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Can AI Plus Electronic Health Records Predict Childhood Obesity Risk?

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Childhood obesity is one of the most common pediatric chronic diseases in the United States, affecting 1 in 5 children. It is also one of the most complex — driven not only by genetic and physiological factors but also social determinants of health such as food insecurity or living in food deserts, poverty, parental education, and insurance access.

But pediatricians and other pediatric healthcare providers have an important strategy at their disposal: Prevention. If they are able to catch a child's obesity risk early enough or at key points in early development, they may be able to address future associated outcomes such as type 2 diabetes, hypertension, and hyperlipidemia.

That is exactly the reasoning underlying the development of a new, validated predictive model that uses deep machine learning applied to data from accessible electronic health records (EHRs), the development and details of which were mentioned last month in *Obesity Pillars*.

"The main motivation behind this work was that we wanted to build a model that can be integrated into pediatric facilities, data that don't require any extra time or money to collect but is already being collected at every visit," said Mehak Gupta, PhD, lead study author and assistant professor of computer science at Southern Methodist University in Dallas.

Performance and Advantages

The study was based on EHR data from 36,191 children enrolled in a large pediatric healthcare network across five states (Delaware, Florida, Maryland, New Jersey, and Pennsylvania), with encounters between January 1, 2002, and December 31, 2019. The model used EHR input starting at birth and derived from seven routinely captured risk categories:

1. Diagnoses
2. Family history/diagnoses
3. Medications
4. Measurements
5. Demographics

6. Last obesity status before age 3
7. Weight-for-length percentage changes before age 2

Researchers examined roughly 500 childhood obesity factors within these categories. It was evaluated on its ability to predict risk for children up to age 10.

Findings showed that the model was able to predict obesity within a 3-year window for children aged 2-7 years and that compared with standard weight-for-length measures, it achieved an area under the operator curve above 0.8 for all cases.

However, the utility and practicality of this approach is unclear, given current clinical time constraints, inconsistently captured EHR data, and pervasive stigma around obesity.

Charles Thomas Wood, MD, MPH, a pediatrician and assistant professor of pediatrics at Duke University School of Medicine in Durham, North Carolina, has also been studying how EHR data can be used to develop interventions to prevent obesity in early childhood.

"There has been a lot of commentary and use of longitudinal studies looking at change in weight gain to prevent obesity at various different ages and a lot of interest in trying to differentiate children before age 2 or 3 who are at highest risk," he said. Wood said that one of the current challenges of using the EHR for risk prediction has been the dearth of data before age 2.

But Gupta maintains that the predictive model still holds value, even at younger ages. "Sometimes you might see a patient who has not reached the obesity threshold yet, but their trajectory of weight is increasing. You cannot be sure that this patient will cross the threshold or not. But this model can tell you that there's a risk of doing so and give you an alert when that risk is above 50% or 70%," Gupta said.

"I think that it's an interesting way to take information that we already have and synthesize it into a picture we could use like an aid to support the family," added Mutiat Onigbanjo, MD, assistant professor of pediatrics at the University of Maryland School of Medicine and medical director of the University of Maryland Pediatrics at Midtown in Baltimore. "It's an additional tool that we can use to encourage families to make those lifestyle changes we are often promoting," she said.

Is It Ready for Primetime?

In its clinical guideline, the American Academy of Pediatrics emphasized the need for risk assessment, comorbidity evaluation, clinical decision supports within the EHR, and the need to treat children with BMI ≥ 85th-95th percentile (overweight) and ≥ 95th percentile (obesity) using an engaging, family-centered, non-stigmatizing approach.

"Say your child has a 45% risk of developing obesity by age 3. Maybe you prioritize some discussions about responsive feeding, about sleep, about physical activity more than you do some

other things during the visit, but these families have already been stigmatized prior to having children," said Wood. "So even if we had some magic number that really helped us differentiate at-risk children, it just becomes a conversation, a way to triage what things to discuss."

At the same time, he pointed to the need for transparency.

"We have to be sensitive to the fact that this is a multifactorial disease; there are things that we don't know about, and we have to be okay communicating uncertainty around that to families," he said.

"It's a sensitive topic," said Suzanne Cuda, MD, a Dallas-based private practice pediatrician specializing in childhood and adolescent obesity and a trustee of the Obesity Medicine Association. "Most of the time, it's not just that child; it's other children in the family; the parents — everybody needs to be part of the discussion about what to do."

There's also a question of applicability. Cuda pointed out that EHR systems vary across provider type and individual offices. However, Gupta and her team are in the middle of addressing this drawback.

"The data we used is based on the OMOP common data model, which is the current format in which EHR data is collected," she said. "However, we are also working on building a user interface for this model to make it interoperable, meaning that even if you have EHR data in a different format, you should still be able to use our tool," she said.

The team is collecting feedback from various practitioners to determine feasibility. Importantly, Gupta also emphasized that everything will initially be open sourced but that the details are still to be worked out.

Finally, broad, multi-institutional representation will be key. Though the study was based on data collected from five states, it came from a single network.

"One big issue with any of these prediction models is what's the underlying population that contributes the data and does that actually represent who's in front of us," said Wood.

The study was funded by an NIH grant. Cuda currently serves as executive editor of Obesity Pillars *but did not edit the manuscript. Wood and Onigbanjo had no financial disclosures.*