportunities in cancer.

What sparked your interest in cancer research?

I like neat solutions to problems. Initially, chemistry was attractive because most things could be explained with theory.

As I was learning that field, I had two formative experiences. First, my aunt passed away from late-stage breast cancer. I learned that simply trying to kill cancer cells, as most medications did then, was not enough – you also have to focus on harnessing the immune system and preventing the spread of the cancer. This pointed me toward finding new ways to control cancer.

Second, I interacted frequently with oncology nursing staff. This taught me that cancer treatment is often difficult in a practical sense – the treatments wreak havoc on the patient and are often complicated to use. It led me to direct efforts toward finding targets that would simplify and unify therapy.

What are your current cancer research projects?

Earlier in 2017, my team published a study in *Nature Chemical Biology* that shows promise for finding new solutions to treat lung cancer, an especially prominent health problem in Kentucky.

Working with researchers at St. Jude Children's Research Hospital and Memorial Sloan Kettering, we developed a compound that blocks tagging of cancer-causing proteins to control their stability and localization within a cell. We were expecting that this compound would block multiplication of cancer cells by controlling the cell life cycle. Unexpectedly, the compound had little effect on cell multiplication itself.

While we didn't kill the cells, we prevented them from being metastatic, and lung cancer is a disease that's really characterized by metastatic growth. We're pretty excited about that.

What is your role in tackling Kentucky's cancer challenges?

I foster and support collaborative projects that are centered around drugs. Our college's research domains include outcomes research, clinical pharmacy, precision medicine and drug discovery, which all contribute to UK cancer research.

I also serve as a leader by example. By maintaining an active research program aimed at practical, useful drug discovery, I show that we can achieve success in developing drugs for cancer. More importantly, we provide an ongoing learning example of how to discover new drugs.

How are you working to enhance UK's cancer research?

As a researcher, I'm characterized by interdisciplinary, interprofessional work. My experience has been that it's never as simple as you think it'll be. You need to bring a wide range of thinking to the problem, construct different models of how the drugs might work, and dig into different ways of explaining what's going on.

To do that, you bring together a diverse range of scientists and clinicians regularly, develop a common understanding, and then synthesize new work from that framework. I apply that model of working to each problem I engage with, especially in cancer.

This is particularly important in a complex disease like cancer, where seemingly similar tumors can actually be unique – each being the product of its genetics and environment.

What's the benefit of having the College of Pharmacy and Markey Cancer Center on one campus?

We're not just on the same campus – we share a facility. Markey Cancer Center has many researchers who reside here in the Lee T. Todd, Jr. Building. Many of our faculty are members of Markey. This gives them the opportunity to physically interact every day and really facilitates collaborative work.

We sit at the crossroads for any project that's going to do a therapeutic intervention that involves a drug. At any given time, Markey has literally hundreds of basic, translational and clinical studies underway, and many of those have a new or repurposed therapeutic agent at the focus.

Kip Guy, PhD, joined UK in 2016 as the dean of the UK College of Pharmacy. Guy has focused much of his research endeavors on pediatric cancers.

CANCER SURVIVOR LOSES SENSE OF TASTE TO TREATMENT, BUT SAYS LIFE IS SWEETER

It wasn't until he could no longer open his mouth to take a bite of a cheeseburger that Barry Warner knew something was seriously wrong.

The Winchester, Ky., resident had been experiencing some mildly annoying symptoms: a little discomfort while eating and a reduced appetite. He pushed on, assuming the issue would clear up on its own.

But once the pain escalated – leading to the jaw mobility issue – Warner sought the opinion of a friend with expertise in the area: the oral surgeon who had removed his wisdom teeth some 20 years before.

The diagnosis ended up being much more serious than Warner ever expected. Seeing a mass in Warner's throat, the surgeon took a biopsy and confirmed the bad news: Warner had advanced throat cancer.

"When somebody tells you that you have cancer, your world stops then and there," Warner said. "But one of my first thoughts was, 'Thank goodness it was me and not one of my daughters.'"

SEARCHING FOR ANSWERS

The news was especially shocking considering Warner didn't fit the profile for someone at risk for a head and neck cancer. Roughly 75 percent of these cancers are caused by smoking or excessive alcohol use, but Warner used neither. Nor did he test positive for the human papillomavirus, or HPV, a risk factor that has been increasing the incidence of these cancers, particularly in non-smokers, in recent years. It was, as some might say, just simple bad luck.

Warner began collecting information on his treatment options. He first sought help at the UK Markey Cancer Center, where he met with medical oncologist Susanne Arnold, MD. Although he says he got "good vibes" from their consultation, Warner was thorough in his research, opting to get a second opinion at another facility before making a decision.

Because of the location of his cancer, Warner was told only two medical centers in the country would even attempt to surgically remove it, and it would be a radical procedure with no guarantee of a good outcome.

After his second opinion, he knew he would go with a combination of chemotherapy and radiation. He wanted to stay closer to home so he would have the support of friends and family to help him through the ordeal. He ultimately chose Markey based on his initial meeting with Arnold.

"The combination of chemotherapy and radiation is some of the toughest treatment to undergo, but he was very strong and did exactly what we asked of him."

– Susanne Arnold, MD

"The second facility told me I had a 40 percent chance of survival – maybe 50 percent just because I was otherwise healthy," he said. "But Dr. Arnold – she said she thought she could help me. And I believed her."

Warner began treatment at Markey, undergoing 35 radiation sessions and three chemotherapy infusions over the next two months. Although his cancer was advanced, it had not metastasized very far and was still in a "curable" stage, Arnold said. Because of this, Warner's treatment plan was bold in an attempt to eliminate the cancer entirely.

"The combination of chemotherapy and radiation is some of the toughest treatment to undergo," Arnold said. "But he was very strong and did exactly what we asked of him."

Markey radiation oncologist Mahesh Kudrimoti, MD, who led the radiation treatments, echoes the importance of Warner's willingness to follow his plan to a T.

"He diligently followed all the instructions," Kudrimoti said. "He had a very positive attitude, was eager to learn about his treatments and was a fighter."

A REMARKABLE RESPONSE

Now age 59 and seven years out from his treatment, Warner is a survivor with a few figurative battle scars. The biggest downsides to treating head and neck cancers are the nearly unavoidable side effects the chemo and radiation cause – namely, significant alterations to taste, smell and hearing. Warner's sense of smell is intact, but he has some hearing loss and is no longer able to taste foods except those that are extremely spicy, sweet or salty.

But Warner says it's a trade-off he happily accepted when faced with the alternative of, say, not being around to walk either of his daughters down the aisle.

"The side effects I deal with are collateral damage," he said. "I'm all right with that. It's just part of it. In the grand scheme of things, it's pretty insignificant."

"He has an amazing philosophy of life," Arnold said. "His experience is pretty common, with chronic side

effects that affect your everyday life, but his response to those limitations is remarkable."

SHARING HIS STORY

Although he may have lost his sense of taste, life is sweeter for Warner, who says that getting sick was one of the most humbling experiences of his life. He calls his experience with cancer his "second chance" to do things right, forcing him to step back and re-evaluate his priorities.

One of the ways Warner is doing that is by sharing his story with others – whether it's speaking with patients about how he dealt with cancer, serving on Markey's Patient Advisory Group to help improve care at UK, or lending his opinion on the best food and drink for patients with side effects similar to his.

"Getting diagnosed with cancer was probably one of the best things that happened to me, and I am not the same person I was before," he said. "So I made myself a promise that if I survived, I would do my best to give back and help make a difference."

Barry Warner was diagnosed with throat cancer and underwent a grueling treatment plan that called for 35 radiation sessions and three chemotherapy infusions. But with the help of Susanne Arnold, MD, Warner is a seven-year cancer survivor with only a few figurative battle scars.

UK RESEARCHER HIGHLIGHTS LINK BETWEEN OPIOID EPIDEMIC AND CANCER

Kentucky has been significantly impacted by two major health concerns facing the nation: the opioid epidemic and cancer. The state's cancer incidence and mortality rates are the worst in the country, while deaths related to opioid overdose continue to rise year after year.

Given those trends, it's no surprise that Doug Lowy, MD, the acting director of the National Cancer Institute, and Norma Volkow, MD, the director of the National Institute of Drug Abuse, visited Eastern Kentucky in October 2016 to learn more about these two health burdens and how they intersect.

Opioid use and cancer may seem unrelated, but research from the University of Kentucky Center on Drug and Alcohol Research is showing how one disease impacts the other.

Jennifer Havens, PhD, an epidemiologist at the center, had the opportunity to speak with Lowy and Volkow during their visit about her work examining the impact of injection drug use in Appalachian Kentucky. Since 2004, Havens has been assessing the rise of injection drug use and the related outbreak of the hepatitis C virus, or HCV.

HCV is important in the connection between opioid use and cancer. It causes inflammation of the liver which, left unchecked, increases an individual's risk of developing hepatocellular carcinoma, or liver cancer. Because many injection drug users become

"Across the UK campus, teams are conducting research and implementing programs in Appalachia to understand and support an underserved population who are being significantly impacted by these two deadly diseases."

– B. Mark Evers, MD

infected with HCV, preventing the contraction of this disease is important to preventing the development of liver cancer.

Havens' research is an example of the multidisciplinary work that is possible at UK, where scientists from different specialties can come together to find novel ways to address the needs of people in Kentucky.

B. Mark Evers, MD, director of the UK Markey Cancer Center, knows that combating the cancer burden in Kentucky must include examining the relationship between opioid use disorder and liver cancer and addressing both diseases.

"Across the UK campus, teams are conducting research and implementing programs in Appalachia to understand and support an underserved population who are being significantly impacted by these two deadly diseases," Evers said.

"The opportunity to share that important work with leaders at the federal level means the stories of our patients and research participants are being heard at the highest levels and being considered when decisions are made on how best to address these two epidemics."

Doug Lowy, MD, (middle), the acting director of the National Cancer Institute, talks with UK College of Medicine Dean Robert DiPaola, MD, (left) and UK Markey Cancer Center Director B. Mark Evers, MD, during his visit to UK HealthCare in October 2016.

Lowy meets with Jennifer Havens, PhD, to discuss her research related to opioid use and cancer.



MARKEY IS RAISING THE BAR FOR CANCER CARE ACROSS KENTUCKY AND APPALACHIA

With more and more affiliate sites dotting the map throughout Kentucky and Appalachia, the UK Markey Cancer Center Affiliate Network (MCCAN) is providing a growing population of patients and families with access to high-quality cancer care close to home.

This improved access to cancer services is vital, especially across Appalachia where cancer rates continue to rise.

However, the affiliate network is about more than convenience: It is about furthering the Markey mission to improve the quality of cancer care across the state and beyond its borders.

THE GOLD STANDARD FOR CANCER PROGRAMS

Markey sets the bar high and encourages its affiliate network members to follow suit.

Thus, when Markey received a three-year accreditation renewal in 2017 from the Commission on Cancer (CoC) of the American College of Surgeons, four affiliates also rose to the challenge and achieved their initial designation. That 13 of the 18 total MCCAN partner sites are now CoC-accredited is proof that Markey is successfully extending its reach to ensure cancer patients receive excellent care, whether they're treated in Lexington or in coordination with facilities in their own communities.

"This accreditation is the gold standard for cancer programs of all sizes to demonstrate their level of commitment to quality cancer care," said Timothy Mullett, MD, medical director of the affiliate network.

"The CoC accreditation is important because it is a national accreditation that can be achieved by all cancer programs," said Cheri Tolle, MAEd, CHES, administrative director of the affiliate network. "Whether it's a small community hospital or a large academic medical center, all are held to the same quality standards regardless of size, so it became clear that this is what we needed to pursue."

MARKEY HELPS AFFILIATES THROUGH RIGOROUS REVIEW

Earning CoC accreditation requires the successful completion of an on-site evaluation and performance review that assesses a site's compliance with 34 key quality standards in areas ranging from clinical care quality and the availability of support services to the scope of research and data management.

"From a patient perspective, if you go to a CoC-accredited hospital, you know that they have met a rigorous list of quality standards and that they have the personnel, equipment and resources to provide specific cancer services, or they can refer directly to an accredited center that can," Tolle said.

All community hospitals and cancer centers that make up the MCCAN either have achieved CoC accreditation or are working toward it, with Markey supporting them every step of the way.

"One of the key features of the affiliate network is our ability to work with other programs to achieve or strengthen their accreditation," Mullett said.

The MCCAN provides individualized support based on each member's needs, such as educating

providers on the latest surgical techniques or medical therapies, providing aid specific to the CoC review process, offering application assistance, mentoring staff, reviewing policies and procedures, and more.

A CONTINUED PURSUIT OF EXCELLENCE

It is because of these efforts that three MCCAN sites achieved CoC accreditation this year: Clark Regional Medical Center in Winchester, Georgetown Community Hospital in Georgetown and TJ Samson Community Hospital in Glasgow. Methodist Hospital in Western Kentucky was first accredited in 2016.

Current affiliates not yet accredited are working toward achieving this designation in 2018. Those accredited, including Markey, will continue to evaluate and adapt their processes and procedures so that they can maintain their CoC quality standing.

Through its collaborative relationship with affiliates, Markey is well positioned to fulfill a key responsibility as Kentucky's only cancer center designated by the National Cancer Institute: leading the way in improving the quality of cancer care throughout the state.



A QUALITY PROGRAM
of the AMERICAN COLLEGE
OF SURGEONS

MARKEY LEADS BY EXAMPLE

The Commission on Cancer (CoC) designation is awarded to hundreds of cancer programs large and small that demonstrate a commitment to providing high-quality, patient-centered care. However, fewer than 50 programs nationwide earn the CoC's top-tier rating, the Outstanding Achievement Award. For the first time, the UK Markey Cancer Center has earned this recognition in 2017.

According to Timothy Mullett, MD, Markey had an obligation to rise to the top.



Timothy Mullett, MD

"We are the only National Cancer Institute-designated hospital in Kentucky and we represent a broader Affiliate Network, so our goal is to set the standard for the state," he said. "We have to represent the level of quality we want others to uphold. We did not want there to be any question that we deliver the best care possible."

To achieve the CoC Outstanding Achievement Award, Markey received a perfect score on all 27 required quality standards. Mullett's team then went above and beyond to achieve a commendation rating for seven additional standards, including routinely disseminating outcomes data to the public, employing specialty trained oncology nurses, enrolling patients in cancer-related clinical trials and more.

"This is another measure of the strength of our program, and it shows that we are taking care of patients in the contemporary and comprehensive way that we should," Mullett said.

DELIVERING THE LATEST TREATMENT OPTIONS TO PATIENTS THROUGHOUT THE COMMONWEALTH

In a state with the highest incidence of cancer in the nation, delivering the most advanced care to as many patients as possible is a vitally important mission.

As part of that mission, the UK Markey Cancer Center continues to cast an ever-wider net of influence, bringing novel research studies to more patients across Kentucky and Appalachia through the Markey Cancer Center Research Network.

“It’s been shown that patients who participate in clinical trials receive high-quality care and have good outcomes because they have access to treatments not available under conventional management,” said Timothy Mullett, MD, medical director of the research network. “If we only offer these studies in Lexington, then fewer patients have the opportunity to participate.”

To bridge this gap, Markey launched the Research Network in 2015, partnering with select community hospitals to conduct clinical trials in more locations. These partnerships are giving more patients access to advanced treatments.

“We now have six sites in the research network, and the expectation is that we will continue to grow,” Mullett said.

Owensboro Health Regional Hospital joined the research network earlier in 2017 and is the western-most location within the network. Owensboro is part of an expanding focus for the Research Network, which initially targeted partners in Appalachia and Eastern Kentucky.

However, as the only center in the state designated by the National Cancer Institute, Markey was tasked with meeting the needs of cancer patients throughout the state, including Western Kentucky.

“We took the NCI recommendation to heart and began talking to programs in Western Kentucky,” Mullett said.

To become a member of the research network, Owensboro, like all partner sites, was required to meet stringent criteria.

“We have a rigorous onboarding process. We select sites based on the expertise of personnel and the capacity of the facility to uphold the critical quality standards required for clinical research,” said Kris Damron, director of the research network. “Owensboro is a superb facility that has been conducting research for many years. Their inclusion in the research network is significant because it

means a dramatic increase in access to trials for the entire western portion of the state.”

Patients with a Markey Research Network site in their community no longer have to travel to receive state-of-the-art cancer care. Instead, they benefit from the convenience and comfort that comes with being treated close to home, under the supervision of a local doctor and with family nearby to offer support.

For Markey, the benefits of this growing network of sites include the dissemination of both NCI-sponsored studies and those led by Markey scientists into more communities, Damron said.

Because it’s not feasible to offer every open trial at every partner site, Markey is strategic in its allocation of clinical studies, giving patients access to those treatments that will be most beneficial.

“We look at the types of cancer most prevalent in a particular area, we consider the requirements of a particular trial, the capacity of the partner site and the scientific interests of their physicians,” Damron said. “We work to ensure the portfolio of studies is always balanced to include those focused on therapeutic options, disease prevention, and survivorship or supportive care.”

Mullett agreed and said the research network is a crucial aspect of Markey’s larger mission to reduce the burden of cancer across Kentucky and the region.

“Our goal is to deliver the right trials to the right program to the right patients,” Mullett said. “This is critical if we are to have a comprehensive impact in the state of Kentucky.”

Some of the key studies currently offered through the Research Network include:

- **Optimization of Smoking Cessation Strategies:** It’s been proven that those undergoing treatment for lung cancer and cancers of the head and neck have better outcomes if they stop smoking, Mullett said. This study, led by Markey ear, nose and throat surgeon Joseph Valentino, MD, helps patients determine the best smoking cessation option for their needs – from medication and nicotine replacement therapy to cessation counseling and more.
- **Lung Cancer Education Awareness Detection and Survivorship (LEADS):** Markey is part of the LEADS collaborative dedicated to reducing the burden of lung cancer in Kentucky. As part of this comprehensive effort to study the disease, select research network sites are examining what barriers exist for high-quality lung cancer screening in the state. These sites are also examining the delivery of precision survivorship care interventions to improve quality of life and reduce symptom burden.
- **Precision Medicine:** Sites are also conducting an observational study evaluating outcomes of genomic testing in cancer patients with rare and refractory tumors.



WITH CANCER BEHIND HER, IT'S BACK TO SCHOOL AGAIN FOR THIS TEACHER

Dealing with a classroom full of rowdy second-graders can be taxing on even the most patient, energetic individual.

But for 42-year-old Versailles schoolteacher Erika Carter, the real challenges have happened outside the classroom. In the summer of 2015, she visited her doctor for her yearly checkup and bloodwork, which yielded some bad news: an anomaly in her white blood cell count.

Months of monitoring and referrals followed, including a bone marrow biopsy. Her white blood cell count continued to drop, and on Sept. 24, 2015, she received a call telling her to immediately come to the emergency room at the UK Albert B. Chandler Hospital. She would not go back to teaching for the rest of the year.

"I was numb," Carter said. "I just kind of didn't have any feelings at that point. I just couldn't believe that my world was completely rocked."

Carter was diagnosed with acute promyelocytic leukemia (APL), a subtype of acute myeloid leukemia. Gerhard Hildebrandt, MD, a UK Markey Cancer Center blood and marrow transplantation hematologist and Carter's physician, says the good news is that this type of cancer is usually curable with fast intervention. And in Carter's case, the cancer was discovered very early, which boded well for her treatment.

"It's characterized by a certain genetic change, which fortunately allows this disease to have a higher cure rate than other leukemias," Hildebrandt said.

GETTING THROUGH TREATMENT

Over the next nine months, Carter underwent 128 chemotherapy treatments, including a 19-day stint as an inpatient at Markey. Throughout her journey, she built a good relationship with the nursing team that took care of her.

"They are always upbeat and friendly," she said. "All across the board, the nurses were fabulous. I've gone back several times to see them. I really had a good experience."

Hildebrandt agreed and said the communication between patients and his team is one of the strengths of the program at Markey.

"The team is not too big, so everybody knows the patients quite well," Hildebrandt said. "Communication is very easy both among the patient and the care team and between the care team itself. I think it gives a level of personalized care."

"They were great, so great, in welcoming me back. I'm just glad I had a story where I was able to come back, and [the students] are like, 'OK, people can have cancer, but they also survive it, too.'"

– Erika Carter

Carter was lucky that she had minimal side effects after chemotherapy, so she tried her best to keep on with much of daily life. She took advantage of some of UK HealthCare's integrative medicine options, including Jin Shin Jyutsu and art therapy, but says the hardest thing for her during the treatment was not being able to go outside.

"I'd look out the window and see everyone going to the UK game," she said. "I love going to the UK games, so just watching them, I felt like this prisoner. Luckily, I had a huge support system with my friends, family and church."

BACK TO SCHOOL

In August 2016, Carter was just getting back to work after nearly a year off. Coming from a family of educators, she carries a love for teaching in her

Top: Erika Carter, a second-grade teacher from Versailles, Ky., was forced to miss a year of school after being diagnosed with leukemia. After being treated at the UK Markey Cancer Center, she returned to the classroom, where her students were excited to see her. Bottom: Carter hugs her doctor, Gerhard Hildebrandt, MD, a blood and marrow transplantation hematologist at Markey.

blood and was eager to get back to the Southside Elementary classroom she's been teaching in for six years. She says she's inspired by her students, who motivate her to carry a positive attitude throughout the day.

"I'll tell you what – with teaching, you just really can't have a bad day," Carter said. "I love the children, they make me laugh. I could have a rough day, but I've got to check that at the door and I've got to walk in and put that smile on my face for these kiddos. I want it to be just a fun experience for them, to love learning and love education."

Although her students are young, Carter says that many of them had some understanding of what she had gone through. She has a picture that says "We love Ms. Carter" and a banner signed by the entire school that she hung at the hospital.

"They were great, so great, in welcoming me back," she said. "I'm just glad I had a story where I was able to come back, and [the students] are like, 'OK, people can have cancer, but they also survive it, too.'"

THE IMPORTANCE OF PREVENTIVE CARE

In fact, at the end of the 2017 school year, Carter invited Hildebrandt to come visit her class and give her students a quick lesson on what cancer is and what doctors do to treat it.

"It's a fantastic honor to be here," Hildebrandt said. "When you have a patient who does remarkably well and then goes back to daily life, like Erika with her kids in this classroom, it's the reward for the entire team."

Carter describes the circumstances around her diagnosis as a "blessing," noting that her case could have turned out very differently if she'd neglected to get her physician-recommended preventive care.

"It is very important to get preventive care," Carter said. "Sometimes when you need to get bloodwork, it's very easy to push that aside. But thank the Lord I did go – because had I not, I would've ended up in a really bad state. It would've been possibly too late or it would've been a whole other road of struggle."



MARKEY'S MOLECULAR TUMOR BOARD THRIVING IN ITS FIRST YEAR

Every first and third Tuesday of the month, a crowd of specialists spanning a variety of healthcare and scientific disciplines gathers in a small conference room at the UK Markey Cancer Center.

Their goal? To take patient care to the most personalized level possible.

This conference, known as the Molecular Tumor Board, officially launched at Markey in October 2016. Physicians from UK and medical centers across the state present their toughest cancer cases to the Tumor Board, seeking new, possibly outside-the-box insights from the team of oncologists, hematologists, surgeons, pharmacists, pathologists, biostatisticians, basic scientists, genetic counselors, epidemiologists and more.

FINDING INNOVATIVE TREATMENTS FOR KENTUCKY

When a patient is referred for Tumor Board discussion, the results of their Next Generation Sequencing test (from UK's in-house testing or

outside vendor testing) is sent to Molecular Tumor Board members. The report will be evaluated for gene mutations offering several possible options for care: potential clinical trials, FDA-approved therapies for that patient's cancer type, FDA-approved therapies in another tumor type (colloquially known as "off-label use"), immunotherapy or further genetic testing.

As of September 2017, Markey's Molecular Tumor Board had reviewed 130 patient cases. Seventy-six of these cases have received an administrative review and recommendations, while the other 54 have been presented for broad discussion because of their complexity. Four to six patient cases are discussed at each meeting to allow the team adequate time to talk through each case in detail.

Although 28 different types of cancer have been presented, the vast majority of cases referred to the Tumor Board are lung cancer patients – a fitting trend for a state that has the worst rates of lung cancer incidence and death in the country.

Learning more about which gene mutations cause specific cancers here in Kentucky will help Markey researchers determine which clinical trials need to be created or recruited to aid the state's cancer population.

"Not only are we able to recommend some truly innovative therapies for our patients, we're also learning valuable information about the mutations causing these cancers," said Rachel Miller, MD, co-director of the Molecular Tumor Board. "This knowledge will guide us as we grow our capacity for clinical trials."

IDENTIFYING INHERITED CAUSES FOR CANCER

The Tumor Board's gene panel focuses on somatic mutations, meaning mutations that have been acquired through a mistake in a patient's DNA and that are present only in the cancer. However, the gene panel sometimes reveals an inherited mutation or other factors around the patient's case may raise red flags about possible inherited mutations.

"Not only are we able to recommend some truly innovative therapies for our patients, we're also learning valuable information about the mutations causing these cancers. This knowledge will guide us as we grow our capacity for clinical trials."

– Rachel Miller, MD

Markey Genetic Counselor Justine Cooper attends the Tumor Board meeting and takes referrals for patients who may benefit from what's known as

Chandler Park, MD, a medical oncologist at Hardin Memorial Health, is actively involved in the UK Markey Cancer Center's Molecular Tumor Board. He provides valuable insights as a treating physician and also gathers knowledge on the latest cancer treatment options that he can take back to his team at HMH.

germline genetic testing – that is, mutations that can be passed down family lineage.

For patients, this additional testing can provide important information for the future, both for themselves and for their loved ones.

"It can help guide them – for example, if a patient is being treated for breast cancer and her testing reveals a possible inherited cause for her breast cancer, then she may have a higher risk of developing another cancer in the future," Cooper said. "Or it may not directly impact that specific patient, but it could impact their family members and help guide their cancer screening recommendations."

BRINGING TOGETHER CANCER LEADERS FROM ACROSS THE REGION

Although the majority of presentations have been referred by internal UK physicians, other health systems across the state have participated, including TJ Samson Community Hospital in Columbia, Ky.; KentuckyOne Health; Commonwealth Health Corporation; Owensboro Health; and Hardin Memorial Health (HMH).

Chandler Park, MD, a medical oncologist at HMH, has been actively involved in Markey's Molecular Tumor Board from the beginning. As a member of the Tumor Board, he provides valuable insight from the treating-physician perspective while also gathering knowledge on the latest cancer treatment options that he can take back to the entire team at HMH.

"We are able to clearly understand a patient's cancer, its distinctive mutation, and hopefully identify treatment protocols that best address its unique qualities," Park said. "The Molecular Tumor Board allows Kentucky's cancer leaders to come together to consider all the potential treatments and agree on the very best option for patients from Paducah to Pikeville and beyond."

COMMUNITY PROGRAM USES ART TO ENCOURAGE DISCUSSION ABOUT CANCER

Alongside the latest treatment options and leading-edge research, the UK Markey Cancer Center also uses art as a powerful tool in the fight against cancer.

In 2014, Carla Repass, Markey's former assistant director for administration, and Cindy Robinson, a former Markey nurse practitioner, had a goal to provide cancer patients with a place where they could relate to others and share positivity with others who need it. With that idea in mind, they launched the Expressions of Courage Survivor Art Celebration, giving former and current cancer patients an opportunity to share their experiences with the disease through art.

Inspired by the success of the celebration, Markey Community Outreach Director Melissa Hounshell started the Expressions of Courage Art Education Program in 2016. The program is a recognition of the enormous toll cancer takes not only on those who are diagnosed, but on their friends, family and community, as well.

When visiting a school, Hounshell presents a health and wellness program to students, and

afterward, art teachers ask the students to create an art piece showing how their lives have been impacted by cancer. To date, the program has given students from seven Kentucky high schools the opportunity to share their experiences with cancer through art.

Accompanying each work of art is a narrative that describes the student's piece. At the end of the program, an art showcase is held and awards are given to two students from each school.

Cancer incidence is especially high in Eastern Kentucky, meaning very few people remain unscathed by the disease. Unsurprisingly, the art education program has thrived in this area.

"Eastern Kentucky is rich with wonderful artists and a love of community," Hounshell said. "This is a perfect opportunity to showcase some of these young artists and at the same time provide a healthy message."

After the art show, prints are created of some of the winning pieces and are hung in community hospitals. Highlands Regional Medical Center

in Prestonsburg, Ky., a Markey Cancer Center Affiliate Network member, proudly displays pieces in its new oncology suite. In addition, student artwork is also displayed at the Expressions of Courage Survivor Art Celebration held each June on Markey's campus.

The program also provides an opportunity to share information on cancer prevention. While students are considering cancer's impact on their lives, Hounshell teaches them about ways to prevent the disease in the future. It's a two-pronged approach that Hounshell hopes will help reduce the cancer burden in Kentucky moving forward.

In coming years, Hounshell said she plans to add more schools to the program, including elementary and middle schools.



Student artwork from the UK Markey Cancer Center's Expressions of Courage Art Education Program hangs in the oncology suite of the Highlands Regional Medical Center in Prestonsburg, Ky., a Markey Cancer Center Affiliate Network member.

UNIQUE PROGRAM EMPOWERS UK UNDERGRADUATES TO FIGHT BACK AGAINST CANCER IN APPALACHIA

The UK Markey Cancer Center is fostering the future of cancer care in Kentucky through an inspirational and quickly growing initiative called the Cancer Training in Oncology Program.

The program, known as CTOP, is in its second year of bringing passionate undergraduates at the University of Kentucky into the fold in the fight against cancer in Appalachia.

CTOP is taking aim at Kentucky's cancer incidence and mortality rates – the highest in the nation – by educating and empowering UK undergraduate students interested in future oncology careers. All program participants hail from one of the state's 54 Appalachian counties, where the cancer rates and mortality are at their worst.

"Our goal is to get these undergraduates prepared to pursue cancer-related careers," said Nathan Vanderford, PhD, MBA, assistant professor and CTOP cofounder. "Whether that's being medical doctors, researchers, nurses, physician assistants, pharmacists – we need more of all these professionals throughout Kentucky, with a passion for helping their communities."

The program introduces students to all aspects of the cancer world through four main components: hands-on research, clinical observation and shadowing, classroom and workshop learning, and community outreach in the participants' own towns and neighborhoods.

"Through outreach activities, students help the community better understand the state's cancer problem," Vanderford explained. "They also help the general population understand their chance of getting the disease and how to lower their risk."

MORE COHORTS OF MOTIVATED STUDENTS

CTOP kicked off in 2016 with its first cohort of eight eager undergraduates. One of these inaugural program participants, junior Kristin O'Leary, says she has found the experience invaluable.

"If you can interest people from Appalachian Kentucky to learn and study cancer, then you can help affect the high rates of incidence," she said. "Through CTOP, I've been able to learn all about cancer and help my community in many ways."

In addition to shadowing as many surgeries as she can fit into her schedule, O'Leary spends her time in CTOP studying acute lymphoblastic leukemia in zebra fish with Jessica Blackburn, PhD, and her lab. With a drive to impact her own community of Edmonton, Ky., O'Leary is also preparing to lead a free mammogram event in her hometown with CTOP's help and support.

"Our goal is to get these undergraduates prepared to pursue cancer-related careers. Whether that's being medical doctors, researchers, nurses, physician assistants, pharmacists – we need more of all these professionals throughout Kentucky, with a passion for helping their communities."

– Nathan Vanderford, PhD, MBA

Now O'Leary is taking on the role of mentor for CTOP's second cohort for the 2017-18 school year, including UK freshman and Stanton, Ky., native Carrigan Wasilchenko.

"I have a lot of family that have been affected by cancer, so it's an issue that's really important to me," Wasilchenko said. "I thought it would be amazing to be a part of something that could help me explore oncology before really venturing into my career."

Through CTOP, Wasilchenko is most looking forward to gaining research experience, learning from others and giving back to her community. And she draws inspiration from O'Leary and the rest of the program participants before her.

"This program has really impacted the first cohort," Wasilchenko said. "They talk highly of their experiences, and their stories are so inspiring. I hope CTOP continues to give more people like me the opportunity to learn about cancer firsthand."

EXPANDING CTOP IN THE FUTURE

CTOP's initial funding came through a two-year National Cancer Institute supplement grant. As the successful program enters its second year, Vanderford has applied for another grant to continue its growth and focus even more on career development.

"Research shows that the more mentorship and career development coaching that students get as early as possible, the more successful they're going to be," he said.

With this grant, Vanderford also plans to significantly increase the program's outreach activities and hold a residential summer camp at UK for high schoolers from Appalachian Kentucky interested in oncology careers.

"Cancer prevention is really the best cure we have for cancer right now. So doing more outreach activities that help individuals understand how they can avoid getting cancer in the first place is something that we want to do more of with CTOP," he said.

Although it will take several years to see the true impact of this program in Appalachian Kentucky, Vanderford says he currently measures success through the aspirational attitudes and achievements of the CTOP students.

"It's inspiring to watch the students gain a better appreciation for cancer," he said. "We hope to empower them to keep on their upward academic trajectory, to pursue their degrees, and to explore their interests in medicine, research and outreach."

Members of the Cancer Training in Oncology Program talk with Nathan Vanderford, PhD, MBA, (center) the cofounder of the program. CTOP is a new initiative at Markey that is bringing undergraduate students at UK into the fold in the fight against cancer.

MARKEY WOMEN STRONG PHILANTHROPY PROGRAM EMPOWERS WOMEN-LED CANCER RESEARCH



“Stronger together” is a motto that inspires many aspects of Lois Reynolds’ life.

From her approach to her family and friendships to her involvement with the UK Markey Cancer Foundation as a board member, she has long understood the impact that can be made when a group of people rally around a mission.

Reynolds’ first introduction to cancer came when she was 24, when her uncle was diagnosed with melanoma despite not showing any of the disease’s typical symptoms. Within six months of the diagnosis, he was gone. Since then, Reynolds has lost other close friends and family members to cancer, including her own mother. She has even faced her own recurring battle with skin cancer.

Reynolds knows that cancer affects nearly everyone in some way, and her experience with it has fueled her desire to make a real difference in the fight against the disease.

She decided she wanted to make a meaningful and lasting contribution to the UK Markey Cancer Foundation in a way that also created passionate ambassadors for the research and clinical work being done at the UK Markey Cancer Center.

With that goal in mind, Markey Women Strong was formed in 2017.

HOPE THROUGH RESEARCH

Reynolds first discussed the idea for Markey Women Strong, or MWS, with UK Markey Cancer Foundation President and CEO Michael Delzotti.

“We talked about the many emotions, including anger, grief and frustration, that surround a cancer diagnosis, regardless of whether it is oneself or a family member, and about the empowerment

From left to right: Markey Women Strong member Katie Alford; MWS Distinguished Researcher Rina Plattner, PhD; MWS member Josefina Young; MWS Distinguished Researcher Kathleen O’Connor, PhD; and MWS founder Lois Reynolds discuss the work being done by women researchers at the UK Markey Cancer Center.

that comes with knowing you are taking an active part in something bigger than yourself,” Delzotti said. “I was reminded of something lauded Markey hematology and oncology specialist Dr. Ed Romond once said: ‘The best hope a cancer patient has is good research.’”

To encourage and promote such cancer research, each member of MWS commits to making an annual gift of \$1,000. Together, the group listens to presentations by female researchers carrying out research at Markey. The group then votes to select which research projects to fund with the pooled contributions.

“We talked about the ... empowerment that comes with knowing you are taking an active part in something bigger than yourself. I was reminded of something lauded Markey hematology and oncology specialist Dr. Ed Romond once said: ‘The best hope a cancer patient has is good research.’”

– Michael Delzotti

“Women in philanthropy supporting the work of female researchers was most appealing to our core group when starting MWS,” Reynolds said.

In its inaugural year, the members of MWS awarded two \$50,000 Distinguished Research grants to Kathleen O’Connor, PhD, for her research on triple-negative breast cancer, and to Rina Plattner, PhD, whose research focuses on melanoma metastasis and therapeutic resistance.

“We had a great first year for Markey Women Strong, and I am very proud of that, but my goals for this project are much bigger,” Reynolds said. “I would like for 100 of my friends to donate \$1,000 each, then I would like them to get 100 of their friends

to donate \$1,000 each and watch it continue to multiply. Each of us knows how uniquely cancer has affected us, and I want them to be an active participant in ensuring their donation makes a difference.”

CREATING MORE STORIES OF SURVIVORSHIP

Throughout the year, the UK Markey Cancer Foundation, which manages the MWS fund, hosted a lecture series for MWS members featuring updates and scientific advancements that are being made as a result of the group’s funding. Each salon-style event also features a testimonial from a cancer survivor.

Reynolds said the presentations are an emotional reminder of the positive work the group is supporting in the fight against cancer.

“At our first MWS lecture, 24-year-old Reilly Butler gave us a very authentic and moving account of her journey through brain cancer diagnosis and treatment,” Reynolds said. “Afterward, Dr. John D’Orazio explained that we are funding research that will create more stories of hope and survivorship like Reilly’s. It is profoundly empowering to know we are playing an active role in the process and to truly understand the difference we are making with our contributions.”

To learn more about Markey Women Strong or to become a member, go to www.ukmarkey.org/how-to-help/markey-women-strong or contact Amy Morgan at amy.morgan1@uky.edu.

MARKEY HOSTS NATIONAL CONFERENCE FOR CANCER CENTER DEVELOPMENT AND COMMUNICATION PROFESSIONALS

More than 400 communication and development professionals from cancer centers across the country gathered in Lexington in 2017 for the National Association of Cancer Center Development Officers (NACCCDO) and the Public Affairs and Marketing Network (PAMN) of National Cancer Centers annual conference.

The UK Markey Cancer Center and UK Markey Cancer Foundation served as hosts for this year's conference, which took place April 17-21. Participants representing more than 75 cancer institutions attended the event, making it one of the highest-attended conferences since the joint event began in 1987.

The NACCCDO/PAMN annual meeting is an opportunity for public relations, marketing and development professionals at major cancer centers to network and learn from their peers about current best practices for highlighting cancer research and clinical care.

Membership is open to cancer centers based in academic medical centers and/or research institutes: members include either National Cancer Institute cancer centers or members of the Association for American Cancer Institutes.

In addition to the nearly four dozen individual breakout sessions for NACCCDO and PAMN members, this year's conference included multiple

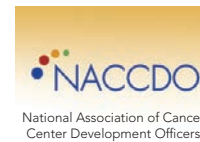
plenary presentations on a variety of topics. One such presentation featured UK HealthCare neuropsychologist Dan Han, PsyD, and Kentucky chef Ouita Michel in an interactive lunch demonstration highlighting the field of neurogastronomy – the science of how the brain influences a person's perception of food.

The conference also included a cancer center directors panel featuring Roy Jensen, MD, director of the University of Kansas Cancer Center; Candace Johnson, PhD, president and CEO of Roswell Park Cancer Institute; Patrick Loehrer, MD, director of the Indiana University Melvin and Bren Simon Cancer Center; Ed Partridge, MD, director of the UAB Comprehensive Cancer Center; and Robert DiPaola, MD, dean of the UK College of Medicine.

Attendees from across the country also had the opportunity to go on a "Markey patient experience tour," which highlighted six of Markey's integrative medicine offerings: a cooking demonstration, art therapy, music therapy, narrative medicine, Jin Shin Jyutsu and hand massage/aromatherapy.

"We were honored to host our fellow cancer center colleagues here in Lexington for this year's conference," said Michael Delzotti, president and CEO of the UK Markey Cancer Foundation. "We enjoyed not only the opportunity to provide valuable education and information for other cancer communicators across the nation, but also the chance to show off some of the things that make Markey, and Kentucky, so special."

The UK Markey Cancer Center and UK Markey Cancer Foundation served as hosts of the 2017 NACCCDO/PAMN annual meeting, which included a cancer center directors panel (bottom) as well as a visit from UK HealthCare's pet therapy dogs (top right). The NACCCDO/PAMN annual meeting is an opportunity for public relations, marketing and development professionals at major cancer centers to learn from their peers.



PLANNED GIVING CREATES A LEGACY OF SUPPORT FOR MARKEY'S MISSION

For Walter Clare, making a planned gift to the UK Markey Cancer Foundation was the most meaningful way to honor and support the UK Markey Cancer Center – an organization that extended the amount of time he and his beloved wife, Lisa, had together after she was diagnosed with peritoneal cancer.

A planned gift is a commitment by a philanthropic donor to make a gift in the future – often upon their death – that creates a legacy of support extending beyond their lifetime.

Through tax and legal strategies, planned gifts are included in the donor's estate and financial plans. This allows donors making planned donations to have a bigger financial impact in the future than they would be able to have in the present, while also providing for their own retirement and protecting the interests of their estate and family.

As such, planned gifts not only have a tremendous impact on the recipient, they do so in a way that maximizes a donor's support for causes in which they believe.

"Lisa was a warm and caring person who was always looking for an opportunity to serve others," Clare said. "After her death, I wanted to do something that would honor Lisa, and also hopefully help others in their time of need. Planned giving seemed so appropriate. After my death, my estate would be able to be used to address a variety of needs. It is a way that typical people, like me, can ultimately make a difference."

Planned gifts like Clare's are a cornerstone of Markey's long-term financial stability, giving physicians, researchers, nurses and staff the resources needed to provide high-quality patient care and pursue the latest in cancer research.

"Planned gifts are a crucial part of what keeps Markey's leading-edge research and patient programs sustainable now and in the future," said Michael Delzotti, president and CEO of the UK Markey Cancer Foundation, the fundraising organization for the



Walter Clare made a planned gift to the UK Markey Cancer Foundation in honor of his late wife, Lisa, who had peritoneal cancer and was treated at the UK Markey Cancer Center.

Markey Cancer Center. "There are a wide range of approaches that can be tailored to each donor's desire and capacity to give."

Individuals who make a planned donation become part of the UK Markey Cancer Foundation Calumet Society, which recognizes their long-term commitment to supporting Markey and its mission areas of patient care, research, prevention and education.

For more than three decades, Markey has worked tirelessly to fight back against cancer in Kentucky. Recent advances in immunotherapy, genetic testing and therapies, big data, and team science are allowing the experts at Markey to tackle cancer more efficiently and effectively across the full continuum of patient care.

Philanthropy and planned giving have enabled much of the progress that Markey has made and will continue to support that progress in the future, Delzotti said.

"Just as our doctors bring incredible compassion to their science, so too do our donors bring incredible passion to their giving," he said.



UNIVERSITY OF KENTUCKY
MARKEY CANCER
FOUNDATION

UK MARKEY CANCER FOUNDATION BOARD OF TRUSTEES

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M. Lois Reynolds
William J. Shively
Charles T. Wethington Jr.
Christopher H. Young

Michael Delzotti, CFRE
President & CEO

MARKEY PHILANTHROPIC DATA 2017

\$80 MILLION
in financial support since the Foundation began in 1978.

\$5 MILLION
in recruiting assistance

\$500,000
in assistance for Markey's bid to become an NCI Comprehensive Cancer Center

\$500,000
in grant assistance for investigator-initiated trials

\$300,000
in support of pancreatic cancer research

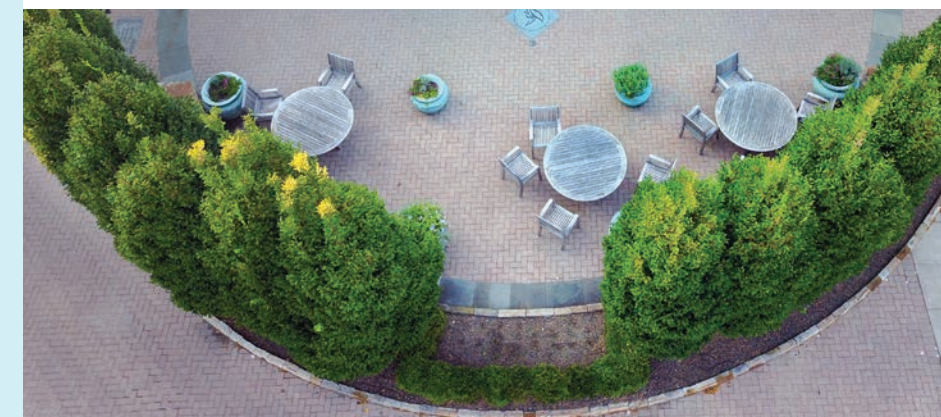
\$185,000
in support to Markey's Comprehensive Breast Care Center

\$100,000
in grant assistance for Markey Women Strong

\$25,000
in support of compassionate patient care at Markey

\$20,000
in support to Markey Cancer Center Research Day

The Healing Garden, which was made possible through philanthropic donations, is a place for patients and their families to relax and enjoy tranquility and calmness while at the UK Markey Cancer Center.

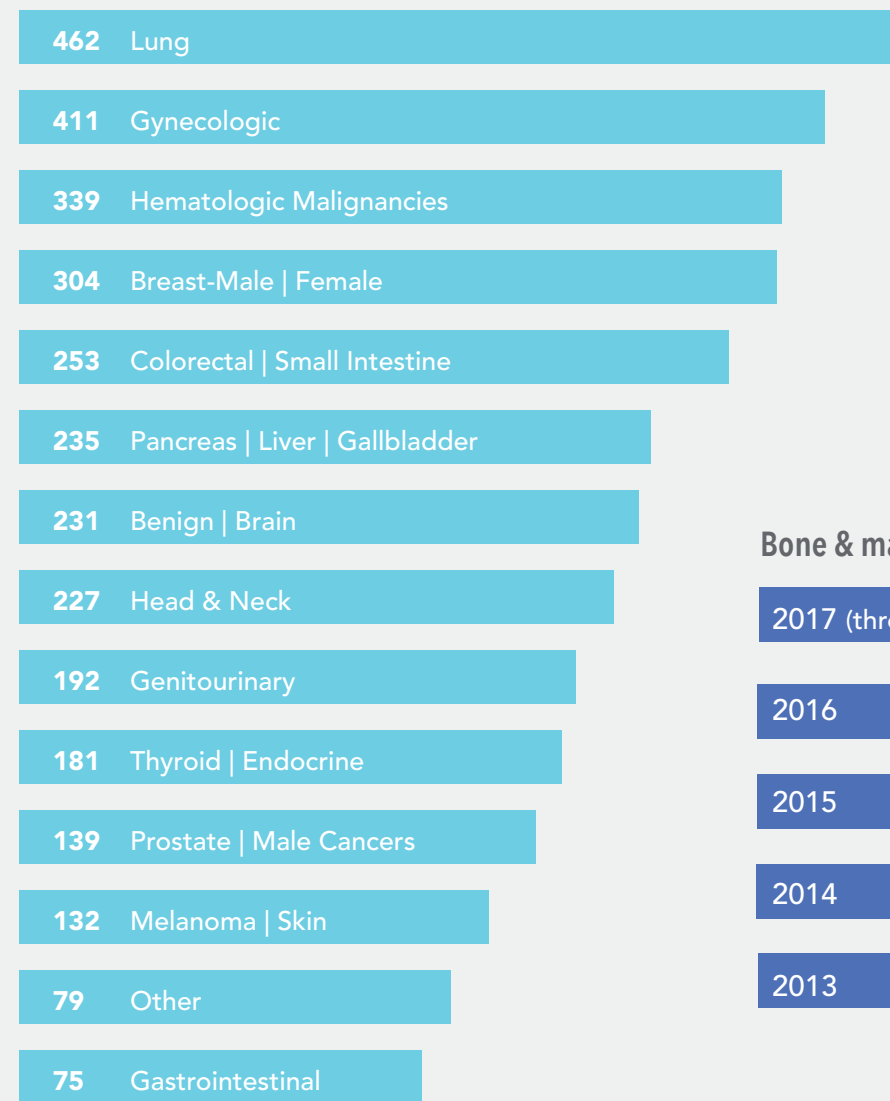


The UK Markey Cancer Foundation office has resources available to those interested in exploring their planned-giving options. Planned gifts can be directed toward research, patient care, or any of Markey's other cancer-related programs and funds.

For more information or to discuss making a gift to the UK Markey Cancer Foundation, call **859-323-6448**.

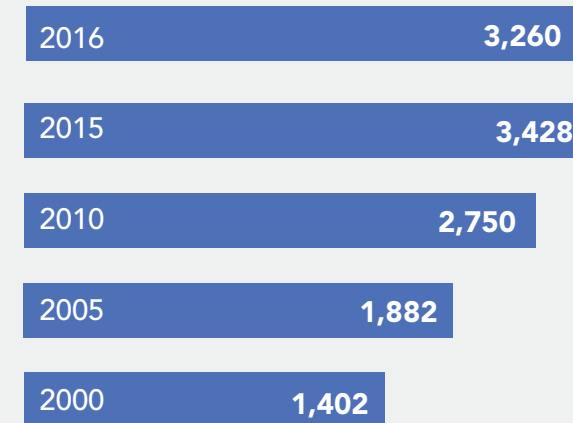
MARKEY BY THE NUMBERS

UK Markey Cancer Center cancer cases by tumor site, calendar year 2016

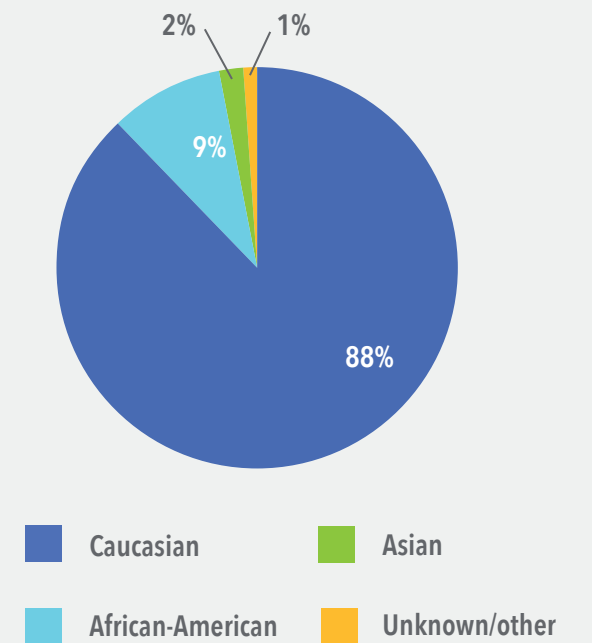


TOTAL 3,260

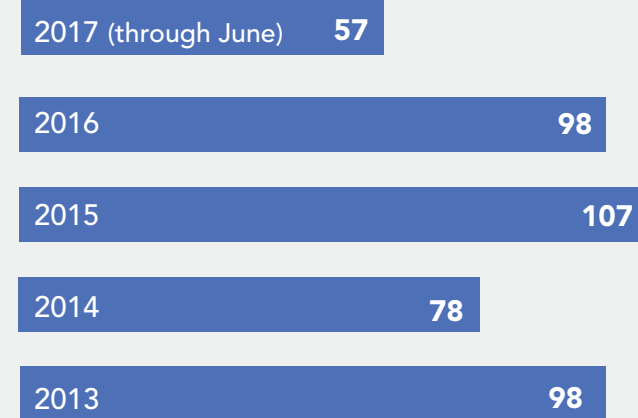
Growth in new cancer cases by calendar year



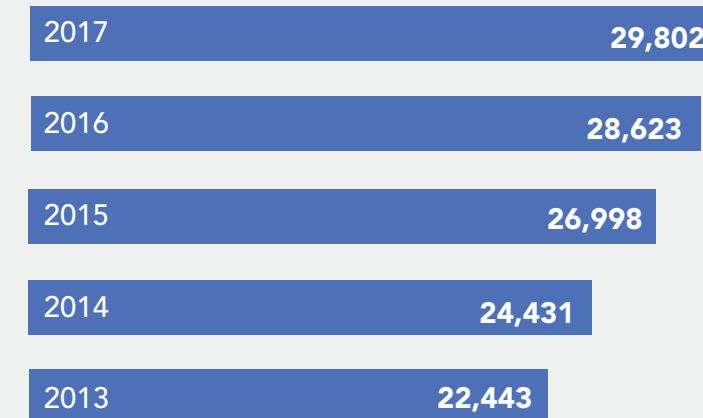
Unique patients by race, fiscal year 2017



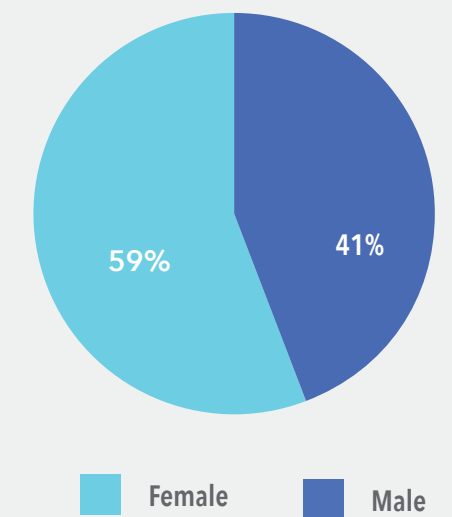
Bone & marrow transplants by calendar year



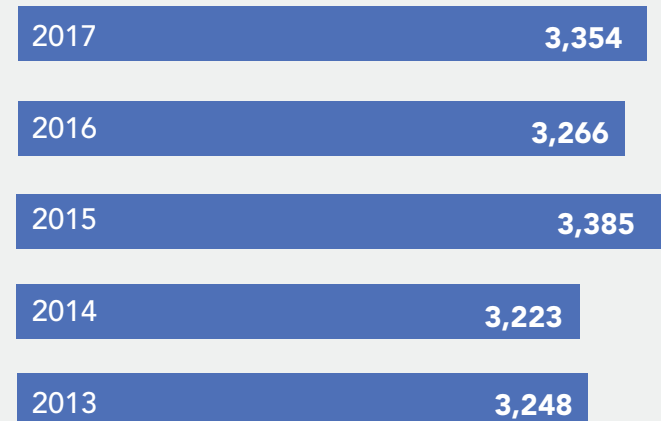
Unique patients (MRN)s neoplasms & hematology by fiscal year



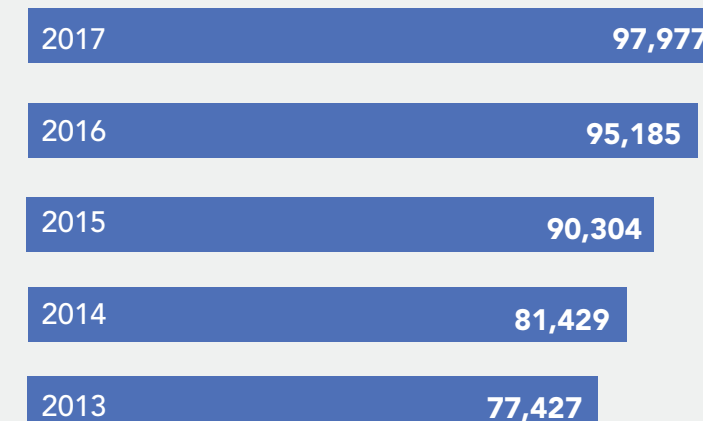
Analytic cancer cases by gender, fiscal year 2017



Inpatient neoplasms & hematology visits by fiscal year

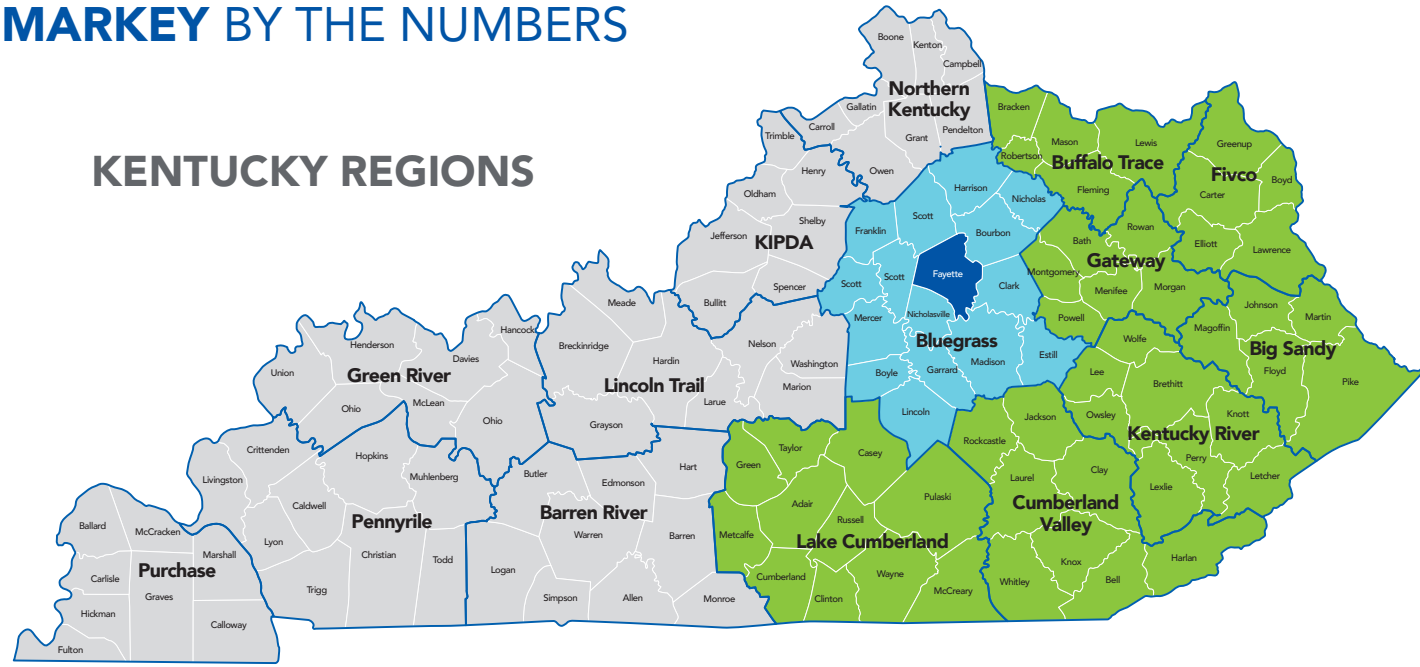


Outpatient neoplasms & hematology visits by fiscal year



MARKEY BY THE NUMBERS

KENTUCKY REGIONS



Markey Cancer Center cancer visits by Kentucky region*, inpatient and outpatient by fiscal year

Market UK HealthCare	Area Development District	2013	2014	2015	2016	2017
PRIMARY	Fayette	27,212	27,369	29,402	31,572	31,413
SECONDARY	Bluegrass	26,396	26,807	28,740	29,824	31,492
TERTIARY	Cumberland Valley	5,857	6,897	7,709	8,346	8,135
	Lake Cumberland	3,407	3,927	4,947	4,941	5,258
	Kentucky River	2,794	3,568	4,550	4,053	4,323
	Gateway	3,135	3,518	3,540	4,003	3,802
	Big Sandy	2,661	2,953	3,292	3,116	3,611
	Fivco	1,657	1,831	2,095	2,352	2,308
	Buffalo Trace	1,430	1,528	1,920	1,890	2,302
OTHER KY ADDs	KIPDA	1,413	1,216	1,232	1,536	1,569
	Lincoln Trail	490	841	1,143	1,302	1,306
	Lake Cumberland	304	355	509	735	1,251
	Northern Kentucky	829	1,145	1,029	1,052	1,023
	Barren River	287	198	254	296	335
	Green River	183	214	339	313	330
	Pennyrile	214	144	115	316	217
	Purchase	90	91	148	258	205
Unknown Out of ST	Unknown Out of State	2,316	2,050	2,725	2,546	2,451
Grand Total		80,675	84,652	93,689	98,451	101,331

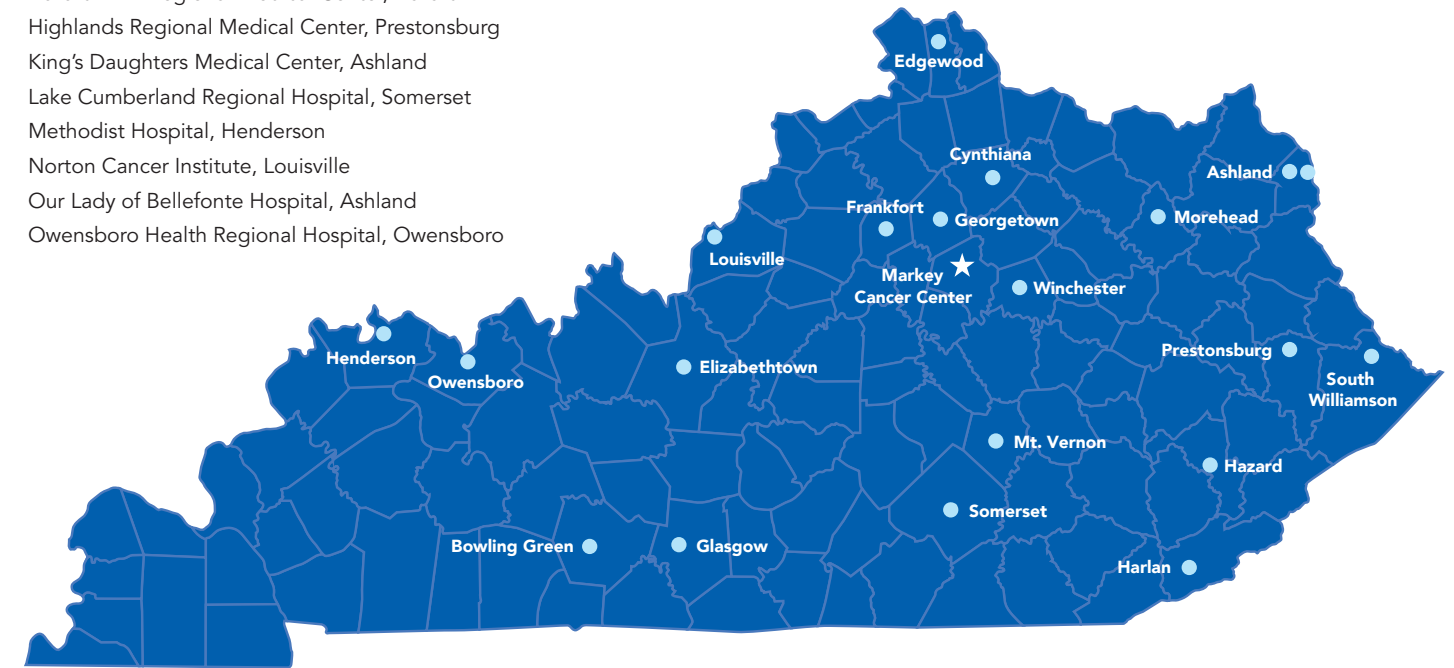
*Kentucky Area Development Districts (ADD) = Kentucky Region

UK MARKEY CANCER CENTER AFFILIATE NETWORK

20 MEMBERS

- Clark Regional Medical Center, Winchester
- Frankfort Regional Medical Center, Frankfort
- Georgetown Community Hospital, Georgetown
- Hardin Memorial Hospital, Elizabethtown
- Harlan ARH Hospital, Harlan
- Harrison Memorial Hospital, Cynthiana
- Hazard ARH Regional Medical Center, Hazard
- Highlands Regional Medical Center, Prestonsburg
- King's Daughters Medical Center, Ashland
- Lake Cumberland Regional Hospital, Somerset
- Methodist Hospital, Henderson
- Norton Cancer Institute, Louisville
- Our Lady of Bellefonte Hospital, Ashland
- Owensboro Health Regional Hospital, Owensboro

- Rockcastle Regional Hospital, Mt. Vernon
- St. Claire Regional Medical Center, Morehead
- St. Elizabeth Healthcare, Edgewood
- The Medical Center at Bowling Green, Bowling Green
- TJ Samson Community Hospital, Glasgow
- Tug Valley ARH Regional Medical Center, South Williamson



UK MARKEY CANCER CENTER RESEARCH NETWORK

6 MEMBERS

- Hardin Memorial Health, Elizabethtown
- King's Daughters Medical Center, Ashland
- Owensboro Health Regional Hospital, Owensboro
- St. Claire Regional Medical Center, Morehead
- St. Mary's Medical Center, Huntington, WV
- Tri-State Regional Cancer Center, Ashland



The UK Markey Cancer Center, Kentucky's only NCI-designated cancer center, is driven by more than 220 research projects, representing more than \$38.7 million in research funding. Our research portfolio is supplemented by \$2.6 million in education and training funding. Markey's research efforts across the University of Kentucky campus comprise*:



220
Research projects



\$38.7M
Research funding



\$2.6M
Education and training funding



188
Team members



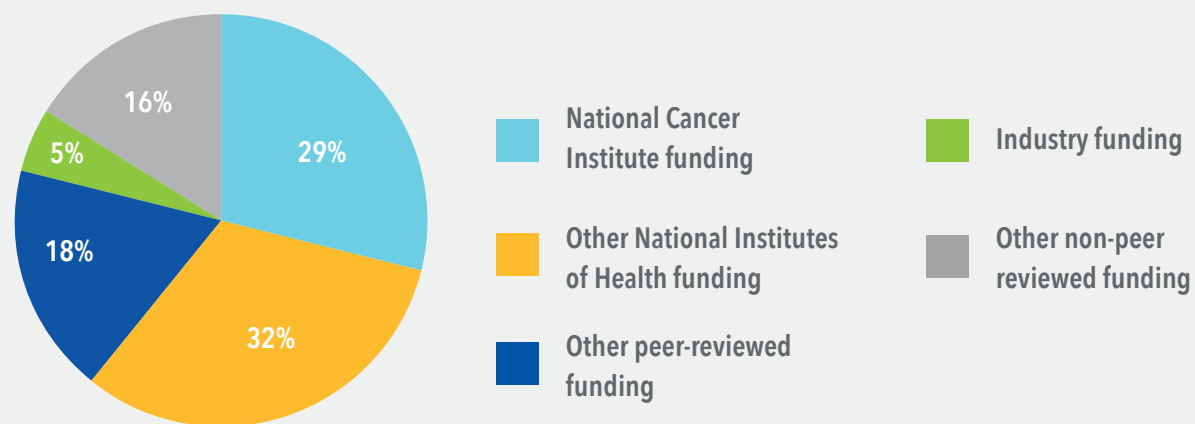
11
Colleges



39
Departments

*All data is as of June 30, 2017.

Markey Research Funding Summary: \$38.7 million (total costs as of June 30, 2017)



Markey Cancer Center Publications, July 2013 to June 2017

Markey's membership produces more than 200 publications each year in leading scientific journals. Since the cancer center received NCI designation, Markey members have increased their output, authoring 851 papers over that four-year period, many of which involve collaborations with researchers in other Markey research programs and institutions outside the University of Kentucky.

Research program	Number of publications	Publications involving collaborations within programs	Publications involving collaborations across programs	Publications involving collaborations with other research institutions
Cancer Cell Biology and Signaling	232	39%	24%	58%
Genomic Instability, Epigenetics and Metabolism	164	44%	22%	60%
Drug Discovery, Delivery and Translational Therapeutics	366	27%	23%	52%
Cancer Prevention and Control	245	12%	34%	66%
Total Publications	851	16%	28%	58%



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UK Markey Cancer Center Mission

To reduce cancer mortality in our region through a comprehensive program of cancer research, treatment, education and community engagement with a particular focus on the underserved population of Kentucky and Appalachia.

markey.uky.edu  facebook.com/UKMarkey  [@UKMarkey](https://twitter.com/UKMarkey)

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UNIVERSITY OF KENTUCKY
MARKEY CANCER
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 **HealthCare**
MARKEY CANCER CENTER
An NCI-Designated Cancer Center