

Hear! Hear!

Applying Precision Medicine to Predict Language Ability

Research has shown that early cochlear implantation, before age two years, optimizes language skills for children born with hearing loss. However, age alone doesn't consistently or accurately predict listening and speech performance. Some children lag behind their normal hearing counterparts despite receiving implants as an infant or toddler. Why this scenario arises may have more to do with what is above the ears.

"How the brain makes use of auditory information is critical to language outcomes in children who receive a cochlear implant," says surgeon Nancy M. Young, MD, Medical Director, Audiology and Cochlear Implant Programs at Lurie Children's. "It's not just about the technology, but how the brain makes use of information provided by the implant, which is less detailed than would be provided by a healthy inner ear unaffected by hearing loss."

Hearing loss early in life deprives the auditory areas of the brain of stimulation, and leads to changes in patterns of brain development. Looking for more reliable

predictors of achieving successful language capabilities after cochlear implantation, Dr. Young and co-senior author Patrick C.M. Wong, PhD, a cognitive neuroscientist, have found a promising crystal ball. They have created a machine-learning algorithm that uses anatomy from brain scans to predict language ability in children after cochlear implantation. Recently published in the *Proceedings of the National Academy of Sciences*, their study's novel use of artificial intelligence to understand brain structure underlying language development may have far-reaching implications for children with developmental challenges beyond severe hearing loss.

"We used MRI scanning to create models of children's brains impacted by hearing loss before cochlear implant surgery, and constructed a machine-learning algorithm to predict whether children would be low or high performers after implantation with a relatively high degree of accuracy, specificity and sensitivity," says Dr. Wong, Director of the Brain and Mind Institute at The Chinese



Surgeon Nancy M. Young co-authored a study in which a novel machine learning algorithm used anatomy from brain scans to predict language ability in children after cochlear implantation.

University of Hong Kong. "Since the brain underlies all human ability, the methods we have applied to children with hearing loss could have widespread use in predicting

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FHSR Support Invaluable in Providing Unique Services



Nancy M. Young, MD

We are excited about our research recently published in the *Proceeding of the National Academy of Sciences* and featured in this issue of *Hear!Hear!* The long-term goal of our research is to improve language development by prescribing the most effective behavioral therapy (listening, speech, music) based upon each child's brain imaging. This work is in its infancy, and further research is needed to realize this vision. Efforts to secure grants to enable expansion of our work to other cochlear

implant programs around the world are underway, and I look forward to reporting back to you about our progress.

Lurie Children's remains the largest center in Illinois for diagnosing and treating children with hearing loss. In 2017, we performed 100 implantations. After implantation for eligible candidates, we are now able to provide amplification of preserved acoustic low-frequency hearing present in the implanted ear while also providing the electric hearing necessary to

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Predicting Language Ability *(continued from page 1)*

function and improving the lives of children with a broad range of disabilities.”

The study is the first of its kind, and utilized brain imaging obtained as part of the standard presurgical evaluation of young children receiving a cochlear implant. Because the technique is objective and task-free, it is suitable even for infants. Much like genomic testing is ushering in personalized strategies for a variety of diseases based on DNA markers, this exciting research could provide a powerful tool to determine optimal therapy for each child after cochlear implantation based on how the brain looks beforehand. Dr. Young calls her ambitious vision a “precision medicine approach to therapy.”

“Someday soon, we may have the capability to predict those who will progress quickly

and those who may not, and then match the types of learners to therapies customized to their specific neuroanatomy,” she says. “With an objective, research-based counseling tool, health care professionals and parents will be able to more effectively plan a child’s rehabilitation needs to attain the best results.”

Dr. Young adds, “So far we have not had a reliable way to predict which young children are at risk to develop poorer language. The ability to forecast language performance is the critical first step to improving outcomes. We hope our research will enable development of new therapies to meet each child’s individual needs to maximize language for all children who receive an implant.”

Support Provides Unique Services *(continued from page 1)*

hear soft high-frequency consonants, like “s.” We are also implanting children with “single-sided” deafness, so that they may have the benefit of hearing from both ears. The result of these advances is better hearing for children in difficult listening situations, including the classroom.

There is no shortage of barriers that families face to implement the multidisciplinary services their children with hearing loss need. The support that FHSR provides to our patients, and therefore our clinical staff who serve these children, is invaluable, and sets us apart for other programs. The importance of the work done by our social workers is highlighted in this issue’s profile of social worker Danielle Lee, LCSW, and by Alfredo’s story. Danielle and her partner, Christine Berg, LCSW, in collaboration with our education coordinator, Jennifer Haney, MEd, make it possible for so many of our children to receive the medical care, therapies and educational support they need, both at Lurie Children’s and in their local communities. Without their expertise and hard work, far fewer children in Illinois would receive and benefit from advanced hearing technologies. The future is now. Today’s children need our help to realize their full language and cognitive potential.

Nancy M. Young, MD

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FHSR Calendar of Events

April 19 at 6 p.m.

Giant Steps: FHSR Presents “Chasing Trane,” a Movie Screening & Reception at the Davis Theater, 4614 North Lincoln Avenue, Chicago

September 28 at 6 p.m.

Cheers & Beers for Ears at the Little Owl, 3747 Grand Boulevard, Brookfield

October 20 at 7 p.m.

Rock the Town for Hearing – Concert & Reception at the Old Town School of Folk Music, 4544 North Lincoln Avenue, Chicago

November 2 at 6 p.m.

An Evening of Merit and Music – Concert & Reception at the Merit School of Music, 38 South Peoria Street, Chicago

Family Events

April 22 at 11 a.m.

Cheers for Ears - Kid-Chella, the 7th Annual Free Family Concert, at Columbia College, 618 South Michigan Avenue, Chicago

May 20 at 8 a.m.

Lurie Children’s Move for the Kids 5k Walk/Run, presented by C. H. Robinson, Soldier Field Stadium Green

For more information regarding these events, to purchase tickets, register for an event or make a donation, please visit fhsr.org.



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Alfredo at an appointment with his audiologist, Lisa Weber, AuD.

Transforming Alfredo's World

After his second cochlear implant last May, Alfredo Mejia, 11, played for the first time on a baseball team with hearing children.

“At first he didn’t want to do it because he felt everyone was different from him,” recalls his mom, Yvonne Hardcastle. “But in the end, he loved it.” She credits his transformation into a boy bursting with self-confidence to his bilateral implantations at Lurie Children’s.

Bilateral implantation has become the standard of care for qualified candidates. Having input from two ears often leads to improved spoken language, as well as the ability to recognize from what direction sound is coming. One of the most important benefits of the brain receiving information from both ears is better understanding of spoken language in noisy situations. The end result of having “stereo” hearing from two implants is an overall improvement in ease of listening.

“Two ears generally work better together,” says Alfredo’s audiologist, Lisa Weber, AuD, Manager of Lurie Children’s Audiology Department. “We recommend bilateral implantation if the child qualifies.”

Slow to speak, Alfredo failed a school hearing screening test when he was 7, and was diagnosed with bilateral sensorineural hearing loss. Fitted with hearing aids,

Alfredo began receiving audiology and speech pathology services at Lurie Children’s. Jennifer Haney, MEd, the Hart Family Cochlear Implant Education Coordinator, also assessed Alfredo’s educational needs and helped transition him from a mainstream classroom to a program for the hearing impaired.

Eventually, his hearing aids and therapy were not enough to overcome his difficulties hearing and understanding speech. It was time to consider cochlear implants.

In April 2016, Alfredo’s right ear was implanted by surgeon Nancy M. Young, MD, Medical Director, Audiology & Cochlear Implant Programs. A year later, he received his second implant. While Yvonne was initially reluctant for her son to undergo a second surgery, her concerns were outweighed by his progress — from hearing birds chirp to singing himself for the first time. Since gaining binaural hearing, Alfredo’s speech perception scores have doubled, and he has excelled academically and made gains socially.

His increased confidence dramatically came into play when his mom suffered a grand mal seizure last year. Alfredo quickly took action and called 911. “Without his cochlear implants and improved hearing, I don’t know if I’d be here today,” says Yvonne.

60 Years of Support, Advocacy

The Foundation for Hearing and Speech Rehabilitation (FHSR) is proud to celebrate its 60th anniversary this year. Founded in 1958, the nonprofit organization is dedicated to improving the quality of life for children affected by hearing and communication disorders through support, education and advocacy. The FHSR has become an indispensable voice and source for services in the Midwest region for parents and professionals seeking help for children with hearing and communication disorders. Thanks to FHSR’s support, these children receive early intervention services, medical care and educational and other support services.

FHSR began as the Robert Henner Hearing and Speech Center. With the combination of passionate family support and otologist Dr. Robert Henner’s leadership, the center answered a great need. The organization developed speech and rehabilitation programs and classes for children and adults. From the beginning, FHSR recognized the importance of securing a partner to advance its mission, and partnered with the Siegel Institute of Communicative Disorders at Michael Reese Medical Center. In 2002, FHSR became affiliated with Ann & Robert H. Lurie Children’s Hospital of Chicago, supporting and advancing an innovative, evidence-based cochlear implant program.

Today, FHSR supports work throughout Lurie Children’s Audiology & Cochlear Implant Programs. It has funded the expansion of a critical literacy program for deaf children in Central and Southern Illinois, and established multiple family events to promote a community among families of children with hearing loss.

These accomplishments represent FHSR’s unwavering commitment to be the leader in supporting the hearing and communication disorder population— from infancy detection through the preparation for productive and healthy adulthoods.

Social Worker Addresses Families' Needs



Audiology & Cochlear Implant social worker Danielle Lee provides essential support for families of children with hearing loss.

The cochlear implant journey can be an anxious one that families at Lurie Children's need not travel alone. Thanks to social worker Danielle Lee, LCSW, families of children cared for by the hospital's Audiology & Cochlear Implant programs can rely on her help every step of that journey.

"As a member of the care team, I offer families support and link them to resources from the moment they walk through our doors," says Danielle. "I provide a familiar face and follow families throughout the entire process by being present at clinic visits and checking in with them by phone."

When a child is diagnosed with hearing loss, their parents can be overwhelmed by making decisions about hearing aids and cochlear implantation surgery. They may experience sadness, confusion, anger and guilt as they worry about their child's ability to communicate and function in a hearing world.

Danielle bonds with families, assesses their psychosocial needs and provides support for those struggling to come to terms with their child's hearing loss.

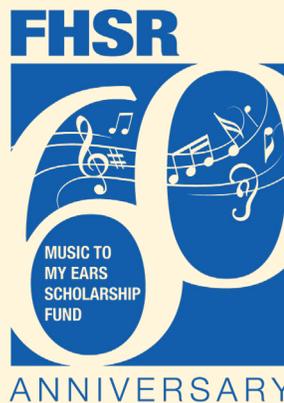
For example, Danielle worked with a child's parents who had received little emotional support from family and friends. She put them in touch with volunteers in the department's ParentWISE™ program, families of children with hearing loss who had experienced many of the challenges they were facing. Speaking with other families who had been in their situation enabled them to focus on the hope

and promise in their child's future, and helped them feel more comfortable about cochlear implant surgery.

Danielle shares her position with fellow social worker Christine Berg, LCSW, thanks to support from the Foundation for Hearing and Speech Rehabilitation, ensuring that these essential services are available five days a week. Close collaboration with the program's audiologists and other staff allow the social work team to help families overcome barriers to treatment or compliance with therapy. When the medical team notices a child consistently missing appointments, for example, social work is called in to assist.

For some families, the expense of traveling to Lurie Children's may be an issue. Recently, Danielle helped a family complete paperwork to gain access to transportation to medical appointments.

"Once the family was able to set this up, it eliminated a significant financial burden so they could focus on their child's therapy," says Danielle. "Getting families to the point where they can see the excited smiles of a child who can hear after a cochlear implant is our ultimate goal."



FHSR Creates Scholarship Fund

The FHSR is honoring its 60th anniversary with the creation of the Music To My Ears Scholarship Fund. The Fund will provide tuition-free early childhood music enrichment classes for young children in Chicago who are deaf or hard of hearing. For more information, please visit fhsr.org.



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