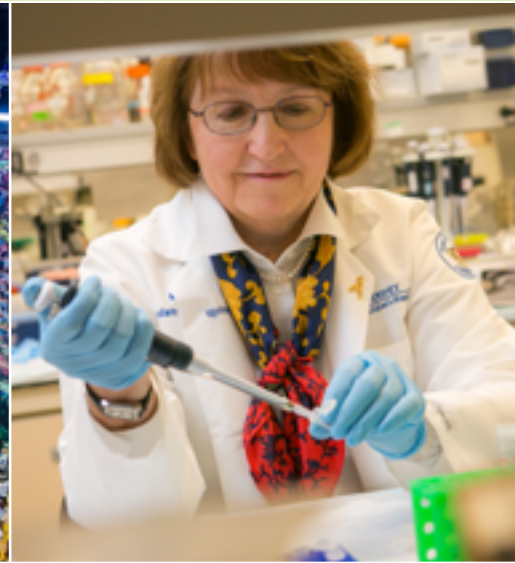


THE EQUATION FOR HOPE™



**WORLD-CLASS
CARE**



**TRANSFORMATIVE
PHILANTHROPY**



**LIFE-SAVING
RESEARCH**



=

**HOPE
FOR A CURE™**



Four Diamonds child Emily

A MESSAGE FROM OUR HOSPITAL CEO



At Penn State Children's Hospital, we are leading the fight to conquer childhood cancer. Thanks to the support of our community, Four Diamonds achieved a remarkable fundraising total of more than \$17 million during the 2016 fiscal year to continue providing direct support to patients and families and to fund life-saving research.

The combination of world-class care, transformative philanthropy and life-saving research is the only hope for a cure, and here at Penn State Health Milton S. Hershey Medical Center and Penn State College of Medicine, this is what differentiates us. It's what makes us special. Patients come here because we have the highest levels of specialty care and clinical trials. Behind the scenes we are innovators, striving for answers to essential questions such as, "How do we improve cancer treatments for kids?"

Every day we are generating new knowledge to help us better prevent, diagnose, treat and cure diseases like childhood cancer, in order to save the lives of children. By continuing to expand our research portfolio, the Milton S. Hershey Medical Center and Penn State College of Medicine will benefit kids around the world.

We are inspired by the 86,500 youth and young adults whose extraordinary fundraising efforts through the Penn State IFC/Panhellenic Dance Marathon (THON™) and Four Diamonds Mini-THON® are transforming philanthropy as we know it. This powerful movement of kids helping kids brings hope to patients and families, and it fuels the Four Diamonds Pediatric Cancer Research Center's pursuit of new treatments and cures for all childhood cancers.

Your generosity provides hope to patients and their families during a very difficult time. On behalf of all our incredible faculty and staff, thank you for powering the fight. Together, we will conquer childhood cancer.

A. Craig Hillemeier M.D.

A. Craig Hillemeier, M.D.
Dean, Penn State College of Medicine
CEO, Penn State Health
Senior Vice President for Health Affairs, Penn State University



Four Diamonds child Corban at THON

WHY WE FIGHT FOR THE KIDS™

In the U.S., more children die from cancer than any other disease.*

Overall success rates for treating all types of childhood cancers hover around **80 percent**.*

80%

That number sounds great until you consider the flip side of that statistic:

1 in 5 children will die from their disease.*



Only 4% of National Institutes of Health (NIH) cancer research funding is solely dedicated to childhood cancer research.*

4%

*SOURCES: American Cancer Society, American Childhood Cancer Organization

An estimated **16,000** children in the U.S. are diagnosed with cancer each year—that's about **43 kids every day**.*



We won't stop fighting until the cure rate reaches 100 percent because we believe every child should grow up in a world without cancer.

Four Diamonds child Lydia



WORLD-CLASS CARE

When a child is first diagnosed with cancer, the family may be scared and wonder how they will make it through. It's during that time that the dedicated psychosocial team at Penn State Children's Hospital introduces them to Four Diamonds.

In addition to the financial support offered to families of children with cancer, Four Diamonds provides family-centered care by addressing not only the physical, but also the mental, emotional and spiritual needs of patients and their families. Social workers like Greg Baiocchi offer families the silver lining to the childhood cancer cloud in the form of Four Diamonds help.



Four Diamonds child Jinnaryz

Four Diamonds child Jinnaryz was diagnosed with neuroblastoma when she was just eight months old.

Thanks to philanthropy and the generous support of the community, Jinnaryz has received incredible care from Dr. Dandekar and Dr. Bhat at the Children's Hospital with no out-of-pocket costs for her family.

Four Diamonds also supports specialty care like music therapy, which has helped now two-year-old Jinnaryz along her childhood cancer journey.

“We try to reassure families that they’re at the right place and because of Four Diamonds they’re not going to need to worry about their child’s medical expenses,” Baiocchi said. From that point on, the family is part of Four Diamonds until their child is five years off treatment, which includes transition into a newly created Survivorship Clinic.

“Four Diamonds supports those team members who are vital to helping families get through this,” Baiocchi said.

The psychosocial support team is made up of social workers, child life specialists, music therapists, a chaplain, a psychologist and a nutritionist – just to name a few – who all do whatever they can to allow children to be children.

The team has also recently added a neuropsychologist to evaluate side effects patients may experience after treatment. “It can affect them cognitively as far as their ability to learn and process information,” he said. “These services are especially important to brain tumor patients and long term survivors because of late and lasting effects.”

The psychosocial support team meets weekly to share information about patients and the family, like how they seem to be coping and adjusting to the illness. They then discuss strategies of how to best meet whatever the child or family's needs might be.

The team also works closely with a psychologist to address any new or preexisting issues the family may have.

“When a child is diagnosed with cancer, the family doesn’t leave their other problems at the front door. Families who come to us may already be in significant stress and then they’re told their child has cancer,” he said. **“We pride ourselves on the individualized direct support that we are able to provide for every family.”**

That same support and customized service is offered to all families regardless of financial need or background.

The team has also recently added a specialty pharmacist to its list of available services. “The pharmacist hand carries the child’s medications to the bedside and goes over each medication, what it’s for and how you use it,” Baiocchi said. “Some of these kids can go home with a dozen medications.”

The service has been a huge relief to families who now do not have to stand at the pharmacy for an hour or two waiting on a prescription. And with Four Diamonds there are no copays.

“Anything that’s going to reduce a family’s stress and help with family coping is a plus,” he said.

Social worker Amanda Musser recently joined the team in the Childhood Cancer Survivorship Clinic. Survivorship is an up-and-coming topic in the oncology world because of the increased cure rates of childhood cancers. Patients who are five years post diagnosis and two years post treatment are transferred to this specialized clinic at Penn State Children’s Hospital to address any issues they have that are unique to childhood cancer survivors.

“It’s important to continue to follow the survivors because of the medical late effects of childhood cancer, but also the psychological, social and emotional late effects, which can be significant,” Baiocchi said.

“What we focus on is what their health is going to look like down the road, how are the chemo and radiation treatments going to affect them,” Musser said.

Patients and families receive information on many possible issues like heart disease, fertility issues and short attention span. Chemotherapy can cause symptoms similar to attention defect hyperactivity disorder (ADHD) and pediatric cancer patients may have trouble in school.

Musser also focuses on post traumatic stress disorder (PTSD). “There is a lot of research now saying cancer patients are at a higher risk for having PTSD related to the trauma associated with diagnosis and treatment,” she said.

Musser watches for depression, anxiety and any kind of mental health symptoms they may be having. During yearly visits to the Survivorship Clinic, every patient meets with a social worker, nurse, physicians and neuropsychologist. “If they need any medical tests, they’d get those done in clinic as well. It’s a one stop shop,” Musser said.

This kind of specialized care allows patients to be closely monitored and eliminates the wait for any needed testing. **“Cancer survivors have very unique needs compared to the regular population so we want to make sure that they’re seeing someone who understands the uniqueness of the disease and their health history.”**

Two-thirds of childhood cancer survivors experience at least one side effect from their treatment, many of which can be severe or life threatening.

Since most family doctors do not specialize in childhood cancer they don’t necessarily know how chemo can affect a patient down the road. Patients are followed until 10 years post treatment or their 22nd birthday, whichever milestone is later. At that point, they can transfer to their family doctor.

Musser can also help address issues at home and school and refers families to financial counseling when necessary.

According to Musser, a genetics counselor recently joined the team as well. The genetics counselor will see patients in clinic the same day as their survivorship physician appointment if need be.

Some pediatric malignancies can be a result of a genetic mutation that’s passed from parent to child. It’s important for the patients to know their risk of passing on a gene that may put their children at risk for a pediatric malignancy. Genetic counseling is an optional service provided.

“For the Survivorship Clinic we’re starting to see some of the kids who are getting a little bit older, some patients who’ve been recently married and thinking about having children,” Musser said. “That’s definitely information they want to know beforehand.”

Thanks to the generosity of the community and the transformative philanthropy through THON™ and Mini-THON®, Four Diamonds provides unparalleled resources for patients and families dealing with the realities of childhood cancer.

For information on all of the services Four Diamonds supports, visit www.FourDiamonds.org

Four Diamonds child Trey



TRANSFORMATIVE PHILANTHROPY

Penn State IFC/Panhellenic Dance Marathon (THON™)

Each year, more than 16,500 Penn State University students join us as Partners In The Fight™ to conquer childhood cancer through their participation in the Penn State Dance Marathon (THON). THON's year long fundraising efforts culminate in February with a 46-hour, no-sitting, no-sleeping dance marathon known as THON weekend. In 2016, THON raised **\$10.2 million and donated 96 percent of funds raised** to benefit Four Diamonds, its sole beneficiary. Since 1977, THON has raised more than **\$136 million For The Kids™** and is the largest student-run philanthropy in the world.

THON 2016



Bethlehem Area School District Mini-THON

Mini-THON®

Inspired by THON, Four Diamonds Mini-THON® mobilizes more than **70,000 students** through multi-hour, interactive, student-led events to support our mission to conquer childhood cancer.

Mini-THON is a powerful movement that encourages teamwork, creativity and school spirit, while empowering youth and young adults through philanthropy and community service.

These elementary, middle and high school students are raising millions of dollars each year to provide hope to children and families and to support life-saving research. Since 1993, Mini-THON has raised **\$23 million For The Kids™**. Last year alone, these inspiring **students raised \$5.5 million.**

Community Support

Thanks to our incredible supporters, Four Diamonds received an additional **\$1.25 million** in 2016 from individuals who made personal or corporate gifts, organized and participated in community fundraisers, created a fundraising campaign to celebrate a milestone, or donated in honor or in memory of a loved one.

FINANCIALS

Penn State Children’s Hospital believes in a family-centered approach to care, including childhood cancer. We treat the disease while also caring for the child’s well being and their family.

Four Diamonds makes it possible for 24 specialty care providers to exclusively serve the physical, mental, emotional and spiritual needs of our patients and their families. These care providers include child life specialists, social workers, music therapists, a clinical nutritionist, a psychologist, a pharmacist and a chaplain.

100% of patient bills covered

Four Diamonds provides comprehensive support to children and their families by paying for care and treatment not covered by insurance, as well as additional expenses that disrupt the welfare of the children. Thanks to generous donors like you, Four Diamonds has been able to assist 100% of the eligible childhood cancer patients treated at Penn State Children’s Hospital.

According to the original Four Diamonds gift agreement by co-founders Charles and Irma Millard, after all of the costs for eligible patient medical expenses have been met, Four Diamonds may direct funds to support pediatric oncology clinical and research needs at Penn State Health Milton S. Hershey Medical Center and Penn State College of Medicine.

As awareness of our cause has grown, so too has our philanthropic support. The tremendous increase in funds has allowed Four Diamonds to direct millions of dollars into pediatric cancer research. We are also able to build a long-term investment strategy, in order to create an additional revenue stream that is self-sustaining.

All of our work is FTK®—For The Kids™

Four Diamonds remains committed to helping improve the health and lives of children fighting cancer today, and those who will fight in the future.

SUMMARY OF SOURCES AND USES OF FUNDS

Philanthropic Gifts by source

THON	\$10,262,256	60%
Mini-THON	\$5,497,215	32%
Special Events/Other Gifts	\$1,252,615	7%
Honor/Memorial Gifts	\$103,512	1%
Bequests	\$10,100	0%

Total Fundraising \$17,125,698

USES OF FUNDS

Patient Care and Family Support

Patient/Family Support	\$715,097
Patient Care Providers	\$2,494,688

Research

Research Institute	\$320,841
Research Grants	\$884,604
Research Support	\$3,429,093

Investment in Research Endowments

Epigenetics	\$4,000,000
Millard Endowment	\$600,000

Administrative Expenses \$1,651,109
TOTAL USES OF FUNDS \$14,095,432

91¢
OF EVERY
\$1.00
DONATED

directly impacts children fighting cancer today and helps improve the path kids who will face cancer in the future.



84

pediatric oncology research professionals supported.



24

specialty care providers serve our patients and their families.





LIFE-SAVING RESEARCH

On August 8, 2006—just four days before his first birthday—Layn was diagnosed with Wilms tumor. After surgery to remove his left kidney and the tumor, in addition to multiple rounds of abdominal radiation and multiple drug chemotherapy, Layn's mother had a very difficult decision to make. Layn's cancer had become too aggressive and doctors said there were only two options: stop treatment altogether and let Layn live out his remaining days or participate in a Phase I clinical trial that would cost more than \$230,000 and was not covered by insurance. The next day, Layn's doctors shared that **Four Diamonds had offered to pay for the clinical trial so that Layn's mother could focus on her child getting better.**

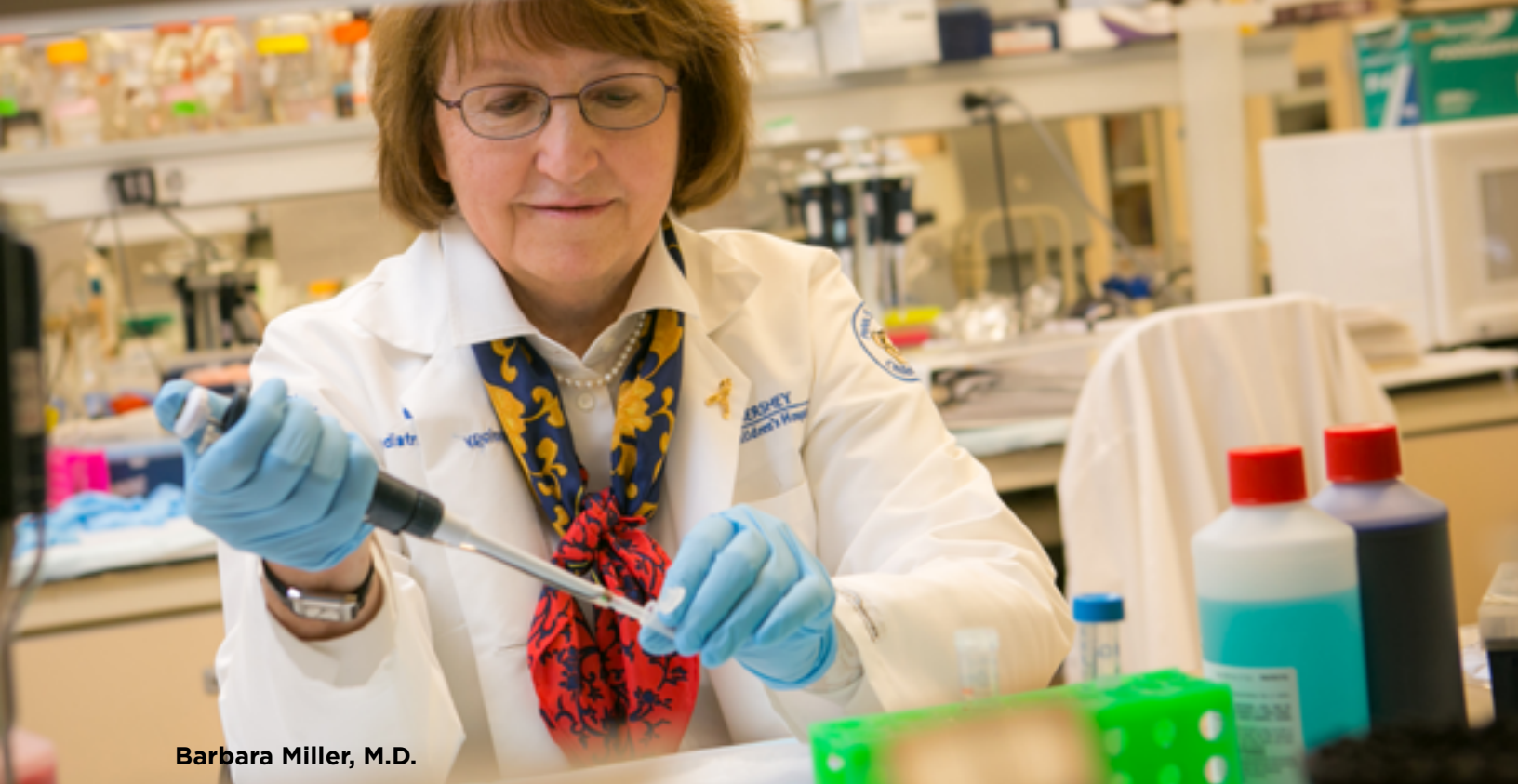
Layn is now a healthy ten-year-old who has been off treatment for more than eight years!

Layn's story highlights the tremendous financial support Four Diamonds can provide a family, thanks to the community's generosity. It also highlights the fact that ongoing support helped build a research program at Penn State Health Milton S. Hershey Medical Center and Penn State College of Medicine that offers the most leading-edge therapy available—therapy that offered Layn's family hope and success.



Four Diamonds child Layn

Sinisa Dovatz, M.D., Ph.D. and student



Barbara Miller, M.D.

Penn State’s commitment to childhood cancer research enables us to provide innovative treatment to all of our pediatric cancer patients.

While outcomes for children diagnosed with cancer have greatly improved over the past five decades, in the U.S. more children die from cancer than any other disease. In the U.S., an estimated 16,000 children will be diagnosed with cancer this year, and approximately 1 in 5 will not survive.



Investigators at the Four Diamonds Pediatric Cancer Research Center at Penn State Children’s Hospital are working to change that.

Four Diamonds supports more than 80 pediatric cancer research professionals who are working to identify more effective therapies that increase cure rates and minimize long-term side effects for survivors, by studying how cancer forms and developing new targeted treatments.

“With Four Diamonds support we have been able to continually expand our research,” said Dr. Barbara Miller, Division Chief, Pediatric Oncology and Hematology and Director of the Four Diamonds Pediatric Cancer Research Center. “We conduct laboratory based research to better understand disease mechanisms in pediatric cancer and to

identify potential targets in the molecular disease process to which new drugs can be directed.”

Funding from Four Diamonds has helped finance development of a Pediatric Neuro-oncology Program, a Pediatric Cancer Survivorship Program, a Stem Cell Transplant Program, an Experimental Therapeutics Program, a fellowship training program, as well as the Research Center itself.

The money raised for the Clinical Experimental Therapeutics Program allows investigators to conduct Phase I and Phase II trials for pediatric cancer patients.

“These are very early trials with new drugs to treat patients whose disease is resistant or refractory to any of the existing therapies,” Miller said. **“Because of this program, we can offer these very exciting new treatments here in central Pennsylvania.”**

Investigators at the Four Diamonds Pediatric Cancer Research Center are members of the Children’s Oncology Group, Pediatric Oncology Experimental Therapeutics Investigators Consortium (POETIC) and the Neuroblastoma and Medulloblastoma Translational Research Consortium (NMTRC). Working with these organizations gives patients access to new drugs and novel therapeutic approaches for cancers, which are difficult to treat.

“We are currently developing an adolescent and young adult oncology program because for a number of cancers, adolescents and young adults have been shown to do better when treated with pediatric rather than adult regimens,” Miller said. “We’re working out how to provide the best care for these patients.”

The support from Four Diamonds has also allowed for recruitment of outstanding research talent.

“With these endowments, we’ve been able to develop a formidable group of scientists. All of the investigators are looking at different aspects of molecular signaling pathways that lead to tumor development and are working on drugs targeted to those pathways,” Miller said.

Miller’s own research concentrates on a channel highly expressed on the surface of many pediatric tumors including neuroblastoma and leukemia. This calcium channel protects cells from being destroyed and also controls the cell’s energy production.

“We’re exploring how it does that with the hope that in the future we can target it to reduce the ability of cancer cells to grow and survive, particularly to reduce survival after chemotherapy,” Miller said.



Valerie Brown, M.D., Ph.D.

The future of Brown's program, as well as other pediatric cancer research, comes down to awareness and support.

Dr. Sinisa Dovat, Director of Therapeutics and Translational Research, and his team have several innovative projects in the works.

One is trying to understand what makes leukemia cells multiply and how cell proliferation is regulated in order to design more efficient, specific and less toxic treatment.



"Pediatric leukemia is the most common malignancy. At the same time, it's had the biggest success and the least success," he said. "We went from 0 percent survival in the 1950s to 90 percent today. This is one of the biggest successes in medicine. On the other side, with relapsed leukemia, survival is still 50 percent and that has not changed over the last 30 to 40 years."

His study concentrates on the Ikaros protein, a molecule that impedes and suppresses the development of leukemia cells.

Four Diamonds child Trey

One of Dovat’s published studies involves a drug that can restore the function of Ikaros and effectively suppress leukemia. Further study will be required to determine other medications that can be combined with this drug to treat B-cell Acute Lymphoblastic Leukemia (B-ALL).

Dovat’s team has also delved into system biology — epigenetics — an emerging science. While genomics is the study of DNA, epigenetics is the study of the biological mechanisms that switch genes on and off, making some genes active while others remain inactive.

“We are studying the epigenetics of cancer cells to see how these changes in the cell affect cell multiplication in leukemia,” he said.

According to Dovat, this is a rapidly developing area of study. His lab and other labs across the country have already made significant progress and have developed drugs that target specific epigenetics.

Dovat believes funding from Four Diamonds is essential to the advancement of pediatric cancer research.

“Based on these results, we’ve received additional funding from other organizations. Once you get the preliminary data and you publish that information, that of course attracts more money. **Four Diamonds support helps us do the groundwork to take our research to the next level,**” he said.

That includes funding from the National Institutes of Health (NIH). Each of the Four Diamonds Research Center’s investigators are NIH funded, which is an extremely competitive application process.

Dr. H.G. Wang, Director of Pediatric Molecular Oncology, believes that teamwork is the key to fighting cancer. The process to take a therapy from the lab to the bedside requires tremendous patience.

In order to get a new drug through the FDA for approval it normally takes 10-12 years at an average cost of \$2.7 billion.

“It’s a long process and very, very costly,” Wang said.

Wang believes that is one of the important reasons for Four Diamonds.

“That’s why we not only need government support, but we also really need philanthropic support through Four Diamonds to do more and better research to develop new treatment strategies,” Wang said.

While childhood cancers are often genetic, causes of adult cancers are often environmental, hormonal, due to poor life style choices or related to aging, according to Miller.

“Often what happens in adults is that over time, environmental and other factors they’re exposed to cause genetic mutations. These accumulate in tissues and cells and ultimately can lead to the uncontrolled cell growth that is cancer,” she said.

Additionally, Wang said because of the differences in pediatric and adult cancers, a treatment or a drug for an adult’s leukemia may not work for a pediatric leukemia patient.

The current focus of Wang’s team’s research is autophagy, the self-eating process of a cell.

“The cell generates a lot of garbage. Just like we would recycle a can or bottle for reuse, the cells can collect all of this trash and generate a new building block,” he said.

This kind of self-cleansing process is very critical to keep the cells healthier and the tissue more functional.

Its role in cancer is truly complex.

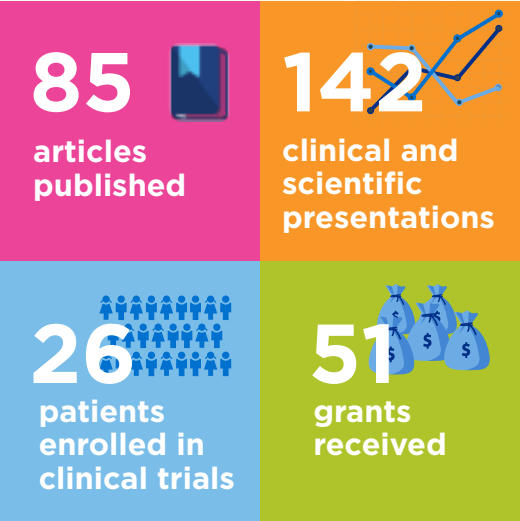
“Autophagy can prevent a DNA mutation and also the transformation of normal cells,” Wang said. “It’s a housekeeping system to clean up all of these harmful materials.”

On the other hand, autophagy also is critical for cancer cell survival. The process generates nutrients the cells need.

“The question is how autophagy can affect the cancer cells’ survival and how this affects the cancer cells’ response to treatment,” he said.

“The data suggests that we may be able to use autophagy to kill cancer cells.”

This should make cancer cells more vulnerable to the treatment.





The team has more work to do in the area of genetics to better understand how and why the cells react the way they do. They also hope to identify new compounds to target autophagy for the treatment of pediatric cancers.

Dr. Miller emphasizes, **“The investigators at Penn State are forever grateful to Four Diamonds and those who support it. These funds are key to our ability to do innovative research to develop new therapies. They provide support for the infrastructure to conduct clinical trials to increase our ability to cure more children and to reduce long-term side effects in those who are cured. Four Diamonds enables us to give our patients HOPE.”**

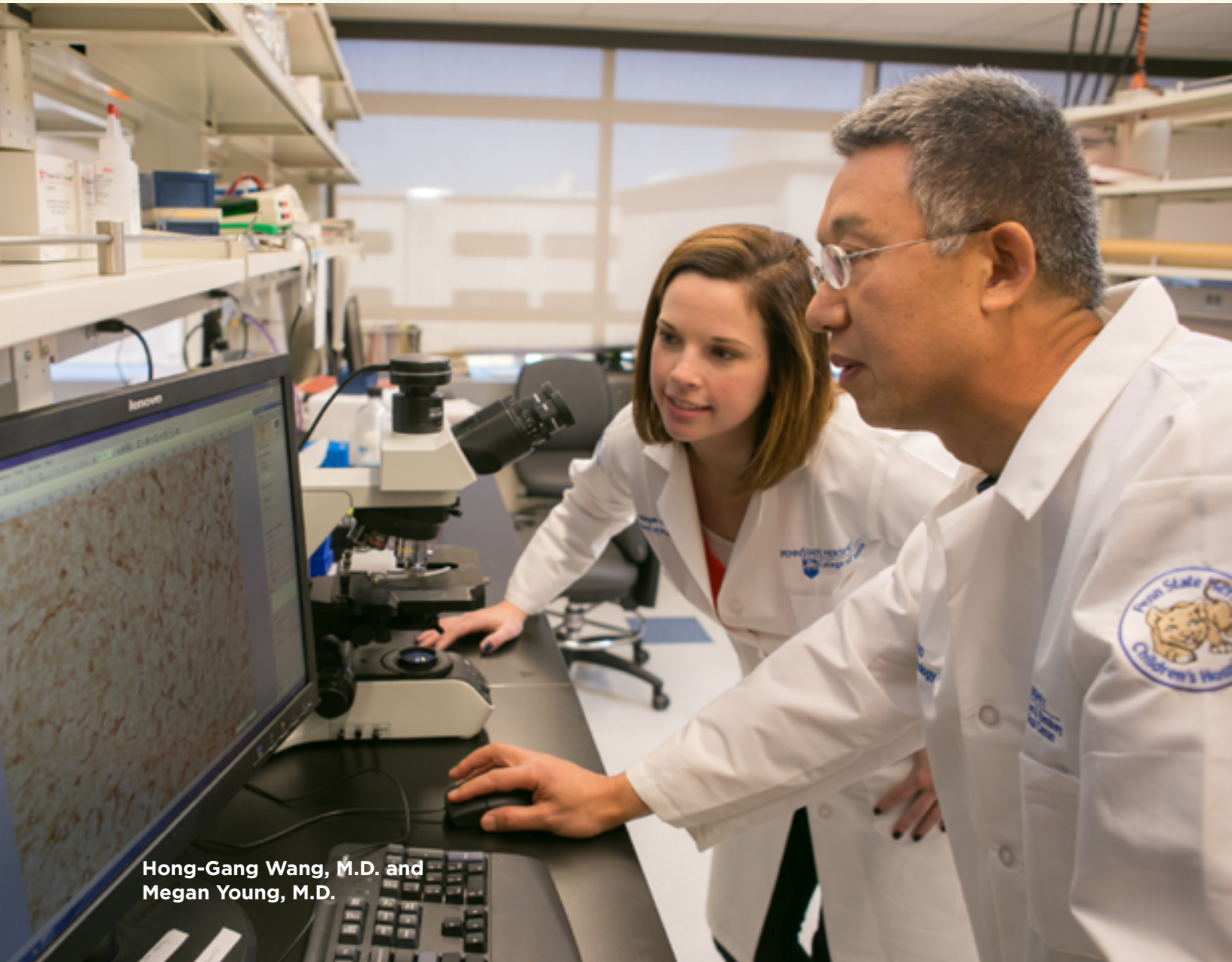
For more information on Four Diamonds and pediatric cancer research, visit www.FourDiamonds.org

On behalf of Four Diamonds patients and families, thank you for joining us as **Partners In The Fight™** to conquer childhood cancer. With your support, Four Diamonds provides family-centered care at Penn State Children’s Hospital and funds groundbreaking research to benefit children around the world.

To make a donation or to get involved, contact the Four Diamonds office at **(717) 531-6086** or **fourdiamondsinfo@pennstatehealth.psu.edu**.

Four Diamonds at Penn State Children’s Hospital
1249 Cocoa Avenue, P.O. Box 852, Hershey, PA 17033

www.FourDiamonds.org



Hong-Gang Wang, M.D. and
Megan Young, M.D.



Four Diamonds child Lily



PennState Health
Children's Hospital