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Developing In The NICU: An Introduction to Positioning & Handling, Part 2

Recorded October 3, 2019

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OccupationalTherapy.com Course #4455

- [Fawn] I'm very honored to introduce today's speakers, Jenny Jolley and Carrie Molder, joining us to speak on Developing In The NICU: An Introduction to Positioning & Handling, Part 2. Jenny Jolley has always loved babies, and becoming a pediatric occupational therapist was the perfect opportunity to combine that passion with a profession. After OT school, she practiced internationally in Rome and China, then returned to her hometown to open a one-of-kind therapy clinic with her sister, Carrie, focusing on early intervention and neurodevelopment. She created the development care model for their local NICU and uses neuroscience to inform her habilitative treatment method despite early brain damage, specifically, in the prevention of cerebral palsy. Jenny enjoys presenting in a sensory-based format to enhance the memorability of the learner's experience. Caroline Molder is a pediatric occupational therapist. She's practiced in a variety of settings, including public schools, private schools, and outpatient clinics. In 2015, she and her sister opened a unique integrated community playground and therapy clinic in central Arkansas, with a focus on early intervention. She has a special interest in primitive reflex integration and the neuroscience behind early brain development. Becoming a mother inspired her and her sister to begin creating online course content for new moms with an emphasis on how to help babies develop successfully. This has grown into a weekly developmental show, "Moms & Milestones," currently available on YouTube and Instagram. She is pursuing a certification in neurodevelopmental rhythmic movement. Welcome, Jenny and Carrie. Thank you so much for joining us today.

- [Carrie] We are excited to be here. Thank you for having us back. Okay. Okay, so as Fawn mentioned, I'm Carrie Molder. I'm gonna be speaking first today, and then my sister Jenny will be coming on in just a little bit. And you did hear a little bit about us just a second ago. But what nobody really knows is that we've actually just had babies again, our second. On our first presentation, we were nine months pregnant, and

basically huffing and puffing through that. But it's an awesome presentation. It's the first Developing In The NICU, the neuro developmental care model. So if you haven't seen that, that's an awesome one to check out, too. But this is gonna be a great follow-up, as we go and dive into interventions. So I'm gonna be speaking first again. And we won't go ahead and tell you which sister is older. Here is our commercial use stock photography statement and disclosure, and the learning objectives.

So after this course, participants will be able to describe the benefits of flexion and containment of a premature infant. You will be able to name three ways to position an infant in a NICU isolette. And after this course, you'll be able to analyze the neonatal states as a communication method, as well as list three ways to manage pain in the NICU. So here we go. This is the course, Developing In The NICU, the introduction to positioning and handling. And it's the part two in our series. And we love this quote that we constantly have to be aware of that all living things are in constant communication with their environment, and the trick is learning their language.

Okay, so here we go. How does stress feel? Have you ever asked your husband to do the dishes? Sorry if there's any guys out there. You may feel like that, or he may feel like that. No, but seriously, this is kind of a picture we thought is kind of an accurate representation of how stress can feel at some point that we all go through. So we know that under stress, the body goes into fight or flight, which is the adrenaline, noradrenaline, and cortisol responses. So your body experiences shortened respirations and oxygen saturation. A flood of cortisol suppresses the immune system and inflammatory pathways. Your heart rate and blood pressures can increase. And so repeated stress becomes chronic stress. Repeated stress, especially that occurring during that critical last trimester of infant development, has profound and long-lasting effects on several physiological systems, especially the central nervous system. And we're kinda diving into, we're setting up what OTs are gonna do with interventions, but it is so important to know, with what we are already dealing with, the infant is

experiencing being in the NICU. And caregiving procedures disturb rest and often bring discomfort or pain daily. Preterm infants are particularly sensitive to handling and pain, compounding the impact of stress-related procedures. So what would chronic stress feel like? Probably a lot like a live wire. They've come into the world early. Their systems have not matured. And so they basically kind of just live and develop in that fight or flight. And this is one of the best pictures we can give that feeling.

So stress is the single most individualized pathogen for a compromised infant. And we found this extremely important to realize, because these infants are developing actually in a hospital setting, which carries its own plethora of germs and pathogens. But they are finding that stress is actually, tops anything else that they go through. And the research finds that it can reduce brain size in the frontal and parietal regions, alterations in functional connectivity within the temporal lobes, and reduce maturation of white and subcortical gray matter. So you're looking at executive functioning down the road, speech and communication issues, and cognitive abilities, all from chronic stress, repeatedly, on a developing brain. So the two worst things for brain development is stress and pain.

So this is a great visual of a developing brain. And if you can see in the 35 weeks, that is demonstrating brain connections that the brain is doing while it's growing in those last five and six weeks. And you can see all the way over to the 40-week brain the amount of connections it has grown. So this is an extremely critical time in development for just brain growth. And so these babies that even come one week, two week, three weeks early, they are missing a significant amount of just intrauterine growth that's not happening where it's supposed to be inside the womb, because they're being exposed now to all the environment and stress of a NICU setting. So the connections that are being made now are being made now under painful procedures and stress-like environments. So this is a great place, and just something to be aware of, as OTs, that no one's probably really thinking of all the brain connections that and

the sensory experiences that OTs can have an impact on within these five weeks. Because the brain makes a connection by going through sensory experiences, positive or negative. So the role of an OT is really to try to minimize as many negative connections that they can within the NICU environment. Because what essentially is happening is, what's firing together is wiring together over and over and over again. So that is where they are getting their sensory system set up from the beginning.

Okay, so let's look at where all these sources of stress are coming from. We've identified there are six sources: respiratory stress, nutritional stress, infection stress, the stress of sensory stimuli, maternal separation stress, and then, of course, stress from pain. So respiratory stress, when an infant is experiencing respiratory stress, they'll have an increased effort in breathing, which results in fatigue, hypoxia, and additional calorie consumption. Basically, if you can't breathe, you can't eat. And part of what gets you discharged out of the NICU is being a good feeder. So if your baby is having to work extremely hard just to breathe, you're gonna have a longer stay just trying to get to where you are to be able to discharge. And then, of course, there is nutritional stress. And this is a big one. Immature receptors in skin make the experience of handling stressful, and handling is necessary for feeding. So we like to think that live wire picture is basically what that baby is experiencing just even being held. Their skin receptors are not even mature enough to, you would think, oh, let's just pick up the baby, and start feeding 'em, without even understanding how they are experiencing just that stimuli right there. And then, traditionally, volume intake has been emphasized over safe, individualized practice. And techniques such as nipple twisting, nipple milking, and pushing baby to finish a feed are now known to be stressful with long-term consequences. And we know this is a huge area, especially, that OTs can help address in. So there will be a part three that we go into all about feeding in the NICU. So stay tuned. I think that's coming in January.

Okay, and then the stress from infection, which, basically, procedures involving tissue injury heighten the susceptibility of infection, which, in turn, causes additional invasive procedures to be necessary, therefore increasing chronic stress. I mean, just the stress of having an infection. And then, yay, the one OTs love and hang their hat on is the sensory environment and the stress that can cause. Light, noise, smell, touch, taste, vastly different from an intrauterine environment, where everything's cushioned and minimal. And they're thrust out into fluorescence and into a hard isolette. So early negative input on a developing brain and nervous system, again, have long-term developmental outcomes. The single most difficult topic by the sheer nature of the environment that the infants are cared for in.

So we like to think that sensory, the genes are the brick and mortar to the brain, and the environment is the architect. It is just so impactful to how, the long-term developmental outcomes of these babies. Okay, and then stress from maternal separation. In utero, the mother's biorhythms support the CNS and the acquisition of sensory input. And they've found that early life adversity in animal models with maternal separation and pain exposure induces, whoop, long-term consequences, like we kind of said. And one of the single most obvious ones but most undertreated, underrecognized is the stress of pain. Pain in newborns is often underrecognized and undertreated. Early repetitive pain is demonstrated to have permanent changes in peripheral, spinal cord, and supraspinal pain processing, neuroendocrine function, and neurological development. These changes later manifest as abnormal pain states or pain thresholds, increase anxiety and stress disorders, attention deficit disorders, or atypical behaviors, such as hypervigilance and exaggerated startle responses.

So again, if you work with peds outside of the NICU and later on down the road, this is absolutely your sensory processing disorders. It all starts in the very beginning, where everything, again, is getting fired and wired together in a negative way. Children who had NICU experience, regardless of developmental age at which it took place, were

shown to have altered basal nociceptive processing indicative of altered neuronal organization. Every time. So this was a really great study, and then we encourage anyone who's really interested in this area to take a look at it, Predicting Later-Life Outcomes of Early-Life Exposures.

So without going too far into this, in the study of epigenetics, which is how they look at genes and the expression of genes in the DNA, they found that developmental exposures early on, such as clinical events, are actually mapping and changing genes to later-life outcomes and susceptibilities. And this one is directly connected to neurobehavior. So it's just saying that what babies are experiencing can have a negative effect in actually changing genes and their DNA. So what does that mean? That's not just affecting the physiological stability. So say your NICU baby goes through a routine heel stick, which they do millions of times while they're at their stay. And that's a painful procedure. And the baby is trying to process that painful procedure. But then, while they're processing that, 10 minutes go by, and it's time for their first feed. So they come in and do first feed, because it's time for their feeding on schedule. And the baby has a poor feed, because it's processing what had just happened to him from that painful procedure. So maybe that feed is noted as poor feeder. Maybe they have low oromotor skills, and it goes on and on and on. Because from the very beginning, what fired together and wired together was a negative experience from trying to process a painful procedure to then, now, carried over into its first feed, which would carry over later, eight weeks later, for that first social smile, and then five months later over with the ability to roll. Later on down the road, we could be looking at executive functioning disorder.

And with that, it's just saying that everything can be a snowball effect in the NICU. So it's not just that they just had a heel stick, okay, the baby will get over it. Well, no, it can affect, and we are seeing this long-term outcome now that these negative repeated exposures are mapping, and again, firing and wiring together in a negative way. And

then, of course, as OTs, we're seeing it down the road. So ability that they would have problems rolling in the five-month milestone all goes back to the painful procedure they were experiencing. So how do we handle a baby under all this stress? And I'm gonna pause and let Jenny take over from here.

- [Jenny] Okay, I'm on. This is Jenny to finish up this presentation. And I feel stressed.

- [Carrie] I know.

- [Jenny] I don't know how y'all are feeling after hearing all that. And then you're probably also thinking, how does this relate to the topic title, which is positioning and handling. But we're gonna bring it all together here in this next part. So the reason you have to understand stress sources is because how you handle the baby and how you position the baby will be related to what stresses them the most. So you've gotta have those six things as your background information. And if you are ever interested in working in the NICU environment, this theory right here 100% changes the way you do your work there.

The synactive theory was created by Dr. Heideliese Als. And she came up with these brilliant five states of regulation, which is always mind-blowing to me, how people can just come up with their own theories. But she basically studied infant behavior so much in these stressful environments, like NICUs, and came up with a way to understand what the baby is telling you in the moment. So we're gonna look at that. And that is the language of the neonate. So you have the autonomic system, the motor system, the state system, the attention/interaction system, and then the self-regulatory. And we'll break these down a little bit. And hopefully, you'll begin to understand this triangle with some clarity after hearing what all of these five things mean.

But we're gonna start at the bottom, which is physiological stability, which is our autonomic state. And then that is gonna influence the motor organization of the baby, which then, obviously, influences the behavior state, going further into attention and interaction, and then the top of the pyramid being self-regulation. So let's go look at that physiological stability. And all these systems are dependent on them working harmoniously. So you have your autonomic subsystem, which is expressed in all basic physiological functions necessary for survival. And those include respiration, which is the rate, the saturation, and the expenditure of just breathing; cardiac, which is the beats per minute and the circulation pressure. Then you have your digestion and elimination, which OTs play a huge part in with how a baby is transitioning to oral mouth feeds. Digestion and elimination includes smooth intake of nutrition, bowel movements, and urination, and then the thermoregulation, under temperature, for the infant. So when this system is stressed, this is what we know. In respiration, you're gonna see significant changes in breathing rate. And specifically, respiration rates dropping below 40 or going above 60 breaths per minute is a signal of stress, or a change in the breathing pattern. We, most OTs, know that in any setting, that if your O2 is dropping below 90, we're having a problem. And obviously, that applies here in the NICU.

And then any changes in color, which, this one threw me through a loop when I first started practicing with premature infants, because it was like, how do they change color? But after seeing so many, the best suggestion I can give to you, 'cause I'd love to show you picture after picture, is to just start googling babies in the NICU and see if you can identify what color they are. And then this becomes much more clearer as you begin to practice there. But also, oddly timed coughing and sneezing, and it looks like a little bit got cut off, but that's hiccuping. And those usually happen during a stressful feed. A baby will pause and just start coughing, sneezing suddenly. And if you missed all the signals about the stress that they were showing you, that's a red flag to you as a therapist, oh, something's happening that's not quite ideal. And then cardiac, so if your

heart is gonna beat more than 160 beats per minute or less than 100 while you're handling the baby, that's definitely stress, a stress sign being sent. And then digestion, gasping or gagging, that generally happens during feeds. Excessive spitting up, obviously, feed. And straining without a bowel movement or excessive residual, so when you are given a new patient to feed in the NICU, and you go in and you check to see how much of the last feed they had, whether it was through a tube or mouth, how much is left over that didn't get digested. So we deal a lot with babies who aren't digesting at the rate that we know is normal.

So those are the autonomic signs of stress. And unfortunately, and fortunately, technology in the NICU setting focuses only on identifying autonomic stress, because it's that basic survival mechanism that we have to have, respiratory, cardiac, digestion, and temperature control. But it's at the expense of the motor, and the state, and the organizational, and the self-regulatory systems, which are interdependent on that bottom pyramid happening how it's supposed to, so intimately dependent on the environment. And so when we affect one state, we affect another. But it's only really measured by the beeping alarms that you hear going off all the time in the NICU. So the next system is the motor subsystem, and this is observable through the infant's muscle tone, movement, activity, and posture. And this is primarily, I think, when most people think, "I'm gonna work in the NICU," they're thinking they're working in the motor subsystem, because that's kind of the traditional outpatient, well, I don't wanna say that's all outpatient, but I think y'all know what I mean when I say we think we're gonna work just with the motor system in any setting.

Okay, so motor signs of stress, these ones are the most observable, as a therapist, and any time that you are handling it, handling the baby. And that's gonna be a finger splay. That's kind of nicknamed the stop sign. So when a baby stretches out its hand in full extension, that's a stress sign on the motor level. Any taut mouth, and usually, if they're awake, they're gonna have a relaxed mouth, as well as when they're asleep, so

any tightening of oral musculature is definitely a sign of stress, nasal flaring, a furrowed brow. And then this one takes, I think, a little bit of practice, but once you see it once or twice, you'd know exactly what it is. A baby being handled will suddenly stiffen, almost like spasm in response to the handling that they're receiving. Or they'll do the exact opposite. Oh, it looks like the audio isn't, is the audio not working? Can somebody? Okay, Caitlin's gonna let me know. Okay. So just keep going? I'm sorry to interrupt. Okay, so when you see this happening, you're basically gonna, the flopping of musculature is like a baby that just loses all control of what little control they already had. They just kind of melt. And it can happen quickly. And as a trained therapist, you would recognize it. But other caregivers don't notice that, 'cause they think it's just a little baby being a baby. So it's just something that takes fine-tuning to kind of keep an eye out for, but definitely something that a therapist recognizes first is that stiffening or flopping of musculature.

And we're gonna go on to the next subsystem, which is the states subsystem. And this is the level of central nervous system arousal. So is the baby drowsy or sleeping, alert, awake, fussing, or crying? And we're gonna break those down just a little bit, even though they're somewhat obvious. And the state subsystem gets abused massively in the NICU, because it's so procedure-driven. And we're all on a time clock. And I have to do what I have to do right now. And so it almost never gets paid attention to by general caregiving. And only a therapist is going to intervene for a baby on behalf of their state. Because in the first part of the, in part one presentation, if you remember, we talked about the importance of sleep for brain development and infant growth. You would think that would be the number one thing that a hospital would protect is sleep. But it's the number one thing that they don't protect. It's, I have to get this heel stick done right now so I can get it to lab, so I can get the results for the doctor who's coming at five today. And so it doesn't matter if this baby is asleep or awake. What I have to get done has to get done. So it's at the expense of all that important brain growth that's happening during sleep and why states is so important to recognize, as a

therapist. Because, again, you have to get to your patients on your caseload, but when you go to check baby one or baby two, if baby one is sleeping, you go on to baby two, because you recognize how important that state of the central nervous system is. And when you begin to treat a baby, you should be watching them transition between states in a smooth and predictable manner. I stopped that too late. But basically, your baby that is coming off of any kind of drug interaction in utero is going to be twitchy. You would be able to see these state differences based on babies that have had birth trauma or drug exposure. And so this is something I urge you to definitely do if you're very new in this environment is state identification. The more you practice this, the better you get at it. And basically, it's just, before the baby is handled, you approach the baby, and you just make a mental note, are they aware, or are they asleep? Are they moving? Are they screaming? So it's before baby is handled that tells you about their nervous system and how alert and awake it is. And then you observe if the state changes from light touch or light handling.

So like, if I insert my hands into an isolette, does the baby stir a little bit? Does the baby keep sleeping? Does the baby jerk awake as though they were startled by your touch? So that's an observation about how their central nervous system was responding environmentally. And then you analyze it. So you know, okay, well, maybe this baby had too many painful procedures this morning. I'm gonna let them sleep longer. I'm gonna go on to my next baby. I'm gonna come back and do what I need to have done later. And obviously, it's a very fine dance between schedule and what you have to get done. So like Carrie was saying, it's just one of the greatest challenges, that these babies are developing in a setting that is not conducive to what they actually need, which is sleep and low stimulation. Okay, so how do you know if they have state signs of stress? Well, like we just said, diffuse state sleep, sorry, diff sleep, I can't get it. diffuse sleep state, so lots of twitching, grimacing in their sleep. They just don't rest peacefully. If you don't have time or haven't observed a baby sleeping that you're about to treat, you can talk to their nurse. Like, "What have you noticed?" "Are they

getting good rest?" Gaze aversion, this one happens so fast, you have to have eyes on that baby for this stress sign. But basically, a baby will be briefly making eye contact, and they will cut their eyes right, or they'll cut their eyes left. And what they're basically trying to do is eliminate the overstimulation of the visual in front of them, which is usually somebody feeding them. And at some point, it just all becomes too much information between trying to breathe, trying to suck on the bottle, trying to look at mom, trying to hear mom talk to me, trying to listen to her over the nurse explaining to mom that she wants her to do the bottle X, Y, and Z, and then here comes dad. So a gaze aversion happens quickly, but it's basically the first signal that will happen during a feed, usually, where everything else seems to be going right, but baby's getting overstimulated. And it's helping a baby before they get too overstimulated. Because what fires together wires together. If we can find these little signals ahead of time, then we can intervene before the signals keep happening, keep happening, and keep happening. So that's that one.

And this one is also kind of a neurological shutdown. Their eyes will kind of gloss over, look glassy, almost like a doll eye. And they're tuning out, so they're actually starting to shut down when you first see that glassy-eyed response. Or you'll get a panicked look or irritability in a baby, which is what, irritability would be the absolute last, the point of no return for a state signal of stress. Because they would have already gaze-averted. They would have already gone glassy-eyed. And then those little signals are not being recognized by their handler, so then they go into irritability, which is the stress level up. Like, "Okay, now I gotta escalate "so I can get what I need done here, "which is basically to stop all this overstimulation "from happening to me." So those are important little cues to recognize on the state level. And then once you have a baby in a quiet, alert state, which is the ideal time to be working with the baby, then you're going to have the next level of up of a subsystem, and that's the attention and interaction subsystem. And this is the availability of the infant for interacting. So how much alertness, how much engagement can they tolerate while you're handling them?

And it can fall apart pretty quickly if they are getting stressed. So we'll look at that a little bit. And I love this quote, "Touch is the communication of love." And what we don't often recognize when parents are holding their NICU babies is, well, you should recognize this. I probably presented that in the wrong way. We don't often think about this. Because when we're holding our babies, we think that's the ultimate goal, as a parent, right. I'm not thinking that me holding my baby is hurting my baby. And that's not the education that we want to stress to them, that when you're holding your baby, you're overstimulating them. It's helping them understand these little cues that will happen at some point during their handling that we then slow down, and we either, we change something about the input that they're giving. And so infants who are showing attention and interaction stress, they're going to have a reaction on the autonomic, the motor, and the state system.

And the example here is that they can't look at the face, listen to talking, and then suck on a bottle all at the same time. And what would be the first cue would either, they would gaze-avert, or they would start coughing during their feed, or they may have hiccups. And then they are going to have a glassy-eyed response that, you know, mom and dad might be taking pictures or are just so proud that they're able to try the bottle in that time period that they're not knowing or even aware that these are signals from their baby, as well as most caregiving staff have not been trained on the synactive theory. So they're also thinking, oh, this baby's feeding well. They're doing great. Mom and dad are having a great moment, talking to the baby, and just, it's the ideal picture for an ideal setting. But then the therapist should recognize, well, hold on, guys, maybe we need to turn the, if they weren't already off, maybe the fluorescents are a little bright in the baby's eyes, so you change that environment, and you see how the handling affects at that point. I'm saying, I'm sorry, I did not set this up correctly. I was trying to present the picture of feeding a baby, doing a feed with a parent and a nurse, and I should have said that first. But you, as a therapist, are sometimes performing the action but also sometimes moderating the action. And that is a mindset change when

you walk into the NICU. Because in every other setting, we perform the action of our therapeutic process. So you're helping somebody do a transfer, or you're teaching a child how to roll. But in the NICU, it's almost like, you can step out of the handling, the physical handling, and you are troubleshooting everything, all the time. What is happening to this baby that I can make a difference on in that time period that I'm there? And it's just, it's such a different way to treat is what, and why these things like the synactive theory is so important, because if we're only thinking, "I'm here to position this baby," and then I walk out and go on to my next patient, then we've failed them on some level. Because it's not just the physical position that we leave a baby in. It's the whole environment that their brain is immersed in all the time. So I kind of went down a tangent there. I hope y'all are still with me, 'cause I'm gonna keep going. 'Cause I could talk about this stuff all day.

And the next level up is the self-regulatory states, sorry, self-regulatory subsystem. And this is the top of the pyramid. And these are the things that your baby is gonna do in an attempt to deal with their stress and regain control. So they have a very select few ways to help themselves try and reel in when they're unraveling. And they're right here on the left. The baby will change in position. So they'll shift, try to do a little bit of a weight shift. They'll do hand-to-mouth if they're strong enough. But so frequently, these babies aren't strong enough. But here, pictured, is a baby who's got both their hands tucked in flexion patterns there. So that's a self-regulating attempt, grasping. They'll sometimes grab their little wires, and people will get so irritated, because they can frequently pull their wires out. I think that's probably one of the saddest realities for them, is that grasping in a super reflexive sort of way, like, I'm just grasping to try and gain control, is one of their very few mechanisms for helping relieve stress, and it kind of gets a bad rep, a bad rep for pulling a tube out and irritating the caregiver who's gotta go in a reflex that. But it's really just an attempt at self-regulation, and then sucking, which is why pacifiers work really well for babies in the NICU in terms of calming, and really, any baby, right? Visual locking, which, if this was a video

background, this baby would be visually locking, because they basically will hold their eyes in a gaze for a certain period of time. And again, if they were to then cut their eyes, they're being unsuccessful at their their own self-regulation. We'll go back to that scenario I had painted earlier. Positive are trying to feed. Nurses may be doing some talking about how their baby's night went. And the baby is visually locking on the mother who's feeding as a attempt to calm themselves during a feed that might be going well on the outside, but you can't see what's going on on the inside with that baby in terms of how successfully they're swallowing and clearing their throat. They may be aspirating a little bit silently and not able to, obviously, communicate. But they do communicate is what I'm getting to, is that they would be visually locking on mom, and then those eyes would gaze-avert to the side. So a quick cut to the side, and then the therapist that's watching would say, "Okay, hang on just a minute. "We need to take a look at how this baby's eating, "because they're clearly having a little bit of a hiccup "in how they're regulating themselves." And then hand-clasping, which, obviously, the Palmar reflex plays a lot into why babies can hand-grasp. But frequent grasping, clasping in and out is a sign of self-regulation.

So these aren't necessarily negative. We want our babies to have these things. But it is good to know that when you do see them, that this is what is happening, and the presence and success of the infant's efforts to acheive and maintain a balance of the other four subsystems. So if they are falling apart with breathing, respiration rates, that's an autonomic stress. And they may show that on a motor level by flopping out of their musculature and just melting, because they're starting to stress over their rapid breathing, which then means that on their state level, they likely will have been in a quiet alert state if they were handled at the right time. Or they may begin to be glassy-eyed, or gaze-avert, or become irritable, that last step in the state subsystem, which means that the intention and interaction that they may have been experiencing with the handler will begin the fall south. And in those four processes that are all happening simultaneously, the baby may be shifting, so changing in position. They

may be trying to get their hand to their mouth, but it might get caught on a wire, or a blanket might be in the way. They may start sucking rapidly on the pacifier they have. But you would see these things would be happening simultaneously. So it's a lot of really finessing what you're analyzing in the moment to kind of picture exactly where that baby's at. And now we're gonna get to the title. But it all plays into it, right? So we're gonna get into positioning and handling. And this last slide is that, the earlier the gestation of the baby, the less self-regulatory behaviors the infant has available to themselves. So they are always co-relying on you to help regulate. And this just crushes me, as an OT, knowing that babies lay in isolettes, and in pain and under stress, and they can co-regulate with their caregivers, if their caregivers know how to help them, but so often, it's just not, this is a whole new world of neuroscience that's showing us what these little brains are doing. Because before, it was just acceptable that they were surviving. But now that they're surviving at such young, young ages, it's almost like we're celebrating their survival but not supporting them fully along the journey. And the earlier they come, the less like, you know, just in the motor subsystem, they wouldn't be able to get their hands to their mouth. So we have to help everybody participating in that baby's care make that difference, if they're give support to deal with the stress. And that's what our interventions are going to be talked about next.

So I got ahead of myself. I was too excited. But what I was trying to get to is that, how do we observe when the systems are just, how do we observe these systems disorganized through our own neurobehavioral assessment? So there are lots of tests that you can do in the NICU. But the greatest thing that will contribute to your practice is your own ability to use the synactive theory in the moment, understanding all those different stress signs, and then reacting to 'em and helping other caregivers and parents understand stress signs. And I can tell you that when I gave a presentation to a hospital, the entire NICU staff laughed at the idea of babies being stressed. So we are very far behind in terms of our general medical community recognizing this in infancy.

And it is 100% the OT's job to find the most positive way to share with people how to support babies in this stressful state that they're developing in. Because then we see them in outpatient for years. And so that's my soapbox on using the synactive theory and your neurobehavioral assessment.

So our role as neonatal therapists coming in to help is that we are looking at the stress. If you haven't figured that out yet, hopefully that bubble tells you that that's what we're doing. We are examining the environment first. And then we support nursing to help reduce, in daily care, the stress the baby has. Then we are working in education. We need parents to understand stress signals and know when they're stressing their baby out. And our constant clinical analysis of their neurobehavior tells the team about where that baby is at in terms of neurological maturity. So if we treat a baby for several weeks, we're gonna begin to see that baby stabilize on the autonomic level and get their breathing and their respiration and their heart rates figured out. And then we're gonna be looking at 'em more on that motor level. But you wouldn't know that in terms of how to inform team about neurobehavior until you are recognizing it regularly with each treatment session and each conversation you're having with their nurse or their caregiver about just, what are they showing in their communication on the daily basis? And then, of course, intervention, which is where positioning comes into play.

So we're also looking to reduce those negative outcomes in our intervention. And then we have to touch on really quick, so obviously, the number one issue with stress is pain. And it's these five things right here. And it's positioning, containment, swaddling, pacifier, and sucrose. And sucrose is a sugar suspension that they give orally. And they just place it on the tongue. And the studies show, it's kind of poorly researched. But what research we do have says that it almost stuns the baby briefly so that you can do a painful procedure following the sucrose administration, and there are almost scrambled signals, like the body can't decide if it should pay more attention to sugar overdose it just got or the pain signal. So it's considered a pain management technique

in the NICU and can be a part of your practice, too, if you are, and, okay, I've gotta jump in here real quick, and I'm not gonna, I will get right back to these interventions. But one really effective way to use that that demonstrates a lot to staff how much you care about the pain that the baby's about to experience is, you may not be clocking in and clocking out for a treatment session with a particular baby that's on your caseload, but say you're going to feed baby B, and baby A is about to have a heel stick, and you just grab that nurse really quick and say, "Oh, my gosh, please let me give this baby sucrose. "And I'll do a containment hold while you do the heel stick, "and then I'm gonna go on to feed baby B." And those are in-the-moment types, not chargeable, but ultimately, chargeable by your whole interaction with staff during your time treating that baby. And it doesn't always add up to 15 minutes, and from 10:00 to 10:15, you did X, Y, and Z, but you're there modifying their environment in the moment, because the NICU is such a small, small space, and you actually have the ability to do that there. Okay, but back to where we were at. This is what a containment hold looks like, and probably the most perfect illustration of how to support a baby that's about to undergo a painful procedure.

Positioning prone is demonstrated to have the best neurological effects on the brain in terms of calming it and organizing it. We love to sleep on our stomachs, right? So if you can help a baby get positioned into prone, if it's applicable for the procedure, but otherwise the flexion position is ideal in terms of helping them feel the most organized to experience pain. And then you want them to feel contained with firm boundaries. And we're gonna look a little bit more at that in the next slide. But they can be swaddled, which also provides containment, but it's one form of containment. It's not the full form of containment. Pacifier for that sucking response and that self-regulatory state, and then the sucrose administration. So we could say, if this baby was about to have a heel stick, he's ready to roll. He's gonna have some tools that is gonna help him cope with the influx of stimuli. And one other way that you can do it, if a mom is on board, and sometimes it's hard for them to see, but I like to think of it as, you're asking

them to participate in this procedure because it will make a difference in how their baby feels about it, instead of, you just have to watch your baby cry and scream in pain. And I know that if that was a scenario with my baby, I would rather be there to mediate for them than to think about them being alone, suffering. So you can offer skin-to-skin clustered care if you've got a great hospital that will support you in this. 'Cause sometimes this slows down the efficiency of procedures. But ideally, put that baby on mom in skin-to-skin, and then do that heel stick.

Breastfeeding also has been known to intervene in terms of those pain signals arriving at the brain and the way that the brain neuronally organizes around it. So that's a great tool to have in your back pocket. Hey, let's do this on mom. And sometimes that's just not as possible based on where mom is at and what is actually about to be done. Okay, so what we're gonna do here is, and for my type A people in the audience, I have to apologize, because I'm not a protocol-based person, and I don't think, the NICU does have a lot of protocols, but your clinical analysis will serve you better if you can just get this stuff without thinking of it as a black and white list. And so I'm not actually going to list out, like, keep the baby at 90 degrees in this way or that way. We're gonna look at some positioning pictures so that you have a visual memory of what you would want to leave a baby looking like.

So what we do know about therapeutic positioning is that it affects absolutely every system, respiratory physiology and thoracic development. So ribcage can actually get changed if they're not turned enough. Body alignment prevents postural deformities. Deformities can happen in four hours or less if they're not changed into a different position regularly. Promotes self-soothing, so we're hitting that top pyramid with regulating that subsystem. And going further into it, we know positioning is, correct or incorrect, it's gonna affect all the neurobehavioral organization, musculoskeletal development, neuromotor functioning, and feeding performance of the baby. So 100%, absolutely everything going on with this baby goes into how they are positioned. So it's

important, right? It's at the end of the show here. But at any age, we know that across the human lifespan. But what specifically happens in the nursery is that you get these types of deformities. And you get retracted shoulders, so shortened scapular adductors, which interfere with bringing hands to midline later on at three months, reaching at four months, and poor shoulder stability in prone, when you're trying to get that baby in tummy time. You get hyperextended necks with shortened extensors interfering with that midline and graded head control. That's a disaster for a baby that can't hold their head at six months. Downward gaze and midline awareness is gonna be huge for visual development. If you can't see, you can hardly develop, really, one skill efficiently. And frogged legs, you get shortened hip abductors and IT band, external tibial torsion, which leads to out-toeing in gait and transitions and requires a wide base of support. I'm sorry, it leads to a wide base of support, so they don't have as well, they don't have good dynamic balance. And then everted feet, so pronation in standing and gait. And then plagiocephaly with head changes and torticollis with neck shortening. Oh, did I hit? Okay, it is going. We're almost through.

Okay, so when we're positioning, this is what we're thinking about. We're creating a womb-like boundary that maintains flexion but allows for supported extension. Like, what? We're gonna look at that in a picture. And this next sentence, utilize prone, and it should say side lying whenever possible, that's a typo. So people love the back, because in the '80s, a huge campaign called Back to Sleep made everybody put their babies on their back. But babies need to be the most time in prone and side lying. And what we just say when we're helping our hospital understand this in terms of when you go in to position them and leave them in prone or side lying, they're being fully monitored. That's what we tell parents. So any chance of SIDS is nonexistent. Because an alert, an aler, I'm sorry, an alarm slash alert, is what I'm trying to say, will go off in the event that they're having any kind of distress. So we can use prone and side lying, because they're fully monitored. And then what we do say is, as they are getting closer to discharge, we start teaching the education about Back to Sleep at home. So it's like

a do as I say, not as I do. When positioning, we're hoping to get them changed every two hours. That includes the ongoing help of your caregiving team. So it's important to be in good collaboration with your colleagues so that they're keeping up with the positions that you're recommending. And then we want to maintain a base of support for feet. You walk through any NICU, and you will find baby after baby with their feet kicked out of their support and your head wanting to explode. 'Cause you're like, I just don't see why this is so hard to do. But babies need a support for feet. You wanna keep their little hands near their mouth so that you're supporting that self-regulatory system. And then provide resistance or recoil for stretching arms and legs.

So here is the catch 22 about positioning. You're wanting them to feel like they're in flexion but still be able to kick out and have resistance so that they're actually therapeutically exercising their musculature when they do move. So it's a really fine line between the two. You want 'em to be able to move in a certain way but feel secure. And so these are the last pictures that we're gonna look at to kind of support the visual of what these things are doing. So first is the containment hold. And a containment hold is gonna increase the infant's feelings of security and self-control while decreasing stress. So infants who are contained have... I'm sorry, I lost my train of thought. Infants who are contained tend to be calmer, require less medication, and gain weight more rapidly. Could this be any easier? They just wanna feel secure. So what you do during a containment hold is surround the infant snugly with a three-dimensional boundary. So you're trying to get the head, sides, and feet as much as you can. So as you can see here, the forearm has pinned the feet down. She's got the hand spread across hips and arms with the thumb holding that arm from spazzing out, and then the hand over the head. So if a baby was about to get a spinal tap, have an IV inserted, anything that is specifically painful, this would be a great time to do it. Or if they just had a painful procedure, you can go ahead and follow it with a containment hold if it's not possible to do during it. And this is rarely a one-person intervention. Usually, it's like, maybe the nurse is doing a diaper change, so you

provide containment to the arms with a hand on the head in the moment. And that is a tick towards you providing containment during a procedural care that causes stress. So this imitates the spacial limitations of the womb, having a positive influence on neuromotor and neurosensory maturation.

So teach your parents this. Like, say, "Hey, mom, you wanna know one thing you can do "that will really, really help your baby? "Put your hands like this. "And as long as you can stand here, "they're gonna benefit from it." So that's just one thing that, especially a mother that isn't able to do skin-to-skin yet would love to know. There's another containment hold. Head and arms are pinned. Or, I hate to say pinned. There's another there, and with a little bit of a bigger baby. So it's definitely usable across the board. This is a little tool that some NICUs have. They're not too expensive. And so if you know a family that is wanting something that they can bring in, if the hospital doesn't provide these, these are called Zaky hands. And they were invented by a NICU mom. They can be warmed up. But basically, there are little silicone beads inside there. And you can position baby like they're being held with hands. So obviously, you know I love that. You can keep them tucked in. And even more so, you can see that the baby has a 360-degree boundary. But they're even adding the hands on top. So it's not just about nesting babies, but fully providing the comfort of more of a womb-like environment.

Okay, and so, really, we're gonna nail these maybe just one or two minutes over the hour. But when we look at supine, this is obviously the favorite position of the hospital, because babies have a lot of procedures that they have to do. And when they're not in this position, they're harder to deal with. This is where you see a lot of babies. This baby has supported feet, but it's really not the best picture. We're gonna look at another one. Because those feet could kick out, and then they would unsupported. But the hands are up near the face. So they have some self-regulatory coping skills available to them, and they're 360-degrees surrounded but not contained. And sometimes that's just not possible. It really depends on your hospital and how vested

they are in positioning. It's something that therapists really do have to advocate for. But here's this little band that some of these positioners will come with, can provide that resistance of the uterine wall. So has folded over the legs. And it's usually just Velcroed on the opposite side so that it's not real tight. If that leg kicks out, that leg will feel resistance but also come back to flexion, which is the goal for therapeutic position is to make sure that baby has womb-like flexion as much as possible.

So that's a good supine picture to know with some control. And then if your baby, again, the same thing up there with the arms, is a little band to control the punches that would maybe, the Moro reflex, the startle, or the punches that the baby may do when they're awake. But this is something that, while it's not a video, I think most of can fill in the blank on what this therapist would be doing. She can be providing some range of motion with gentle pressure that is similar. So the palm in, with the feet in the palm is like, again, uterine wall. So if the baby kicks against it, she can provide some pressure like it's coming back and teach that baby a little bit about boundaries and body awareness in that moment. Babies don't need a ton of this. But it is part of your care. If you're there positioning them, and they happen to be awake and wanting to move, then you can provide the resistance, and it is 100% the most beneficial therapeutic exercise they could get in the moment. Because it's dynamic, and it's responsive to their body, which is what a mother's body is. It's dynamic and responsive, so it's not static. And it really teaches the neuronal organization on the most most correct level, second to the womb, so easy to provide in the moment if your baby's awake and kicking.

Okay, prone. And here's a little baby in prone with, it's not 100% the perfect positioning. We're gonna look at the perfect positioning for prone next. But it's just a nice little containment hold. And sometimes it's not possible to get these inserts. That really, again, just depends on the hospital that you're at. But baby is tucked in with arms and legs underneath their body, which is the key with prone. You don't wanna

have splayed arms and legs out to the side. You don't want the tummy to be technically flat on the mat. So you can see use these little prone inserts, which position baby up and bring those shoulders and elbows a little bit underneath the body, which is key to preventing scapular retraction. Sorry, Carrie was saying something to me. Scapular retraction. This is another prone positioner, so a little bit of tension across the hips and lower back. If that baby happens to push up, they're gonna have that uterine resistance as well as support for their feet, which looks like a bigger deal than it is. It's really just kind of a rolled-up end of that positioner there. And then the picture's almost blurry, but they do have an insert there under the head so that the hands, you can see the hands aren't, the hands and the head are not at the direct same level. The head is a little bit elevated on that insert. So that's really how you would wanna leave.

And here we go, this is a very sick baby, obviously, but how comfortable does that baby look in prone? This is how positioning should look when you walk through a NICU. Baby's legs are tucked in. They have bands across hips and shoulders. There's a prone positioner there. And they've got a Zaky behind them providing some containment. So they're not just leaving the baby in a prone position, but they're actually giving some containment for when they walk away from the isolette. And that really does make a huge difference therapeutically. And finally, side lying, which looks like this in perfection. You gotta love some stock photography. But it's what we're aiming for. So if you don't know what you're aiming for, it's kind of hard to reach, right? So this is a Philips Healthcare system. And I don't even wanna go into different types of positioners. Because if your hospital doesn't have it, it's not worth the time. But the idea, again, you can actually even use the delivery blankets. We roll those up all the time. The NICU that I taught in and worked at is probably in the '80s compared to what they have for as far as resources. So don't let fancy positioners play into how you feel confident in how you position your babies. You can do this with rolled-up delivery blankets, 100%, without a hesitation.

And so let's look at a different one. That's a containment hold at the same time that she's positioning. So even positioning can be a little stressful for a baby. Because again, this is a physical touch that my skin, which has delicate receptors, is not ready to receive at this early age. Even though it's gonna make me feel comfortable in the long run, in the short, wiring and firing, it's gonna feel uncomfortable. So you can contain a baby with one hand while you position them, too, to help support 'em. And some babies don't need that. But if you recognize their state level and their motor level and their autonomic level, you're going to understand right off the bat whether that baby communicates a stress signal, or are they comfortable, which, basically, comfort for a baby is being asleep. And if there are any state after that, if they begin to show you the signs, then you know you need to at least slow down what you're doing or change something in the environment. Maybe it's lights. Maybe it's the sounds. But the first step is always, always to slow down, because it's so easy to go faster than you think is normal, or you know, I don't even have to dive into that rabbit hole. We all need to slow down in every area of life, right?

Okay, so that's a beautiful side-lying position, flexion of the hips, flexion of the knees and the feet and the shoulders and the elbows. Everything's tucked in. The baby has a pacifier for the coping skill of sucking. They have hands near their mouth for a secondary coping skill. And they have containment for a third coping skill. And they also have, well, they have all of the above. I'm trying to wrap this up quickly. So there we go. There were my arrows. There's the flexion that you're looking for for side lying. Okay, so of all those other pictures we looked at, this is about 90% of the babies that you see in a NICU. And just the shear lens change makes you understand how wrong this picture is, this baby. And the level of pain that baby's experienced, anybody see that bruise on the left hand, or wrist? And just the lack of organization this baby has motorically, no support for the feet, arms splayed, that's for sure gonna cause some issues with getting to midline down the road. Baby is obviously in respiratory distress because of that gaping, wide mouth. Nobody really breathes like that unless you're

having problems breathing. And the tone here is just almost nonexistent, how that hand is twisted backwards. But if anybody else, who wasn't an OT, or I'm sorry, well, this is an all-OT audience. I mean, there's some other neonatal therapists that would recognize this. But on a sensory level, everybody else would say this baby has a nest, and they should be comfortable. But until you understand what the sensory experience is of being so disorganized in space and having wires, in fact, I can see a wire underneath the leg on the left. So does anybody like to sleep on a pebble? We feel these things, and we can adjust ourselves, but babies can't. So this alone right here makes me want to walk over and tuck that baby in. Because it makes a huge difference in their organization and their outcomes. And this is a fabulous tool for parents. And love it for nurses as well. I always tape it on my babies' isolettes. Because there's nothing like a good visual. And it's totally lay terminology.

So signs your baby is stressed, your baby may arch their back. They do this, and once you've seen it once, you'll recognize it every time. Your baby may thrust their arms or legs rigidly into the air, which is picture number two there. They do this when they are getting diaper changes and heel sticks and all of the above that show you baby is stressed. They frown or they scowl. They spread their fingers or their toes out, that classic stop sign, which you see in the first picture and the last picture. And then your baby may look away because they are tired. And that's the baby looking away with the mother holding it. Such a small signal that happens so quickly, but you see it once, and you'll never miss it. So those are your stress cues that you just wanna burn into your brain for the next time you're working with a baby. When you're handling a baby, about to go position them, think about what stress signals they tell you, and then you can provide the alternative in terms of making them comfortable by this. Your baby is in a curled position. Their body, arms, and legs are curled up like they would have been in the womb. Your baby, not your body, is surrounded by a nest that supports them firmly. Tight spaces make them feel safe and secure. Your baby will have their hands near their face and mouth. And I love to educate parents on this. Hey, one little

thing you can do every single time you walk to this isolette is pick that hand up and put it by their mouth. You will make them feel better. That's it. It's the simplest education. It's a little tool for parents to use. And it will do leagues for their baby. And then finally up with, your baby may even manage to suck one of their fingers, which they find very comforting. And then, obviously, your baby's feet will be together, and your baby will have support for their feet. And I don't know why, but feet seem to be the most overlooked thing in the NICU. But if you can just walk around and put everybody's baby's feet back on that little base, you'll have done way more for brain development than you'll ever realize. And so that is, I'm sorry we went over. There's just a lot of information to get through. But that is Developing In The NICU Part 2. And I guess we'll go into questions if anybody has 'em. And if not, we'll say goodbye.

- [Fawn] All right, thank you so much. This brings us to the end of today's webinar. I wanna thank Jenny and Carrie so much for sharing your knowledge and expertise with us. I hope everybody has a great rest of the day and you join us again soon on OccupationalTherapy.com. Thank you.

- [Jenny] Okay, well, it was great. I'm glad we got through it, not too many stumbles. We'll see y'all in January, hopefully.