

# Research & Innovation

## Annual Report 2025



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How personalized medicine helped liberate a family from insulin injections

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Using AI and cutting-edge technology to power personalized care

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What miniature brain models are revealing about mental illness

# Research & Innovation Annual Report 2025

## Welcome

Welcome to Endeavor Health's Research and Innovation Annual Report, where empathy and expertise converge to improve outcomes for patients in our Chicagoland communities and across the world.

This report is dedicated to celebrating the incredible research and innovation efforts across Endeavor Health. In this report, we will bring you stories and insights — from groundbreaking studies to in-depth interviews with thought leaders shaping the future of healthcare. We'll also introduce you to the people who make it happen — from clinicians to researchers, donors to patients.

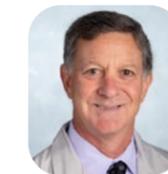
We believe that research and innovation are the driving force behind discoveries that save and improve lives. It's through these efforts that we challenge the status quo, push boundaries and ultimately make life safer, healthier and better for the communities we serve.

We'll dive into several efforts we're especially proud of. We'll cover the groundbreaking work of Endeavor Health neuroscience researchers, who are creating miniature 'brains' that will help them study and better understand how neurological and psychiatric conditions develop.

We'll hear about a young family who, thanks to an innovative genomics test developed at Endeavor Health, are now cleared of a diabetes diagnosis that would have meant daily insulin injections for the rest of their lives. And, we'll share how Endeavor Health is driving positive patient outcomes by leveraging artificial intelligence, robotics and other cutting-edge technology.

Thank you for joining us on this exciting journey. We hope this annual report will not only inform and inspire you, but encourage you to engage in the ever-evolving world of healthcare. With research, innovation and everything we do, your best health is our endeavor.

Best,



*Mickey Caplan, MD,*  
Chief Scientific Officer,  
Endeavor Health



*Kristen Murtos,*  
Chief Innovation & Transformation  
Officer, Endeavor Health

Research & Innovation Annual Report 2025

EDITOR: Baylee Pulliam, Director of System Research and Innovation Communications

CONTRIBUTORS: Kate Gawlik, Keith Hartenburger, Jonathan Hillenbrand, Janet Hosey, Laura Martinelli, Ryan Morton, Susan J. White

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For more information, please visit [endeavorhealth.org/about/innovation-research](https://endeavorhealth.org/about/innovation-research).

# 2024: By the numbers

Last year was a banner one for research and innovation at Endeavor Health, with major new awards and partnerships and a dramatic increase in our active clinical trials. These efforts support bold discoveries, new treatments and other efforts to save lives and improve the health of our communities.

## Innovation



### Research

**2,280+**  
patients enrolled  
in studies

**30+**  
venture  
partnerships

**100+**  
AI and automation solutions  
deployed across the system

**\$23.8M**  
total external  
research funding

**550+**  
clinical trials

**#21**  
among the  
top hospitals  
for AI readiness  
by CB Insights

**5** new NIH  
awards

**299** active principal  
investigators

Listed on Becker's  
52 hospitals and  
health systems  
across the U.S. with  
great innovation programs

BECKER'S  
**52**

**9** innovation  
projects  
supported by  
Endeavor Health  
Catalyst fund

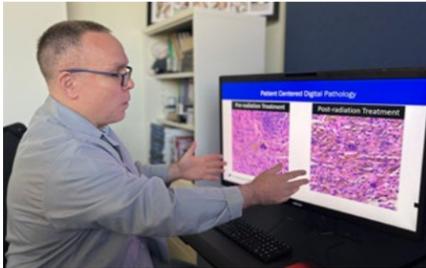
**1,043**  
active research  
studies

**10** active pilots with  
innovative external  
companies

# The pathologist will see you now

Endeavor Health partners with Google Cloud® to revolutionize pathology

Pathologists are critical members of your care team, but most patients will never meet them during their care journey. A new fully cloud-based digital pathology platform developed by Endeavor Health and Google Cloud, one of the world's first, aims to change that.



The new platform will digitize this process, speeding up diagnosis times, improving accuracy and giving patients direct access to their pathologists and records, so they can ask questions and better understand their results.

“This will allow us to drive transformation and advance diagnostics in ways that make a positive impact for patients across our system and deliver the best care now and in the future,” said John Groth, MD, an Endeavor Health pathologist and lead for the project. ■

Pathology reports, which uncover the causes and effects of diseases, play a major role in many critical medical decisions. Pathologists currently rely on physical slides and papers, making it difficult to collaborate with other physicians or meet with patients.

## A ‘home run’ for seniors

When you’re recovering, sometimes nothing beats the comfort of home.

Endeavor Health’s new ‘Home Run’ clinical study aims to provide that comfort to seniors healing from surgery after a hip break. Instead of the traditional route of sending patients to nursing homes or medical facilities, the goal is to provide qualified patients with coordinated care in their own homes.

Since the study began in September 2024, clinicians at the Endeavor Health Orthopaedic & Spine Institute have seen higher rates of patients able to recover from home, from 22% to 49%. They’ve also seen higher patient satisfaction and dramatically lower rates of readmission — returning to the hospital — for patients who received at-home care (6%) vs. recovering in a nursing home (40%).

“Bringing patients home doesn’t just change where they recover — it changes how they recover,” said study lead, Alex Crespo, MD. “Being surrounded by familiar comforts,

family, and independence leads to faster healing and a better quality of life. We’re seeing that in real time with this new study.” ■



# Moving on

Deep brain stimulation technology offers new hope to Parkinson’s patients



Dr. Katerina Markopoulou (L) helped patient María-Paz Salas (R) manage her tremors and movement symptoms.

María-Paz Salas felt like she was walking with weights around her ankles. A few mouse clicks later, and “the weights are gone,” said Salas, an elementary school outreach coordinator and Endeavor Health patient.

Salas is one of the first patients outfitted with the new adaptive deep brain stimulation (DBS) technology to better manage the symptoms of her Parkinson’s disease. Endeavor Health is the only provider in Illinois and one of only 20 nationwide offering this new treatment, which has been shown to give patients more hours free of life-altering symptoms, like tremors and slowed movement.

“For patients, it can be liberating,” said Katerina Markopoulou, MD, the Endeavor Health neurologist leading the clinical practice, who is also Stanley C. Golder Chair of Neuroscience Research. “If you have these tools, it gives you the ability to better manage your symptoms and improves the quality of life.”

Dubbed a ‘pacemaker for the brain,’ the adaptive DBS (aDBS) therapy builds on the previous continuous DBS (cDBS) therapy. Continuous DBS involves the implantation of a stimulator device on both sides of the brain and a battery in the chest that allows for stimulation adjustments. However, adjustments are manual and do not adjust automatically as the patient experiences symptoms.

Once calibrated for the new aDBS software by a neurologist using a tablet, the device can deliver stimulation that automatically adjusts throughout the day to compensate and improve the control of changing symptoms.

Dr. Markopoulou, who has been researching and treating patients with movement disorders like Parkinson’s for 25 years, said the goal of the aDBS therapy is to compensate for fluctuating abnormal brain rhythms that can cause tremors and slowness of movement. “When you suppress these brain rhythms, called beta activity, you can effectively suppress the symptoms of Parkinson’s disease patients.

“It’s like adjusting the volume of the radio,” she said. “It’s a relatively simple change, but it can make a big difference for patients.” ■



## Talk therapy for new moms

Up to one in five pregnant and postpartum individuals experience depression or anxiety, yet most go untreated — often due to a shortage of mental health specialists and long wait times.

A new clinical study co-led by Endeavor Health, the SUMMIT Trial (Scaling Up Maternal Mental Health Care by Increasing Access to Treatment), explores whether talk therapy can be delivered by non-specialists — like nurses, midwives, and doulas — and through telemedicine when specialists aren't available.

"Finding effective ways to treat these patients is critical," said Richard Silver, MD, Chief Academic Officer and site lead at Endeavor Health. "Talk therapy can help fill this gap."

The trial, one of the largest of its kind, enrolled 1,230 participants across the U.S. and Canada, nearly half from racialized communities. The results were published in *Nature Medicine*, and show that with 20-25 hours of training, non-specialists were just as effective as mental health professionals. Participants reported significant improvements in depression and anxiety after 6-8 sessions of behavioral activation therapy, delivered either in person or online. ■

# I'M SPEAKING

*Endeavor Health study focuses on Black women's birthing experiences*

Tennis star Serena Williams made headlines in 2017, not for a victory or her first child, but because of a pulmonary embolism after a Cesarean section (C-section).

Williams, who had a history of clots and took heparin daily before her C-section, suspected what was happening. Her request for a CT scan and heparin drip was dismissed by a nurse, but a doctor eventually agreed to the procedure, finding several small clots in her lungs.

In an April 2022 *Elle* essay titled "How Serena Williams Saved Her Own Life," Williams notes that Black people are about three times more likely to die during or after childbirth than white people in the United States.

"Many of these deaths are considered by experts to be preventable," she wrote. "Being heard and appropriately treated was the difference between life or death for me; I know those statistics would be different if the medical establishment listened to every Black woman's experience."

Anne Borders, MD, Endeavor Health's Ian Bernard Horowitz Chair of Obstetrics, agrees. She is part of a team studying a new communication technique, TeamBirth, as part of the "Improving Safety, Patient Experience, and Equity through Shared Decision-making Huddles" study (I'M SPEAKING). The \$7 million study is backed by the Patient-Centered Outcomes Research Institute (PCORI).

Statistically, Black patients face more complications during childbirth and higher mortality rates. Cesarean sections are also more common for Black patients, raising the risk for life-threatening complications.

In her prior work, Dr. Borders found that some patients didn't feel heard during childbirth, particularly Black patients and those with public health insurance. The I'M SPEAKING study aims to improve these experiences through TeamBirth. The approach trains hospital teams to listen to patients, understand their needs, and make decisions together.

While most nurses conduct team huddles and reports, TeamBirth focuses on shared decision-making. The huddles involve the patient, provider, and nurse discussing labor progress and noting decisions and preferences on a whiteboard.

"It is important to study care models like TeamBirth to better understand how we can improve care and patient experience during birth for all patients, and specifically for Black birthing patients," Dr. Borders said. "PCORI has provided us funding because this work matters. We must do all we can to eliminate disparities in patient respectful care experience and eliminate disparities in birth outcomes." ■

*"It is important to study care models like TeamBirth to better understand how we can improve care and patient experience during birth for all patients, and specifically for Black birthing patients."*



# Detecting cancer early

What if a simple blood test could tell you if you had cancer — and early enough to seek treatment when it's most effective?

That's what Endeavor Health researchers are studying as part of Exact Sciences' Multi-Cancer Early Detection (MCED) Falcon Registry Real-World Evidence (RWE) study. The MCED test used in the Falcon study analyzes both DNA and proteins for changes that may be suggestive of cancer. As the only multi-biomarker MCED test available today, this test can help clinicians identify many types of cancers — including those not currently covered by standard screening methods.

Together with other study sites, Endeavor Health will enroll up to 25,000 participants over a five-year period. During this time, the Falcon study will assess the clinical performance of MCED testing as well as patient and provider experiences with MCED testing.

The study will also create a registry that tracks patient data over time to evaluate outcomes, understand the influence of MCED testing on patient care, and guide improvements in future strategies for cancer screening and treatment. ■



# Advancing heart valve care

Normally, the heart's valves act like doors, opening and closing with each beat to keep blood flowing in the right direction. When valves weaken and allow backward flow — a condition called regurgitation — symptoms like fatigue, shortness of breath, palpitations and swelling can occur.

Endeavor Health cardiologists are focusing on tricuspid regurgitation, where the valve between the heart's right chambers malfunctions. To address this, the Endeavor Health Cardiovascular Institute at Glenbrook Hospital recently performed two of the region's first bicaval valve implants. These were part of the TRICAV-1 clinical trial, which evaluates the TricValve® Bicaval Valve System for severe cases.

"This milestone reflects our ongoing commitment to providing patients with access to the most advanced, evidence-based cardiac care available," said Mark Ricciardi,



MD, Director of Interventional Cardiology and Structural Heart Disease programs and Mr. and Mrs. Charles R. Walgreen, Jr. Chair of Cardiology at Endeavor Health. "Through groundbreaking clinical research, we are transforming the way this condition is treated."

Endeavor Health's newly opened state-of-the-art Cardiovascular Institute at Glenbrook Hospital brings together specialized staff and top experts to improve outcomes and recovery. The institute follows a "hospital within the hospital" model and supports emerging technologies like AI, robotics, digital health, and wearable devices.

The TRICAV-1 procedures were performed in the facility's Bergstrom Interventional and Surgical Center, named in honor of a generous philanthropic gift. ■

# COVID-19 vaccination may have broader benefits for children

States with high COVID-19 vaccination rates saw more pediatric asthma patients experience symptom relief, according to research published in JAMA Network Open by Endeavor Health and partners.

In the early months of the pandemic, social distancing and school closures likely reduced asthma flare-ups in many children. Lakshmi Halasyamani, MD, Chief Clinical Officer of Endeavor Health and Davis Family Chair, and her collaborators wondered if that benefit persisted into 2021 as COVID-19 vaccines were widely administered.

In the study, Dr. Halasyamani and Matthew M. Davis, MD, MAPP, of Nemours Children's Health compared parent-reported childhood asthma symptoms between 2018-2019 and 2020-2021. They combined this data with state COVID-19 vaccination rates for people ages 5 and up, as reported by the CDC.

The researchers found that with each 10-percentage point increase in vaccination coverage, parent-reported asthma symptoms decreased by 0.36 percentage points.

"Ongoing vaccination against COVID-19 may offer direct benefits for children with a history of asthma, but this must be confirmed with further research," Dr. Halasyamani said.

"It also raises the question of whether broader population-level COVID-19 vaccination among children and adults can help protect children with asthma, too."

States with the highest vaccination rates saw asthma symptoms decrease by 1.7 percentage points, nearly three times the reduction seen in states with the lowest vaccination rates, where symptoms decreased by only 0.6 percentage points.

Several factors could explain the reduction in symptoms, including community-level immunity in high-vaccination states, which may have lowered children's risk of COVID-19 and related asthma complications. Additionally, children in these states may have received vaccines earlier when they were approved for their age group. ■

*States with the highest vaccination rates saw asthma symptoms decrease by 1.7 percentage points, nearly three times the reduction seen in states with the lowest vaccination rates.*



# This is personal

*How personalized medicine helped liberate a family from insulin injections*

*The Acevedo De Arias family with Dr. Liana Billings (far left) who developed a first-of-its-kind genetic test which helped correctly diagnose the family's specific form of diabetes.*



**E**ricka Acevedo De Arias was diagnosed with diabetes nearly 15 years ago. When her kids, Dominic (8) and Anastasia (5), received the same diagnosis, she worried they were doomed to a lifetime of insulin injections, blood sugar checks and thousands in medical costs.

But they aren't, thanks to a groundbreaking new genomics test developed by researchers at Endeavor Health. The test revealed all three — mom and kids — actually have a lesser-known form of monogenic diabetes, often confused for Type 1 or 2, that can be managed with simple lifestyle changes alone.

"It makes me a little emotional," said Acevedo De Arias, 35, from Waukegan. "I feel like if we hadn't gone to these doctors, my kids would have been labeled just like I was. They freed my kids of that and opened our eyes. Our whole family — we're just so happy they don't need insulin anymore."

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*I feel like if we hadn't gone to these doctors, my kids would have been labeled just like I was. They freed my kids of that and opened our eyes.*

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#### 'LIBERATING DIAGNOSIS'

After their initial diabetes diagnosis, Acevedo De Arias helped her kids adjust to wearing glucose monitors and taught them to administer their own nightly insulin shots, which left bruises on their stomachs. When they went to birthday parties, Dominic and Anastasia were frustrated that they weren't allowed to have cookies and cake, like their friends.

"They hated that," she said. "It was the ultimate hardest thing ever for them, because they're kids. They don't understand."

But Acevedo De Arias, a home health nurse who works with diabetic patients, noticed something was off. The kids weren't

constantly thirsty, for one, and she thought, "This can't be diabetes. This has to be something else."

Her Endeavor Health endocrinologist, Brian Bordini, MD, agreed. He sent the family to see Liana Billings, MD, a researcher and endocrinologist, who had developed a first-of-its-kind genetic test that could give them more information.

That test revealed the family actually has glucokinase-maturity-onset diabetes of the young, also known as GCK-MODY or MODY 2, a lesser-known form of diabetes. GCK-MODY is caused by a genetic alteration in the GCK gene, which causes your blood glucose to naturally sit at a higher level. The condition tends to be milder than other forms of diabetes and does not tend to get worse.

"That means patients might not require diabetes medications, except in certain cases during pregnancy," said Dr. Billings, who diagnosed the Acevedo De Arias family with GCK-MODY. "We simply encourage a healthy lifestyle — eating well and staying active — just as we would for anyone. For many, this can be a truly liberating diagnosis."

#### IN THE GENES

Every year, more than one million Americans receive a diabetes diagnosis. However, an estimated 1 in 2,000-4,000 people may actually have the same condition as Acevedo De Arias — it's hard to say, though, since it's so often missed or mistaken for something else due to symptom overlap and a lack of available testing.

"There's a critical need for more personalized diabetes evaluation," Dr. Billings said. "In particular, testing that leverages a patient's genetic information to enable more precise and personalized diagnoses."

Today, diabetes is typically diagnosed with a blood sugar test, some educated guesses based on clinical information and, at times, trial and error with medications. But that's a one-size-fits-all approach, she said, and can lead to missed or incorrect diagnoses.

This insight inspired Dr. Billings to establish Endeavor Health's Personalized Medicine in Diabetes Consultation Clinic, which focuses on evaluating atypical forms of diabetes, like GCK-

MODY, through genetic testing. The clinic is also working to develop a comprehensive, cost-effective genetic panel to support more accurate diagnoses.

"We need to look at genetics," said Jianfeng Xu, DrPH, Vice President of Translational Research, who developed the test with Dr. Billings. "Some of these forms of diabetes can only be diagnosed with genetic testing. Across all of healthcare, genomics is reshaping our understanding of diabetes and many other chronic conditions and sparking hope for precision care."

#### THE FUTURE OF TESTING

Genetic testing is becoming increasingly prevalent in clinical settings, and could yield significant benefits for patients with chronic conditions, like diabetes, that require long-term management. Aside from GCK-MODY, genetics can play a role in many kinds of diabetes, including the more common Type 1 and Type 2.

"With genetics, we can get more precise — we don't have to paint in broad strokes," said Dr. Xu, who also is Endeavor Health's Ellrod-Schweighauser Family Chair of Cancer Genomic Research. "We can tell you the exact genetic variant you have. We can tell you your personalized risk of developing the related disease. We can tell you that you need this specific treatment plan or that the standard one won't work for you, which could lead to better outcomes and, in the case of diabetes, save you time and money."

At Endeavor Health, Dr. Xu is part of the largest primary care-embedded clinical genomics program in the nation. This effort is primarily based on Endeavor Health's large genetics research cohort, the Genomic Health Initiative (GHI), led by Alan Sanders, MD. GHI recently welcomed its 68,000th patient. Over half of these patients have already provided a DNA sample for research, which Dr. Xu hopes will lead to breakthroughs in risk assessment, diagnosis and treatment.

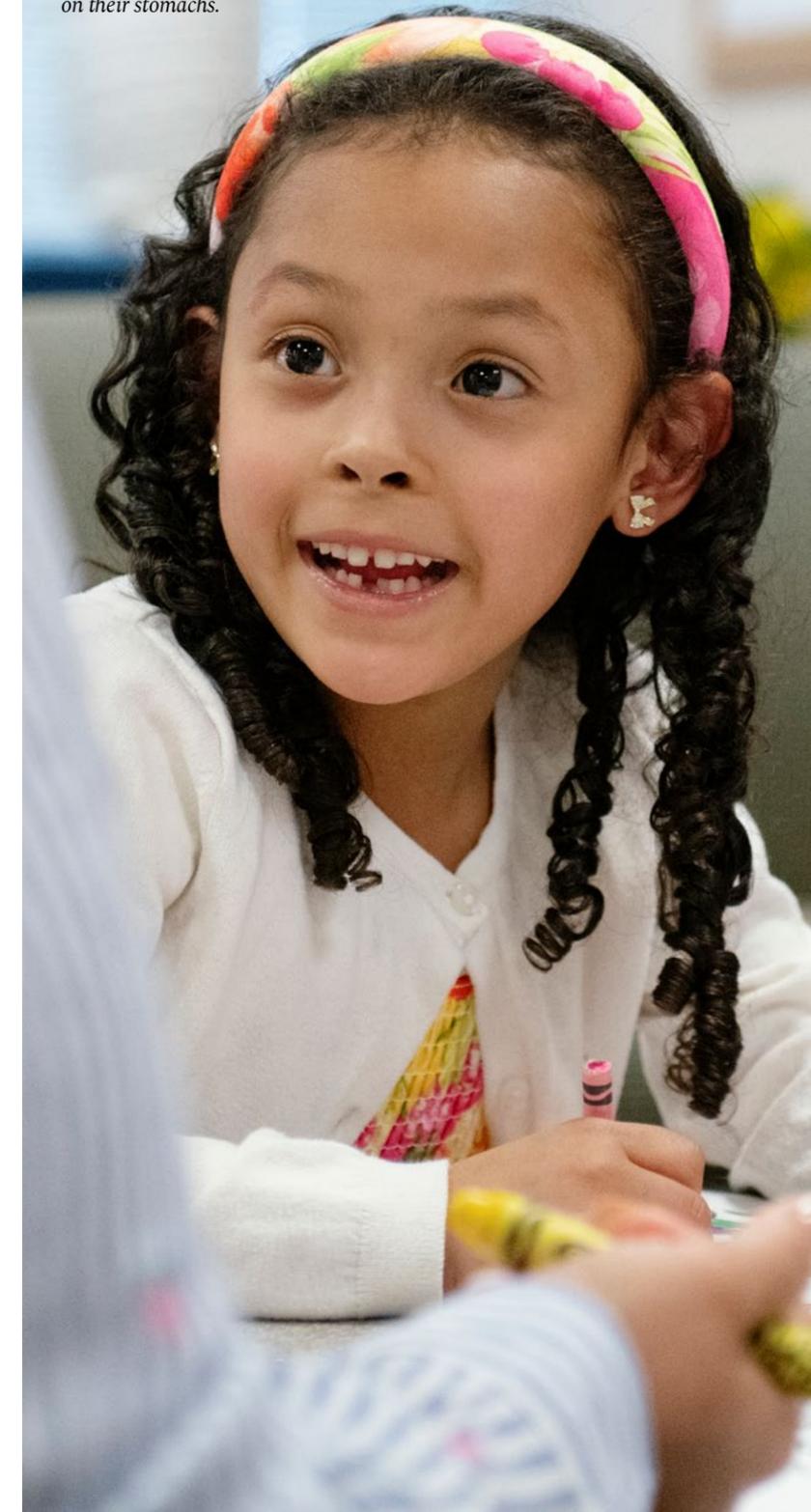
For her part, Acevedo De Arias couldn't be happier that genetic testing is making its way into daily clinical practice. She'd always thought diabetes ran in her family and that her kids' diagnosis was inevitable. Now armed with the knowledge of their genetics and GCK-MODY, she knows her kids — and their kids and their kids — may never have to deal with a lifetime of needle pricks.

Her kids are excited, too.

"When I told them they didn't have to do the monitoring or insulin anymore, they were ecstatic," she said. "They were so happy, and our whole family was happy for them."

For more information about this one-of-a-kind genetic test, please contact Endeavor Health at (224) 364-7502. ■

*Anastasia De Arias and her brother Dominic no longer have to wear glucose monitors or give themselves daily insulin shots that left bruising on their stomachs.*



*The Acevedo De Arias family meets with Dr. Liana Billings (right) at Endeavor Health.*

# Smart Medicine

Using AI and cutting-edge technology to power personalized care

**W**hat if your doctor had the sum total of medical knowledge at their fingertips? What if your nurse could focus more on you, thanks to an extra set of (robotic) hands?

We are in an age of medicine like no other, with next-generation 'smart' technologies like artificial intelligence (AI) offering tremendous promise for improvements in access, efficiency and personalized patient care.

Endeavor Health is at the leading edge of this shift, using these technologies to support clinical decision-making, operational efficiencies, predictive analytics and more.

"There's an imperative now to incorporate these tools that we believe will make truly life-changing impacts on our patients and our team members," said Nadim Ilbawi, MD, System Medical Director of Innovation and Care Model Redesign. He's working to identify opportunities to incorporate these technologies into how Endeavor Health delivers care.

For example, AI lets physicians access a broad base of knowledge and analyze patient data and medical images to make better diagnoses and treatment recommendations. It can also remove some of the administrative burden of medicine that can keep them from spending more time with you, the patient.

According to Dr. Ilbawi, Endeavor Health is constantly exploring and adopting tools, with several pilots launched to date and more on the way. The potential for AI in healthcare is practically limitless.

## Connection in progress

Endeavor Health physicians now have a super-powered AI assistant. With patient permission, a new 'smart' ambient documentation program records conversation during a patient exam and quickly generates notes,

**109M**  
nurse steps saved

**50,000+**  
miles traveled by robots  
(that's more than twice the circumference of the Earth!)

**106,000**  
supply deliveries completed

## How smart is that?

*Moxi the robot provides help to nurses at multiple Endeavor Health hospitals, running errands that once took nurses and nurse assistants valuable time and steps.*





With a patient's consent, the physician opens an app on their phone to begin a secure recording of the patient visit, allowing them to focus solely on the patient.



Dr. Robert Gray, an orthopaedic surgeon at Endeavor Health, explains the AI note-taking tool to a patient.

significantly reducing the time many physicians spend taking notes and creating after visit summaries.

After asking patients if it's OK to use during the visit, the physician opens an app on their phone and begins a secure recording. When the visit is over the recording is stopped and notes are generated for review within 30 to 60 seconds. The recording is held in a secure cloud and is deleted after a short period of time and physicians review the notes to ensure accuracy.

"Physicians don't have to type things in during the appointment or worry about missing something," said Dr. Ilbawi. "They can focus completely on their patient."

**Robot assistants**

Nurses are on the frontline of hospital care, with ever-increasing demands on their time. Now, they're getting an extra set of hands and more hours in a day thanks to a new high-tech assistant. Moxi the robot provides valuable help to nurses, running errands that once took nurses and nurse assistants valuable time and steps.

Moxi makes her own way to the pharmacy and can unlock doors with her code by waving her hand. The pharmacist checks her instructions on the screen on her chest and scans open a secure compartment to deposit the medicine. Moxi does not interact with patients, but frees up time for nurses to focus on what they do best — taking care of you.

"Nurses can concentrate on being at the bedside with patients, providing the best care possible, which is the primary reason why most of them became nurses in the first place," said Elmer Dulce, Nursing Director for Cardiac Telemetry Units.

**Spotting potential dangers**

Heralded as a game changer, an AI powered tool that uses natural language processing piloted at some Endeavor Health emergency departments is helping flag patients who may be struggling and in need of a social work consultation. The platform runs clinical notes through its AI queries to identify patients at high-risk of social determinants of health challenges, like poverty or dangerous home environments.

For example, notes from prior emergency department encounters identified one woman as a likely victim of physical abuse. The social worker had an understanding of what she had been through without a lengthy chart review and was able to use a trauma-informed approach to quickly intervene and offer help.

"It's very clear that this has made a significant impact and we have been able to provide crucial support to at-risk patients through this innovation," said Nirav Shah, MD, Associate Chief Medical Informatics Officer of AI and Innovation at Endeavor Health. ■

**Ambient AI by the numbers**

**68%**  
increase in physician work satisfaction and patient-physician connection

**12%**  
decrease in time spent on note-taking

**40%**  
reduction in physician burnout



Post-doctoral fellows Greg Tracy, PhD, and Elle Brandt, PhD, with the “mini brains” — tiny mounds of brain cells, complete with neurons and synapses.

### ‘Mini brains’

In a research lab in Evanston, post-doctoral fellow Greg Tracy, PhD, holds up a culture tray spotted with little white blobs.

“These are the so called ‘mini brains,’” he says, letting out a small laugh. “These little thinkers will help guide us to a big new world of understanding and psychiatric medicine.”

These ‘mini brains’ are actually tiny mounds of brain cells, complete with neurons and synapses. Dr. Duan’s team uses them as a window — a miniature model of how these disorders develop in the brain.

Schizophrenia and others remain a mystery, in part, because they’re so hard to observe. They’re often

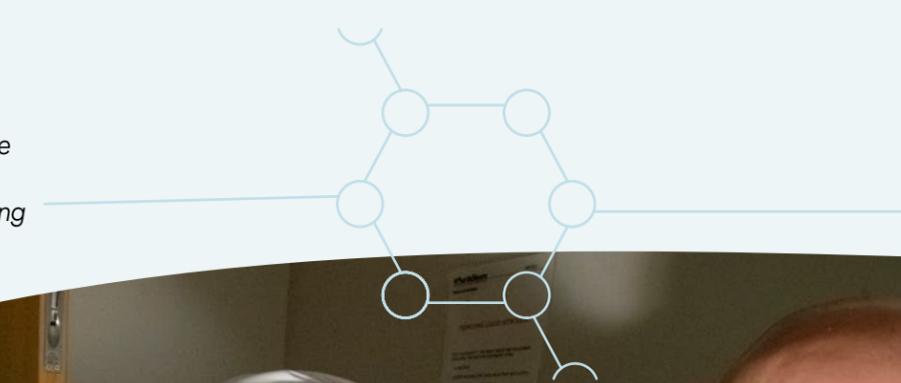
diagnosed after symptoms appear, and it’s hard to study genetic causes in living patients.

The “mini brains” offer researchers a unique opportunity to watch as schizophrenia develops from the very beginning, which could help us understand its causes what puts certain people at higher risk.

To create these mini brains, the researchers drew blood from patient volunteers at high risk, and then convert them to induced pluripotent stem cells (iPSC).

“Pluripotent” means these cells haven’t decided what they want to be yet. They could turn into skin cells, liver cells or, with a small nudge, into brain cells. And thus, the mini brains.

Juabo Duan, PhD, (center), Co-Director of the Center for Psychiatric Genetics at Endeavor Health, with Dr. Tracy and Dr. Brandt, extracting patient-donated stem cells that they use to grow brain cells for their research.



# Brain Teaser

*What miniature brain models are revealing about mental illness*

**A**s a young doctoral student in Beijing, Jubao Duan, PhD, loved playing tennis with his mentor’s son, Niu Niu. He was a sweet kid — smart and good at math.

That made it all the more painful to watch as schizophrenia slowly took hold of Niu Niu’s mind. He became socially withdrawn, experienced delusions and had difficulty organizing his thoughts and communicating clearly.

“It made me feel so powerless,” said Dr. Duan, now Co-Director of the Center for Psychiatric Genetics and

Charles R. Walgreen Research Chair at Endeavor Health. “We still do not know how exactly the disease can occur and how to cure it.”

But Dr. Duan is not powerless — in fact, his pioneering research might lead to new breakthroughs in how we diagnose and treat neurodevelopmental disorders. These disorders, such as schizophrenia and autism, affect some 300 million people worldwide.

Dr. Duan’s research meets this big problem with an equally big idea — and sometimes, big ideas come in small packages.





*"We now know that there are over 280 regions in our genome that are associated with increased [Alzheimer's] risk," says Dr. Duan.*

### Code breakers

As with many things in medicine, researchers believe neurodevelopmental disorders come down to our genetic code.

"For example, we now know that there are over 280 regions in our genome that are associated with increased risk for schizophrenia," said Dr. Duan, also a professor at the University of Chicago. "However, which genes and how they can exactly cause the disease remain largely unknown."

Unraveling that mystery could lead to major breakthroughs in diagnosis and treatment. Dr. Duan has been working on it for over 20 years, first on gene-hunting through the Genome-wide Association Study (GWAS) and now on understanding what those genes do as part of Scalable and Systematic Neurobiology of Psychiatric and Neurodevelopmental Disorder Risk Genes (SSPsyGene), backed by the National Institutes of Health.

SSPsyGene includes four centers using iPSC-derived brain cellular models — Endeavor Health/Rutgers, UCLA, MIT, and Yale — investigating 250 risk genes for neurodevelopmental and neuropsychiatric disorders. In Duan's lab, the team aims to model 30-50 distinct gene mutations in each mini brain.

"We're trying to identify which genes contribute to these brain changes," said Elle Brandt, PhD, another post-doctoral research fellow in Dr. Duan's team. "The better we understand the cause, the better we can detect it early and find ways to intervene."

She added that researchers could use this information to create more precise genetic testing and personalized treatments — not just for schizophrenia, but for a range of brain disorders. She's also working on developing a "mini-brain" model for studying brain injury/repair and neurodegenerative disorders.

And Dr. Duan hopes that these studies will help patients around the world. That includes his mentor's family in Beijing, who he visits whenever he gets the chance.

"I am so happy that Niu Niu can still call my name every time I see him," Dr. Duan said. "With this research, I hope we can make a difference for him and many, many others."

### Looking forward

Dr. Duan and his team are also exploring whether induced pluripotent stem cells could help treat some brain disorders. "You can't easily access or transplant brain cells," Dr. Duan said.

But blood cells are more accessible, and as in the mini brain models, can be turned into healthy brain cells. This method could reduce immune rejection risks and offer new treatments for conditions like Parkinson's disease.

The researchers are also investigating gene-editing with induced pluripotent cells to correct inherited defects, and clinical trials are underway for diseases like macular degeneration and Parkinson's.

"This concept remains experimental, but it holds great promise," Dr. Duan said. ■



*Researchers Dr. Brandt (left) and Dr. Duan (right) examine slides under a microscope.*



1001 University Place  
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