UK otolaryngologist works to address rural disparities of pediatric hearing loss

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Dr. Matthew Bush will tell you two things about himself—that he is Appalachian by birth and that he is fascinated with the anatomy and physiology of hearing. And his work clearly reflects both: As an otolaryngologist at the University of Kentucky, he focuses on rural health disparities of pediatric hearing loss, particularly in Appalachia.

Not only was Bush born in Appalachia (Charleston, WV), he also attended medical school in Appalachia at Marshall University in Huntington, WV. He completed his residency at UK in 2008, and following a research and clinical fellowship at The Ohio State University, returned to UK as a clinical faculty member in 2011.

In the course of his extensive training, Bush "fell in love" with hearing health care, ear surgery, and technologies like cochlear implants that offer revolutionary opportunities for people who are deaf or hard of hearing to rejoin or enter the hearing world.

"The reward is in the treatment," he said. "We love to see lives improved."

It was during his fellowship at OSU that Bush began to develop research ideas related to disparities of hearing health care for rural populations. While he has a diverse research background, including bench research, interacting with patients influenced his research most profoundly.

"Really it was the clinic setting that informed and fueled my efforts and

interests because the patients that we see have some tear-jerking stories," he said. "They didn't have access to services, or they were totally unaware that there were options to help their hearing impaired child. So they show up at the clinic very delayed, well past the optimal age for intervention, and the child has already lost a lot of language development potential. Seeing those kinds of heartbreaking situations touched me as a person, as a father, as a clinician, and as an Appalachian. "

Pediatric hearing loss is common, affecting about 1 in 1000 children. Bush says that the incidence is slightly higher in Kentucky, about 1.7 in 1000, although the elevated rate might be related to Kentucky's thorough and mature reporting system.

As Bush explains, hearing loss is really a public health problem with lifelong impacts for individuals, particularly children. Hearing is vitally important in speech, language, and cognitive development of children, and children with hearing loss are at risk for difficulty in socialization, lower self-esteem, and increased behavioral problems.

"It might not seem to be a life threatening problem, but it is very impacting when it comes to the quality of life," he said.

The good news is that hearing loss is most often treatable.

"Nearly all forms of hearing loss can be treated with hearing aids or cochlear implants," Bush said. "Almost every child can have an option for rehabilitation."

However, early diagnosis and intervention for pediatric hearing loss are critical. Current standards of care dictate that diagnosis should occur no later than three months of age, and treatment should be initiated no later than six months of age. Delayed care is associated with language, cognitive, educational, and social development deficits in children, and

can affect potential job productivity, employability, and overall economic well-being into adulthood.

"If a child receives appropriate intervention in a timely manner, they can be very highly functioning and do the things that they want to do. They wont be limited by their condition," Bush said. "But timing is essential – the consequences of delaying care in the first few years of life are amplified dramatically. "

For rural residents, who constitute 20 percent of the national population and experience significant health disparities across the board, delays in pediatric hearing health care are unfortunately common. Children with hearing loss in rural areas are diagnosed later than children in urban areas and subsequently receive interventions like hearing aids and cochlear implants at a later age.

Bush finds this reality is concerning, unacceptable, and solvable. He is currently investigating causes and potential solutions for delayed hearing health care among rural residents. The reasons for delays, he says, are multifactorial but are most likely related to distance from health care facilities and lack of knowledge of pediatric hearing loss and the importance of timely care.

"There's a direct relationship between distance to a tertiary care center for treatment and the timing of accessing those resources," said Bush. "The patients who are farthest away tend to be the most delayed because there's a lack of services in those communities."

To reduce the impact of distance on timeliness of hearing health care, Bush is looking to telemedicine delivery of hearing diagnostic and therapeutic services. These services require the time of experienced clinicians using a "hands on" approach but can likely be delivered effectively and remotely with an appropriate telemedicine set-up.

"There has been little research about telemedicine to change long-term hearing outcomes in children and access to hearing health care," he said. "We'd like to investigate the role of telemedicine in rural regions of Kentucky to do diagnostic testing, patient counseling, and hearing loss rehabilitation with hearing aids and implants. These are services that have not been offered before in Appalachia."

Lack of parental knowledge about hearing loss and treatments and limited experience of rural health care providers in addressing pediatric hearing loss also contribute to the delayed hearing health care for rural children. According to Bush's recent research, about 14 percent of rural parents left the birthing hospital without knowing the result of the state-mandated hearing screening.

"There's an underlying issue of health literacy and knowledge of your child's condition, the importance of seeking treatment, and what the options are," said Bush. "A child may look completely normal and may be born to parents with no family history of hearing loss, yet may be profoundly hearing impaired."

He is currently working on a grant proposal to the National Institutes of Health to pilot a patient navigator program to assist parents in understanding the results of their child's hearing test results and the importance of early diagnostic testing and intervention. Patient navigator models have been successful in improving treatment and outcomes for other conditions, but haven't been employed and studied systematically with congenital hearing loss. The current patient navigator is a parent of cochlear implant recipient, so she has lived through the process and is dedicated to helping others access the care her daughter received.

"We hypothesize it will be cost effective and sustainable because it will involve a lay person with personal knowledge about hearing loss in children, and a passion to provide psychosocial and education support to

other parents of hearing impaired children," he said.

Another barrier to hearing health care for rural patients is that primary care practices in rural settings might not have experience in navigating the diagnostic and treatment processes for pediatric hearing loss.

"This is not something that they're seeing on a daily basis, so provider knowledge about next steps and resources is limited," Bush said. "But this is something that can be improved."

To that end, Bush is working to develop solutions that reduce delays of rural children accessing the hearing health care they need. He and his colleagues have assessed primary care provider practices in rural communities and have developed online educational modules with follow-up community accountability that will be circulated to providers. Hopefully, targeted education to rural health care providers will increase their knowledge of the condition and the medical community accountability support will impact their long-term practice.

Much of Bush's current research is facilitated by the KL2 Scholars Program of the UK Center for Clinical and Translational Science (CCTS). The program provides multidisciplinary research mentorship, protected research time, and funding to support junior investigators in obtaining independent research awards. Like many physician-scientist-educators, Bush—who is also enrolled in the CCTS PhD program in clinical and translational science—understands the difficulty of managing competing demands.

"The KL2 program is a total game changer," he said. "It's very difficult in this day and age for clinicians to do research - to be able to balance productivity in the clinic and in the research realm while also being an educator."

The program is just one component of what Bush appreciates about working as clinician-researcher at UK.

"I just have to pinch myself to tell myself that I'm not dreaming," he said. "I'm so thankful to be here—to have the opportunity to be where I love and do the work I love. My job is to help alleviate fears, provide knowledge, and use our expertise to provide the best care as timely as possible. It's a privilege and an honor to work in this field."

Even he will admit that there's much work left to be done to ensure timely access to hearing health care for all children, but he's hopeful about UK's capacity to affect change.

"The challenge of health care disparities is something that UK is poised to address as a national leader, with some brilliant researchers who are well-funded and very experienced in trying to address these problems," he said. "You have to start small and delineate and define what the problem is before you can determine the best fix."

Bush, who says that the first doctor he remembers seeing as a child was an ear, nose, and throat doctor, nevertheless has a clear vision for what he and his colleagues can accomplish.

"In an ideal world," he said, "we wouldn't have socioeconomic, educational, or geographic barriers that would prevent a child from getting the hearing healthcare that they need. There would be a seamless transition from the birthing hospital to resources for hearing testing and treatment, whether face-to-face or via telemedicine. We'd like the quality of care and access to care to be the same for all children. That's really what our passion is."

Provided by University of Kentucky