

# INSPIRED MINDS INSPIRING RESEARCH

STEPHENS FAMILY CLINICAL RESEARCH INSTITUTE



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**DISCOVERY/INNOVATION/EXCELLENCE/INSPIRATION**



# BIG QUESTIONS DRIVE BIG DISCOVERIES

At the Stephens Family Clinical Research Institute, the biggest questions start with: “What if?” Our dedicated physician-scientists are problem solvers. They use their diverse expertise to conceive the rest of the question and then work tirelessly to find ways to answer it. Those questions motivate their work and create a culture of inquiry that opens doors to new methods of preventing, detecting and treating disease.

In this report, you’ll find examples of the many ways our clinicians turn questions into answers and research into results. From groundbreaking cancer studies to innovative cardiac and neurological research to investments in state-of-the-art technology, the initiatives of Carle and University of Illinois partners are unleashing the power of “What if?” every day.

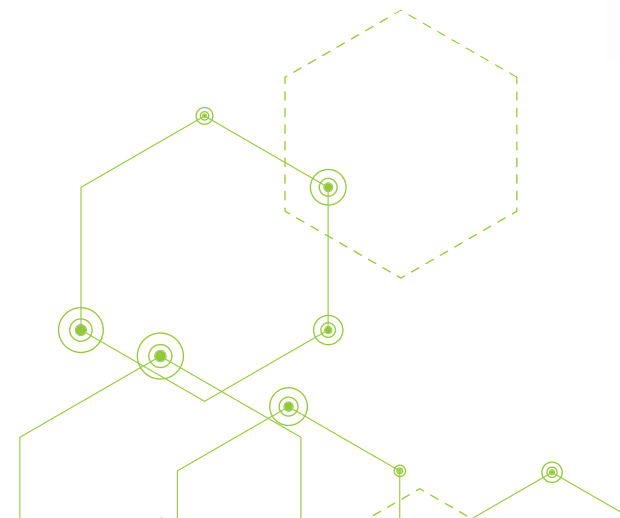
Which brings us to another central question: What does this mean for patients? Here, it means possibility – the promise of advancements in disease detection and treatment that will impact their futures and the futures of so many others. It means quality – a dedication to the resources of people and technology that ensure the highest level of patient care. And it means opportunity – the opportunity to participate in clinical trials that become tomorrow’s standard of care here and across the country.

There will always be “What if?” questions. Our growing team of physician-scientists will be on the forefront of answering them. And at the Stephens Family Clinical Research Institute, we’ll be right beside them, supporting their efforts to solve today’s healthcare challenges – and tomorrow’s.



**Jennifer Eardley, PhD**

*Vice President for Research*  
Carle Health





# SURGICAL PRECISION

After Georgina Cheng earned her MD/PhD, the gynecological oncologist was looking for a position where she could care for women with cancer and also pursue research that would advance the field. She found the opportunity to do both at Carle.

"I had heard of Rohit Bhargava's work using optical spectroscopy in colon cancer," says Dr. Cheng. "As we corresponded, it became clear that his work had implications for the research I was hoping to do in the area of gynecological cancers."

Two years later, Cheng and Bhargava, professor of bioengineering and director of the Cancer Center at Illinois, are collaborating to design a new technology that could improve surgical outcomes for patients with gynecological cancers.



"During surgery, physicians need to make a decision in real time regarding the spread of cancer and what to remove," says Professor Bhargava. "Currently, the ability to make those decisions is restricted by the data-gathering process. You have to remove the tissue, send it to the lab, and wait for results. We are considering whether it's possible to develop a tool that will allow us to image the chemistry of fresh cancer tissue in the surgical suite to inform decisions."

Those decisions include whether margins are clear, whether more lymph nodes should be sampled and even whether there are genes present that indicate a cancer risk.

"This is valuable information that, when available during surgery, would expedite diagnosis and treatment, which obviously would have significant benefits for patients and improve care," says Dr. Cheng.

"We're considering whether it's possible to develop a tool that will allow us to image the chemistry of fresh cancer tissue in the surgical suite to inform decisions."

*What if...*  
we could shorten  
diagnostic time  
to minutes instead  
of days?

## Prove It



Dr. Cheng and Professor Bhargava are taking the first step toward a technological discovery by proving the concept. It's happening in the controlled environment of the Bhargava lab, where tissue samples from patients recruited by Dr. Cheng are being examined at a microscopic level. The team will use that information plus fundamental advancements in chemical imaging and machine learning, such as algorithms and artificial intelligence, to inform the development of what could be a groundbreaking tool for understanding tissue structure and cancer pathology.



*What if...*

we could use bacteria to unlock new treatments for pancreatic cancer?

## Fingerprints Provide Clues



The microbiome of the gut is composed of thousands of different microorganisms, which means everyone has their own microbiome fingerprint. Some of those microorganisms secrete molecular signals that interact with human cells to trigger disease. By examining the composition of a few key microorganisms present in pancreatic cancer patients and how those microorganisms change over the course of the disease, Dr. Lowe and Professor Irudayaraj are looking for clues that can advance treatment for cancer patients.

# GUT REACTION

For those who only think of bacteria as “the enemy,” Kevin Lowe, MD, PhD, has a suggestion: read *I Contain Multitudes* by Ed Yong.

“That book was a real eye opener for me of how people through history have thought about our relationship with single-cell organisms,” says the surgical oncologist. “The microbes within us can inform most, if not all, of our physiological processes. Everyone has their own collection of bacteria, and we are working on a research project to examine what role the microbiome in an individual’s gut might play in the incidence, recurrence and treatment of pancreatic cancer.”

The “we” refers to the collaboration between Dr. Lowe and Joseph Maria Kumar Irudayaraj, PhD, professor of bioengineering at the University of Illinois. “There is a theory that the microorganisms in the gut impact cell signaling and mechanisms in other organs,” says Professor Irudayaraj. “We are exploring what role the microbiome plays in changing the DNA modifications to drive the cell to a cancerous state.”

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To answer that question, the duo have initiated a unique clinical research study. Pancreatic cancer patients treated by Dr. Lowe who enroll will provide blood and stool samples during follow-up visits. Professor Irudayaraj is developing techniques that will allow bacteria to be studied in his lab in a way that mimics the condition of the body.

“We are developing capsules that would contain some specific microorganisms that potentially could be critical in pancreatic cancer,” says Professor Irudayaraj.



“We want to grow those microorganisms in the lab so we can study them. That growth requires low oxygen conditions, so we are currently in the process of acquiring a chamber that will allow us to do that.”

According to Dr. Lowe, these efforts “will provide the bacterial profile of patients and how those bacteria affect pancreatic cancers cells in the lab, so we can analyze that information in a way that will benefit patients.”



# TAKEN TO HEART

Issam Moussa, MD, MBA, has a theory about how the brain and the heart influence each other, but until he joined Carle in 2018, he wasn't in a position to fully explore it. Now he can get to the heart of it.



"We all recognize that these two organs are critical to each other," says the medical director of the Carle Heart and Vascular Institute. "We know the brain sends signals that make the heart pump, but there's emerging evidence

that the heart communicates certain signals to the brain as well. We're forging collaborations to explore this bidirectional influence."



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Moussa explains that his "heart-brain axis" research will focus initially on how a heart attack affects the brain.

"This is a new area of inquiry that we can explore here because of the unparalleled opportunities for collaboration between Carle and the University of Illinois and the vision of the organizations," he says.

That vision includes a decision to invest in the Siemens 7 Tesla MRI, which provides the highest brain imaging strength approved for clinical use in the United States.

"The 7 Tesla is further proof of the organizations' commitment to address cutting-edge questions that will allow us to develop cardiovascular translational science right here, so that we can improve health outcomes."

*What if...*  
we knew how the brain responds during a heart attack?

## The Heart's Little Brain



Neurocardiology research explores the communication between the heart and the

brain. One aspect of such investigation involves the "heart's little brain," which refers to the thousands of neurons in the heart that can sense, learn and remember. That "heart brain" sends messages to the head brain about how the body feels. Understanding more about how the heart and the brain communicate can help address cardiovascular diseases, says Dr. Moussa.



# OPENING NEW WINDOWS INTO THE BRAIN

A groundbreaking tool, the Siemens 7 Tesla (7T) MRI, will put researchers at the Stephens Family Clinical Research Institute at the forefront of discoveries that will open new windows into the brain.



Arnold, MD, associate medical director of the Carle Neuroscience Institute. "When you have access to that level of unprecedented detail, you have an opportunity to view what is happening in the brain before a full-blown condition has developed."

As the strongest magnet approved for use with patients, the 7T is a magnetic force to be reckoned with. "It's a tool that provides images of the very highest resolution," says Paul

For patients suffering from spinal cord diseases, compression, brain tumors and head injuries, the 7T provides detailed information that guides patient care and treatment. In addition, it offers imaging detail that could lead to earlier diagnosis and treatment of epilepsy, Alzheimer's, Parkinson's, multiple sclerosis and other neurodegenerative diseases.

Those dual purposes of improved patient care and advancement of the research enterprise are top priorities at the Stephens Family Clinical Research Institute.

"Having a 7T on site represents Carle's and the University's commitment to enhancing discovery right here at Illinois," says Dr. Arnold. He believes it will have a broad, transformative impact on our research community at a time when a top research goal is understanding the brain's organization, function and plasticity, for both healthy people and those impacted by injury and disease.

"The 7T gives our incredibly creative scientists and physicians the opportunity to unleash new ideas that will lead to discoveries and improved care," says Dr. Arnold.

## *What if...*

Alzheimer's, Parkinson's, epilepsy and other neurodegenerative diseases could be detected earlier?

## Magnetic Attraction



Thanks to a partnership between Carle and the Beckman Institute, east central Illinois is home to one of only a handful of the Siemens 7 Tesla MRI systems in the United States. With the addition of the onsite partnership with Siemens, this unique collaboration will facilitate rapid adoption of new imaging capabilities in clinical care. According to Dr. Arnold, the capabilities of this diagnostic tool will likely attract patients from across the Midwest as well as talented medical and engineering students, faculty and research collaborators from across the country and the world.



"The 7T gives our incredibly creative scientists and physicians the opportunity to unleash new ideas that will lead to discoveries and improved care."



*What if...*

an MRI scan can be done in half the time with higher image quality?

## By the Numbers

Through Dr. Kasam's efforts, we have:

- Reduced scan times by **10** to **40%**
- Introduced **4** new imaging protocols never used before at Carle
- Optimized **10** current protocols
- Implemented a digitized QA program that includes **1,295** devices
- Ensured **24/7** coverage for any patient safety concern

# MAKING A MOVE

Even the smallest movements by a patient inside an MRI scanner can impact the quality of the resulting image. But staying still is difficult, so the less time spent in the scanner the better.

Initiatives undertaken by Mallikarjunarao Kasam, PhD, a physicist in radiology and a Carle clinical investigator, are reducing scan times and repeat scans and providing better imaging. For patients, that means improved satisfaction and diagnosis.



"We focus on optimizing protocols, digitizing quality assurance data and educating our radiology staff so we can create better experiences and outcomes for our patients," says Dr. Kasam.

The benefits are tangible, says Kelly Oppe, director of radiology. For instance, the department has been able to decrease scan times by up to 20 percent for neurology protocols, which makes a real difference.

"We focus on optimizing protocols, digitizing quality assurance data and educating our radiology staff so we can create a better experience and better outcomes for our patients."



"When you reduce the time a patient spends inside the scanner even by 10 or 15 minutes, it means less opportunity for movement," she says. "That leads to improved imaging quality as well as

a reduction in requests for rescans." For the patient, that means a more comfortable, efficient experience and the highest-quality care.

In addition, new protocols like rapid MRI perfusion and MR spectroscopy have been implemented on our 3 Tesla MRI. That's good news for epilepsy and acute stroke patients because these tests make detection of brain tissue changes and diagnosis much easier and accurate, says Travis Taylor, imaging manager.

Implant patients benefit from improvements as well, Dr. Kasam says. "By updating our policies, procedures and guidelines, we now can allow most all of our implant patients on to the 3 Tesla MRI, which was not possible earlier. This provides them with the benefit of obtaining higher-resolution images and precise diagnosis."



# IDEAS FROM THE FRONT LINE

When patients are confined to a hospital bed, they may be less likely to continue their regular practice of brushing and flossing their teeth. Kristin Pritts, DNP, RN, Carle's manager of clinical outcomes, believes improving oral care during hospitalization can impact the incidence of hospital-acquired pneumonia and set out to test her theory.

While studying for her doctor of nursing practice degree, Kristin initiated a project to implement an oral care protocol for patients on the medical/surgical and neurological units. Piloting it on just two floors allowed for a focused monitoring of hospital-acquired pneumonia for non-ventilator patients and a manageable implementation of the protocol.



also monitored compliance through documentation to ensure that oral care was being done correctly and with the right frequency. The next step is to work with our informatics experts to see if there is a correlation between improvement in compliance rates and better outcomes for patients."

"We provided more structure of when oral care should be implemented and made sure that the right supplies were available to provide the right care," says Kristin. "We

Kristin explains Carle strongly supports this evidence-based practice approach, where those on the front lines of patient care look to solve clinical problems through well-designed studies.

"There are many research discoveries being explored at Carle that will impact the future of healthcare on a big scale from drug discovery to new diagnostic tools," she says. "But Carle also supports staff initiatives like mine that impact daily care and patient outcomes and can be shared with other institutions for even greater impact."

“There are many research discoveries being explored at Carle that will impact the future of healthcare on a big scale from drug discovery to new diagnostic tools.”

## What if..

better oral care during hospitalization could limit cases of hospital-acquired pneumonia?

## The Team Approach



Teamwork is vital to the success of evidence-based practice initiatives like Kristin Pritts's oral care project and other recent nursing-led research at Carle, including a project on the correlation between catheter duration and infection and another on neonatal health. For Kristin's project, that team included hospital leadership, fellow nurses, healthcare technicians, the unit partnership council, quality outcomes coordinators, infection prevention specialists and personnel in supply acquisition, information management and electronic medical records. Improved patient care requires a dedicated team.



# TOMORROW'S CURES START HERE

Kendrith Rowland, MD, has a philosophy that informs his work. "Today's standard of care was yesterday's clinical trial," says the general oncologist who specializes in breast cancer and conducts research at Carle. "Research is how we can create something better for our patients." And that's something Carle has been committed to for decades.

What began with a community grant in 1983 has grown to a long-term partnership with the National Cancer Institute through their National Community Oncology Research Program (NCORP), which this year awarded Carle up to \$1.5 million. As one of only 32 community NCORP sites in the country, Carle is recognized as an elite cancer research facility and has special access to a large number of leading-edge clinical trials.

For our patients, that means extensive opportunities to participate in research studies without traveling hundreds of miles. According to Betsy Barnick, clinical research manager at Carle, "Our patients receive the same high-quality care, the same medicines and the same

monitoring as they would receive in a large academic medical center, and they can still sleep in their own bed and continue to be close to family and friends," all of which brings them peace of mind when they need it most.

The NCORP grant supports current Carle studies in cancer screening, treatment, symptom management, diet, nutrition, exercise and scores of other trials, and allows us to expand participation to more rural and underserved areas. It also supports Carle team members as they develop new trials to better understand cancer care delivery and to better support patients and families. For Carle patients, it's a chance to participate in something that has a personal benefit. It's also a way to make a long-term difference for others.

"That's what motivates our patients – who are the real heroes in our efforts – to participate in research," says Dr. Rowland.

## *What if...*

patients could access leading clinical trials without leaving their communities?

## Strength in Numbers

**The Carle partnership with the National Community Oncology Research Program (NCORP) has created long-term benefits to east central Illinois patients:**

- **100+** cancer clinical trials currently underway at Carle
- **70%** of cancer patients in the U.S. don't live near a major medical center; Carle brings that same level of care closer to home
- **32** community NCORP sites in the U.S.; Carle is one of them
- **\$8.16M** projected NCORP funding for Carle over the six-year period
- **46%** increase in NCORP funding since last grant cycle

“Today's standard of care was yesterday's clinical trial. Research is how we can create something better for our patients.”



# THE REAL HEROES

Sarah Adams is one of the “real heroes” that Dr. Rowland talks about. Diagnosed in May 2013 with HER2-positive breast cancer, her treatment included surgery, chemotherapy and radiation.

Sarah knew that the effectiveness of the treatment she received was made possible by patients who participated in clinical trials long before she was diagnosed. So when her oncologist, Maria Grosse Perdekamp, MD, told Sarah about a drug trial to manage the cognition side effects of chemotherapy, she signed up for it.



a better outcome. Plus, during trials patients are followed closely by staff who monitor them, answer questions and provide guidance. That too can lead to better outcomes.”

“There are significant benefits for patients who are willing and able to participate in clinical trials,” says Dr. Perdekamp. “It can allow them to have access to new medicines and, through that, perhaps

After treatment, Sarah also participated in a trial that examined how an exercise regimen can benefit survivors.

“Research is how we improve outcomes for patients,” she says. “I was the beneficiary of the work done by people before me, and I’m inspired to do that for others.”

She carries that out as a graduate of the National Breast Cancer Coalition’s Project LEAD Institute and a member of the Cancer Research Advocacy Group at the University of Illinois, which promotes innovative, evidence-based, patient-centered, translational research.

Ensuring that our patients benefit from a collaborative research effort between Carle and the University of Illinois was the dream of two more real heroes – Linda and Doug Mills. It was their vision that created the Mills Breast Cancer Institute in 2008, the third floor of which is home to Carle’s research enterprise, the Stephens Family Clinical Research Institute.

It’s here where we’re inspired to ask the “What if?” questions, so that all the real heroes can benefit from research efforts that are close to home.

At Carle, our clinicians have a partner in improving medical practices and health outcomes through the research enterprise. The Stephens Family Clinical Research Institute provides the resources to build an intellectual and innovation infrastructure that expands Carle’s engagement in research and supports the efforts of each clinician to solve real-world health problems. Meet our team of directors and managers who provide that support.

## STEPHENS FAMILY CLINICAL RESEARCH INSTITUTE LEADERS



**Betsy Barnick, MHS, CCRP**  
*Manager, Clinical Research*  
Carle Cancer Center



**Reubin McGuffin, MBA, MT**  
*Manager, Specimen*  
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