PEDIAPOD SEPTEMBER 2023 TRANSCRIPT

Geoff Marsh

Hello and welcome to Pediapod for September 2023. This month we ask do Bayley trajectories predict school-readiness better than single assessments in formerly very preterm infants? More than half of very preterm infants have some neurodevelopmental impairments or delays. Not surprisingly, the likelihood of delays is inversely proportional to gestational age. These delays can have long lasting consequences for children as they impact the early construction of complex brain behaviors and processes.

The development of children born very preterm is most often evaluated using the Bayley Scales of Infant Development. These single assessments are routinely used as outcome measures for neonatal interventions, or as a means of prognosis for very preterm infants. However, early Bayley scores may not accurately predict later outcomes. In this episode of Pediapod, I spoke with this month's highlighted Early Career Investigator, Dr Mary Lauren Neel from Emory University. She and her team set up a study aimed to determine whether Bayley-III score trajectories measured at multiple timepoints in children born very preterm, predicted school readiness at age 5, better than a single assessment.

Mary Lauren Neel

My name is Mary Lauren Neel. I am a neonatologist at Emory University. When I went to medical school, I was one of those people that liked everything, but I particularly liked pediatrics and OB-GYN. So then I did residency and chief residency and again, sort of enjoyed everything. But ultimately, I ended up doing neonatology and went to Vanderbilt for a fellowship. Initially, my interests were sort of in prognosticating, counseling families on outcomes and who was going to do well and who was going to have issues. I think over the course of my fellowship and over the course of a very formative relationship with my mentor, Dr. Nathalie Maitre, my interest really shifted from prognostication to intervention. We're not great at prognosticating and we are proven wrong all the time. And then secondly, prognosticating and just telling families what's going to happen with their child is not helpful or empowering. So I think leading into this particular Bailey trajectory paper, so many of the studies that look at outcomes, look at a single two year outcome. And is a single two year outcome, at a period of maximal plasticity, really the best outcome or the definitive outcome? And if our outcome is not reflective of longer-term outcomes, then if we're using that to inform our NICU interventions, I think it's just something to be cautious about.

Geoff Marsh

We think of development as this tightly orchestrated sequence of genetic events in some ways. So what is it about being born very preterm that knocks this pathway off course? What else is going on?

Mary Lauren Neel

Yeah, it's a great question. So basically, in the premature baby what you have is genetic vulnerability as well as whatever environmental influence made that baby be born preterm. So you have this going on and then you have the neonatal brain that is by definition immature. And as much as we try in the NICU, we're not a uterus. It's not the same. And the things that we have to do to keep these babies alive are extremely different than what would be happening in the mom or in the birth parent. And we know that sensory motor systems develop first, and the NICU is a very abnormal sensory environment. And so then, the building blocks of development, these sensory motor systems, are developing in this very abnormal environment. And then you see the downstream impacts of that with more complex neural behaviors, like cognition and behavior and communication. And then on top of that, you have maturity that's happening. So the brain hopefully is growing, the baby is becoming more mature. And you have experiential learning, which I would include parenting in that experiential learning. And so I think anything we can do, in the NICU and beyond, to provide supportive developmental experiences is extremely important and can really help with some of these downstream developmental processes.

Geoff Marsh
So given the incredible complexity and variable trajectories that very preterm infants can find themselves on, it must be very challenging to prognosticate or measure the efficacy of interventions. How is it currently done? How is that currently assessed?

Mary Lauren Neel
If you look at figures of trajectories in general, people report an average trajectory. But the problem with that is that when you look at individual babies, we don't know- are they going to be a kid that exceeds expectations? Are they going to be a baby that struggles more? But I think that this paper and others highlight that we need to understand the limitations of the outcomes that we're reporting.

Geoff Marsh
What is the standardized way of making an assessment that's aimed at predicting neurodevelopmental outcomes?

Mary Lauren Neel
So there are many assessments that can be used but at this point the most commonly used assessment tool is the Bayley Scales of Infant Development. As with all tools it gets refined over time but it's a standardized developmental assessment that contains different developmental domains. So that kid gets a score for gross motor skills, fine motor skills, language including expressive language and receptive language, and then also cognition. And so that at this point is the most commonly used assessment of development, particularly at two years.

Geoff Marsh
And there's some controversy over whether these early Bayley scores are in fact good predictors for those long term outcomes?

Mary Lauren Neel
Yeah, exactly. There's kind of mixed reviews. But again, that's looking at a one time Bailey and a one time later score. And I think that's what makes this study unique in that we're looking at what if you had multiple Bayley scores?

Geoff Marsh
So in a nutshell, what you were doing in this paper was wanting to see whether the trajectories of Bayley scores measured at multiple time points were better predictors of specifically school-readiness in the fifth year, than the single assessments that are typically done.

Mary Lauren Neel
That's exactly right. Does the addition of more Bayley scores add to essentially the prediction of school outcomes at four to five? And it turns out, they do. Actually the combination of the initial Bailey score, like between six and nine months, and these trajectories, so the combination of the initial score, and the trajectory, actually gives us the best prediction rather than either initial or trajectory alone.

Geoff Marsh
And does that make sense to you as someone who's spent a lot of time in NICUs and thinking about these issues with very preterm infants? Does it make sense that those trajectories were more helpful for predicting outcomes than single assessments? Why do you think trajectories are more illuminating?

Mary Lauren Neel
Kids create their own path and some of our children start off scoring low and end up scoring much higher. Some kids start off higher and end up scoring lower. And so I think it makes sense to me that it matters both where you start, but it also matters what happens over the course of the first couple of years of life and over the course of development. By using both initial Bayley score and trajectory we're better able to predict that child's later outcomes because we're accounting for their individual variability. Does that make sense?

Geoff Marsh
It totally does. And it also makes intuitive sense that by taking those multiple assessments you're being more attentive to the unique journey of the individual child, not only because these models seem to work better but also because you're following their unique situation.

Mary Lauren Neel
That's exactly right. And I say this knowing that this is a luxury, right, because this is what we were doing in this paper. And I'm trying to think about what's next for my work and thinking, okay, so I believe this, but how do I do this practically for other studies? You know, how do I use these trajectory-based approaches and essentially kind of personalized developmental medicine to evaluate outcomes?

Geoff Marsh

Does it take a long time to do a Bayley assessment? Is it feasible that you would try and introduce multiple assessments as standard for very preterm infants?

Mary Lauren Neel

I certainly think it's feasible if systems support it. So in our practice we do do multiple Bailey's at one, two and three years. So certainly, clinically it's possible but it is certainly an investment on the part of the institution because a Bayley probably, on average, takes an hour, maybe more. And it has to be someone who's trained to do it, so either a trained psychologist or a trained therapist or someone. So we do do it clinically but it does require an institutional commitment, I would say.

Geoff Marsh

And you mentioned before that there are just loads and loads of different types of assessment for various neurodevelopmental outcomes. Do you think that this general principle of incorporating an initial assessment with a combined measure of change, of the trajectory, do you think that would work for other developmental assessments and outcomes?

Mary Lauren Neel

I do. I mean, I can't prove that because I haven't done the study but my suspicion, given what we know about development and the lack of linearity of development, and even in children who were not preterm, development comes in starts and stops and each child is a little bit different. So it makes sense to me that for other assessments we would see a similar finding.

Geoff Marsh

You mentioned earlier that you shifted from trying to prognosticate to thinking more about interventions. Does this paper have any bearing on your optimism about interventions?

Mary Lauren Neel

Absolutely. You know, if we really want to evaluate the efficacy of interventions we really need to think about a trajectory-based approach to outcomes evaluation. One thing that I'm thinking about a lot is, particularly those kids that when we look at their trajectories they go from starting quite low to ending up above average, you know, I think in the past we might say, well, those kids are just outliers. What if we could learn something from the quote 'outliers'? And what if we could look at these children whose trajectories were quite steep, what if there was something there? And from other work we know that there is. I would say parenting and other things are a part of it but I think it's really important to learn from the children that do well rather than just saying 'oh well, they were just lucky', you know?