Dr. John Marinelli:

Hey everybody. It's John Marinelli from ENT in a Nutshell. Just want to make sure you're aware of our website, headmirror.com, where each podcast is keyword searchable and the content along with our Surgical Video Atlas is systematically organized by subspecialty. All right. Time for the episode.

Dr. Alyssa Smith:

Hello, everyone. Welcome to another episode of ENT in a Nutshell. My name is Alyssa Smith and today we're joined by a pediatric otolaryngologist, Dr. Sarah Bowe. Today we'll be discussing sleep disordered breathing in pediatric patients. Thanks for being here, Dr. Bowe.

Dr. Sarah Bowe:

Thanks for having me.

Dr. Alyssa Smith:

So thinking specifically about symptoms that patients present with, how does a patient with sleep disordered breathing typically present?

Dr. Sarah Bowe:

Again, we're often working with our pediatricians. And so as a caveat, I will say probably about half of the patients that I see often come in actually with a diagnosis of obstructive sleep apnea because they've been sent for sleep studies already, and so they come in with that. But other times they're coming in more with sleep disordered breathing. And so there's a lot of overlap between these obviously. Sleep disordered breathing can really be a wide variety of symptoms, but usually the primary one is snoring.

And then it's kind of alterations in the sleep patterns other than that snoring, whether that be kind of pausing in the breathing or gasping or tossing and turning. Many times they may get up during the night, so they've maybe just like never slept through the night which is a common complaint from parents being like, "I feel like they should be sleeping through the night and they're still not." And then another thing is they may be falling out of bed. Sometimes they are still wetting the bed even beyond the age that they should be. So they're maybe nine years old and they're still wetting the bed. And sometimes their breathing can just look funny as parents are kind of watching them. And I do find that this can be very disruptive to the parents themselves, because they're really worried about the breathing in their kids.

Dr. Alyssa Smith:

And then are there any daytime symptoms that patients can present with?

Dr. Sarah Bowe:

Yeah. Certainly the disruption in the sleep. We know that sleep is profoundly important for everybody, and so that disruption in their sleep can often present with behavioral problems. And so that's a distinct question that I usually ask about is, "Are they having problems concentrating in school? Are there issues in school?" There can be some overlap and overlay with attention deficit hyperactivity disorder as well. In kids, it seems to be more that they have hyperactivity than the same kind of like fatigue or somnolence that adults have. They kind of flip into that reverse. It's something that sometimes we

notice in toddlers, if anyone's a parent, once they get overtired, they become crazy. So it's kind of that similar pattern that seems to happen in kids.

And then they can just have other ENT related symptoms like their chronic mouth breathers. They've never been able to really breathe through their nose. They may have chronic runny nose or other symptoms like allergy related symptoms as well.

Dr. Alyssa Smith:

And then thinking about timing of presentation, can this present with very young infants and teenagers? What is the timing like?

Dr. Sarah Bowe:

Sure. So certainly sleep disordered breathing or obstructive sleep apnea, I'll probably go back and forth between these a little bit throughout because there's a lot of overlap. But these symptoms can present very early. Usually if they're presenting very early, it may be for other reasons. So it's possible that you may have an infant that's having these symptoms and it could be something like laryngomalacia, where they have the floppy larynx that's causing some of that obstruction. But for the large majority of kids that we're talking about here with sleep disordered breathing, usually, we will see it in kind of two, three, four-year-old kids and that's probably the larger chunk of them. And then again, it starts to traipse off as they get in towards school age and older. For the large majority of this reason it's due to their tonsils and adenoids.

And so again, as we know that these kids are getting infections, getting exposed to things, those tonsils and adenoids are protective in that sense and also swell in that sense. And so sometimes these symptoms really actually present after a bad cold or infection, and then may stay that way or may resolve a little bit over time.

Dr. Alyssa Smith:

And how common is this?

Dr. Sarah Bowe:

It is not as common as otitis media which we talked about on our last podcast. But it still can be pretty common. Maybe close to one in 10% of kids will have snoring. And then maybe about like one to 5% of kids will have obstructive sleep apnea.

Dr. Alyssa Smith:

And so what is actually happening in the airway that is causing this disordered breathing to occur?

Dr. Sarah Bowe:

Yeah. So there can be some obstructions that are happening at baseline. And so certainly if a kid has 100% obstruction of their adenoid at baseline, they're going to have some nasal obstructive issues at baseline. And then what typically tends to happen, again, you may have kids that have four-plus enormous tonsils at baseline. They're already going to have some obstruction. But generally what happens is that specifically in sleep, our tone goes down a lot. And so that kind of relaxation in terms of neuromuscular relaxation, causes everything to essentially fall into the airway. And so because of that, even tonsils that maybe don't seem that big on exam, might only be more of that two-plus nature, so

you can see them there, but they're not heading kind of more over or touching in the middle, they still may fall in and block the airway as kids are going off to sleep.

Dr. Alyssa Smith:

And so you mentioned the tonsils as a level of obstruction, but where else can obstruction occur?

Dr. Sarah Bowe:

Yeah. So really it's one of those situations where you can start at the top and work your way down in thinking about it or vice versa. But there are definitely multiple levels that it can happen at. The tonsils and the adenoids tend to be ones that we talk about more frequently because those tend to be the most common. But there can be obstructions at the base of the tongue in terms of the lingual tonsils, as well as even at the supraglottis. So in terms of kind of where the epiglottis sits, or again, similar to how we talked about laryngomalacia can have some of these same presentations in younger infants. And then there can be predisposing factors which can cause narrowing in the nasopharynx or the oropharynx, and that may be due to mid facial growth issues and/or micrognathia. And so all of those can really contribute at the different levels.

Dr. Alyssa Smith:

And so you've mentioned so far two terms, sleep disordered breathing and obstructive sleep apnea. Can you define those for us?

Dr. Sarah Bowe:

Sure. Sleep disordered breathing is a more kind of catch-all term. It is breathing that is disrupted during the time of sleep. And so that can have multiple descriptions as we kind of talked about in terms of pausing, gasping, choking, some of these kind of more broad, generic terms. Obstructive sleep apnea requires diagnosis by a formal polysomnography or PSG. And so in order to have the diagnosis of obstructive sleep apnea in kids, there is a value called the AHI or the Apnea-Hypopnea Index. Generally speaking, what they're doing is they hook up all the monitors and are able to assess whether or not there's pauses or apneas in the sleep, whether or not they're shallow breathing, in which case the oxygen level drops a certain amount. And then they essentially tally those up over time, average them out over the time of sleep, and then that is how you get the Apnea-Hypopnea Index.

And so in pediatric population, anything over an Apnea-Hypopnea Index of one is considered sleep apnea. And then generally speaking, we've divided those into mild, moderate, and severe with an AHI of one to five being mild, five to 10 being moderate, and over 10 being severe. And then another value that we often will look at is also the lowest oxygen saturation throughout the night. And in that case, there's a little bit of rough values that people use, but generally speaking, if the [inaudible 00:09:45] is below 80%, so into the 70s, that's also deemed more severe sleep apnea.

Dr. Alyssa Smith:

And I can imagine that there's other sleep disorders that could be causing some of these symptoms that children can present with. So what other sleep disorders should be on our differential diagnosis?

Dr. Sarah Bowe:

Yeah. Certainly there can be a wide range of sleep disorders as well. One of the biggest things, and particularly in our teenage patients, there can just be their actual sleep hygiene on. And so I think that

getting a good assessment of the actual sleep process is very helpful. And so if kids are going to bed at 11:30, 12:00 at night and trying to get up at 5:00 in the morning, which are a good handful of my teenage patients, they're going to have some sleep disruption, they're going to have some poor attention issues, they're going to have all of that for many other factors other than the fact they might also have some of these sleep disordered breathings. But it's very helpful to have some of that history. So kind of what's the bedtime routine? Are they watching TV or on phones right up until the time that they're going to sleep?

Are they having coffee? Granted hopefully our two and three year olds are not having coffee, but teenagers like to hang out at Starbucks. So all of these things factor in a little bit into that sleep hygiene set. And then there can be other disorders like restless leg syndrome that can also cause kids to toss and turn throughout the night. And some of these other measures can be picked up on the sleep study and give you some of that information. In some places there may even be kind of sleep dedicated or sleep disturbance specialists, many times they may be pulmonologists. And so we have a wonderful basically behavioral sleep person that we're able to access when there may be these other contributing or confounding factors. It's been great for us because we worked on creating essentially a multidisciplinary sleep clinic where we have pediatric pulmonology and neurology and ENT, and we kind of bring everybody together to sometimes talk about these situations where we have complex patients that have a lot of overlapping conditions.

Dr. Alyssa Smith:

So you've mentioned a lot of really important questions related to sleep hygiene that you might ask a teenager or even a younger patient, but what are some other important questions that you are asking during your history taking?

Dr. Sarah Bowe:

Yeah. I think every time a patient comes in, it's helpful to know the entire history of other things that may be impacting it. And so again, allergies certainly come into play. They can impact the size of the turbinates, the size of the adenoids, congestion and other issues in terms of breathing through the nose. And so the relationship to allergy is really important. Another thing that can be helpful is also just making sure that they're not on other medications for other things. It could be that they do already have a diagnosis of ADHD. So that can certainly help. Maybe are they on stimulants for some other reason? And so that can be impactful. Maybe some of the sleep disturbances happened with new medications that were started.

Another thing is, have they had other surgeries before? Maybe they've been somewhere else and they've already had their tonsils and adenoids out. And so that would certainly change a little bit of what you might be thinking in terms of assessment and management. And so really rounding out some of those other history pieces are helpful.

Dr. Alyssa Smith:

And then moving on to your physical exam, what are you assessing and evaluating and what should we be looking for?

Dr. Sarah Bowe:

Yeah. Again, a comprehensive exam is always the right answer. I think in terms of specifically for thinking about sleep disordered breathing and obstructive sleep apnea, a good kind of assessment of the kind of facial skeleton in a way to see if there is any of that mid facial growth or mid facial

hypoplasia, if there is any micrognathia. Also assessing in terms of the oral cavity, we talked about the tonsils. You can try to get a general assessment of their tongue, but assessing tongue size and where that's sitting, other than if it's being impacted by the jaw is sometimes a little bit difficult. And then certainly overall body habitus is really important. We know that obesity is a big risk factor as well, and so having an understanding of the impact of weight as very important too.

Dr. Alyssa Smith:

And so you mentioned that a lot of these patients or some of these patients will present already with a sleep study that's been done. But for those patients that haven't had a sleep study, how do you determine who's a good candidate to get one?

Dr. Sarah Bowe:

Sure. There are definitely some risk factors which are going to want to prompt you to get a sleep study regardless. In terms of our academy's perspective, not every child with sleep disordered breathing that has a history and exam that are concordant needs to have a sleep study. Now, our academy guidelines are a little different than some of the others. So for instance, the American Academy of Pediatrics basically recommends that like anybody that you're concerned for sleep apnea should get a sleep study. And so that's why I think a lot of the patients that I have do already come in with sleep studies ordered in some capacity. But from our standpoint, if you have a story that fits and you look, and you've got three, four-plus tonsils and it's otherwise healthy kid, then that kid probably doesn't need a sleep study.

But if you have kids that maybe they just have like one-plus tonsils and the story sounds like it fits but it doesn't seem like it quite matches up, then that discordance is a reason to consider getting a sleep study. Also with the history just maybe doesn't sound quite right, but maybe they've got more of these other issues, maybe they've got restless leg or something else that's contributing, then that might be a reason to consider one. And then otherwise in kids that have some other basically kind of risk factors. So any kids that are under the age of two years old or kids that have obesity, as well as kids that have down syndrome, craniofacial abnormalities, neuromuscular disorders, basically other reasons that they could have more severity, and/or may need kind of more monitoring postoperatively because of these risk factors.

Dr. Alyssa Smith:

And so you mentioned down syndrome as a risk factor, but are there any other associated syndromes that we should be aware of?

Dr. Sarah Bowe:

Yeah. I definitely think certainly some of the craniofacial syndromes, again, mostly because they're going to impact some of that area in terms of the mid face and the jaw. So some of your like Pierre Robin sequence or Stickler syndrome also [inaudible 00:17:51] potentially hemifacial microsomia. And then in addition to that, some of the craniosynostosis. So really anything that has a kind of risk factor for changing some of the positions that may then impact the nasopharynx and oropharynx. Patients may not have a very specific kind of neuromuscular disorder that's diagnosed, but we definitely can see patients that generally just are a little born delayed or have hypotonia issues. And so any syndromes with hypotonia as a symptom, or some of these kids that maybe are undiagnosed, but certainly are lagging a little bit from developmental milestones are also at risk.

Dr. Alyssa Smith:

And then can you touch on the role of a drug induced sleep endoscopy for children?

Dr. Sarah Bowe:

Sure. Drug induced sleep endoscopy in some respects is a little bit newer-ish into our armamentarium. And I think that we're in the process of teasing out what are the best kind of situations to think about using it? Generally speaking, for most of your kids that don't have any of these risk factors and are otherwise pretty healthy kids that had their tonsils and their adenoids still, usually tonsil and adenoid upfront is going to be your go-to procedure when we're talking about surgical management. The drug induced sleep endoscopy gives us a little bit more information for two subsets of patients. One is those patients that have already had a tonsillectomy and adenoidectomy and they still have sleep apnea.

And so what that procedure can do is we basically take the patient back to the operating room, and we use the same NP scope that we would use in clinic to do an exam of the nasopharynx, oropharynx and larynx area. But we do that as the patient is in this slight sleep state. And there are different medications that people use. Precedex and propofol tend to be the most common ones. But basically as they're just going off to sleep and reaching some of that kind of snoring state, you have the telescope in there in order to look at that velopharynx area, oropharynx area, at the tongue and in that supraglottic area. And then you can see if there are specific areas that are collapsing, some of which may be amenable to additional procedures. So perhaps there is some laryngomalacia that's going on. And otherwise if it's more kind of like collapse of the throat itself, not really as amenable to surgery, but then that may help give direction for other options such as CPAP or the continuous positive pressure treatment.

Dr. Alyssa Smith:

And so before we talk about the specific approaches or treatment options, can you touch on the goals of treatment?

Dr. Sarah Bowe:

Sure. In terms of the goals, in many cases, the goal is to improve the obstructive sleep apnea. Again, there's kind of the different subsets of patients, but in your otherwise pretty healthy patients that you're doing a tonsillectomy and adenoidectomy, ideally you're trying to improve their symptoms. And when it comes to kids that have more mild to moderate sleep apnea, and their symptoms in terms of their snoring gets better, their sleep is much less disrupted, their behavior maybe improves and they appear to have improved very much symptomatically where the parents are relieved that they've finally been able to get some sleep and rest and things have turned around. If they have had a sleep study, I usually will not get a repeat sleep study, and so I will go more off kind of the symptomatic improvement.

In terms of the severe sleep apnea and some of those other cases, generally you're trying to make them better. Ideally, you're trying to get them at least kind of a 50% improvement. Again, depending on the severity and the type of child and other risk factors, I may not always also repeat a sleep study with the severe sleep apnea. I talk about that with the parents, give them the options, but many times those parents, when the kid has really gotten almost entirely better from their standards, they also will say, "I don't think we need to do another one of those." So really it's helping to kind of move the needle in terms of the symptoms.

Dr. Alyssa Smith:

And so before we touch on some of these surgical options, can you discuss a little bit about any medical options that are available, if any?

Dr. Sarah Bowe:

Yeah. So there have been a couple of studies that have looked at certain kind of medication treatment options. And then always there is just watchful waiting and kind of the test of time, depending on the age of the child and the severity. There have been studies where they've watched kids over time where many of them in the next five to seven months will actually improve and maybe outgrow their sleep apnea when it's more in that kind of mild to moderate range. And so certainly watchful waiting can be an option.

There always is the option for continuous positive airway pressure CPAP or, or bi-level positive airway pressure BiPAP. For the most part, most kids aren't going to tolerate that very well also if tonsillectomy and adenoidectomy can potentially treat them of their symptoms and then they do not need to use this. That tends to be an option that most parents would elect for, as opposed to trying to have to do this on a continuous basis. And then in terms of medical options, using topical nasal steroids, there has been support for that to help improvement in kind of more mild to moderate cases.

And then also there was a study or there've been a couple of studies that were done in the pulmonary literature that looked at montelukast or singulair. So another type of allergy treatment that they specifically used for mild to moderate cases of sleep apnea and also showed improvement. And so I know that there is at least a handful of kind of ENTs that had potentially started using the singulair as well in their practice. The kind of hard part in terms of the medication management is when do you start it and when do you stop it? Because most of the trials treated kids for 12 weeks or 16 weeks, but then there wasn't a lot of followup for okay, well, do you keep doing it, or do you start it again or stop it? Or what to really do. So that factor is a little bit nebulous.

Again, this is where some of the background of the patient can be helpful because it's possible maybe they have allergies or there's a suspicion that there's allergies, and maybe they've just been on an anti histamine or maybe they already have been on a nasal steroid. And so having that history can really impact what are some of the future options that you have. In terms of the montelukast, there actually is a new boxed warning on that medication for pediatric patients. So not a black boxed warning, but a boxed warning.

And the boxed warning is that there can be behavioral disturbances on that medication, and so it can, I think, cause problems such as depression or anxiety or hyperactivity. And I believe even in the, I think, generally more adolescent population, that there had actually even been kind of increases in some suicidality. I think that was seen. And so the boxed warning just came out recently. And I will say that I actually heard about this use at an academy meeting, and I did start using it a little bit here and there at least offering it to patients depending on different situations.

And I did hear anecdotally that there was a patient or two that their kid actually became more hyperactive on it, and so I started counseling patients about that and to stop using it if that happened. But with the official boxed warning, I haven't decided, I might change that or leave that more to my pediatric sleep colleagues to dull that out next time.

Dr. Alyssa Smith:

And I know one thing I've heard of just in general for sleep apnea is the whole tennis ball and the T-shirt trick. Do you ever use that and does it work?

Dr. Sarah Bowe:

Yeah. Sleep apnea is interesting because certainly there can be some positionality to it. I can't say that with the tennis ball and the T-shirt I've heard it so much in the pediatric population. I know, I think that

there's a fair amount of people in the adult population that the supine position is basically like the only position they really have their sleep apnea. And so if it can get them onto their side, it works for them. But I guess I could like try a golf ball or something more sizable for a kid and suggest that.

Dr. Alyssa Smith:

So thinking about our surgical options, who is a surgical candidate?

Dr. Sarah Bowe:

One thing that I always find unique is that whether it's ear infections or like sleep disturbance, in many ways the ear tubes and the TNA is kind of like, "Oh yeah, that's the most common thing we do. it's this simple thing we do." And honestly, when you compare kind of the decision making to the surgeries, the surgeries maybe kind of the more simple things we do, but the decision making on these can go so many different directions. And I think that that's because really each child and each family is so unique in terms of what they bring from their past experiences and from the severity of the case and how much the symptoms are affecting the family and do they have allergies or not? Or what other surgeries they've had. And so all of those things really factor in.

When it comes to good surgical candidate, again, most of the time, like maybe 80, 85% of the time, it's a two, three, four, five, six-year-old kid that has three or four-plus tonsils and a great history. And so those from a surgical candidacy standpoint, are pretty easy to then have the discussion with the family and say, "This is an option. More than likely this is gonna get a very good result." It's still something we'll have to check afterwards, but particularly if they're severe sleep apnea, then that discussion becomes much easier. It's kind of the mild to moderate sleep apneas that then make it a little bit harder to figure out, "well, what are we looking to try to improve? What are the symptoms? What is everything else that kind of relays into this?"

And then in terms of kind of all those other risk factor patients that we talked about whether it is obesity or craniofacial disorders, again, if they haven't had a tonsillectomy and adenoidectomy, most of the time if there are tonsils and adenoids that are still there that are reasonably sized, that's still is going to probably be the first option to determine whether or not that can provide an impact, and then basically risk stratifying out after that. And then we didn't get to this in terms of the DISE specifically in the last question, but again, these kind of higher risk populations are another great category of patients to think about DISE. And it may be that more and more, especially if the tonsils and adenoids are small, then DISE gets put in upfront for some of these higher risk patients that are then more at risk to continue to have sleep apnea afterwards.

Dr. Alyssa Smith:

And so we know how common adenotonsillectomy is, but what other surgical options are available for patients that don't have obstruction at those levels or have previously had an adenotonsillectomy done?

Dr. Sarah Bowe:

So again, this will be somewhat patient dependent, but it kind of works on... Say we've got the tonsils and adenoids out, it works on a spectrum from there, all the way up to as we know, really kind of the most extreme surgical procedure is tracheostomy, which really bypasses all of the upper airway level obstructions. One thing that we haven't specifically kind of mentioned in but certainly in the factoring in of the tonsils and adenoids, the turbinates or something else that I also consider. If the turbinates are large and there's a lot of nasal obstruction, and maybe they do, or maybe they don't have a history of allergy. But many times I will also add in turbinoplasty into the treatment paradigm for sleep apnea.

And so then some of the other things, as we kind of go down the levels that we've talked about, it's possible that they could have an elongated palette that has obstruction at the level of the palette. That's something that I tend to see much less commonly, I would say, in pediatrics as opposed to adult practice. I was a general EMT for a few years before I went back to fellowship, and certainly the palatal redundancy was a not uncommon thing in some of the adult patients that we had from a sleep apnea standpoint. And then in terms of moving further, there can be lingual tonsil hypertrophy that we've mentioned. And so doing procedures to basically kind of reduce that lingual tonsil access can also be beneficial.

And then we mentioned that there can be basically a laryngomalacia component that can sometimes contribute, so a supraglottoplasty to treat that can be helpful. And then in terms of additional procedures, if there is retrognathia or micrognathia, mandibular, distraction type procedures, and then overall weight loss in general, and whether that be through kind of diet and exercise and those focuses, all the way up to the extreme and bariatric surgery. But those are kind of a long litany list of the various surgical options, which are really going to be directed at the level at which obstruction is happening.

Dr. Alyssa Smith:

And so thinking about specifically for tonsillectomy, I think we've all heard that there's a variety of different approaches that can be taken, whether it be extracapsular versus intracapsular. Can you talk a little bit about those and the different approaches?

Dr. Sarah Bowe:

Sure. I personally basically was trained and do extra-capsular removal. So basically removing the entire tonsil and I tend to use electrocautery and do that with Bovie. Same thing, I use Suction Bovie for the adenoids. There are obviously various instruments that people use. Some people use the coblator, some people use the microdebrider. So there's different options and those can each kind of interchangeably be used during tonsillectomy and adenoidectomy, as well as just cold steel.

In terms of the extracapsular versus intracapsular, the intracapsular or some people call it partial tonsillectomy, some people call it tonsillectomy, there's a lot of names that essentially kind of get thrown around. But the general idea or concept is that there is a capsule around the tonsil, and so if you're kind of removing it and removing the tonsil with its capsule, so staying right on the border of that capsule, but making that separation on that side, versus the other procedures basically chew or melt or reduce down the tonsil, working from the medial aspect out laterally, but preserve a thin layer of the capsule and usually like a teeny, teeny, thin layer of tonsil that's just overlying that capsule.

There's been a lot of studies that have looked at are any of these procedures better or worse? When it comes to comparing the different varieties of extra tonsillar, or extracapsular tonsillectomy, there's never really been a study which has shown that one technique was better than the other. In terms of the more intracapsular tonsillectomy, there have been studies which have shown that there is probably a little bit quicker return to normal diet, and a little bit lower issue in terms of pain. And then also probably because of those factors, a little bit lower rate of post tonsillectomy hemorrhage as well. So as I mentioned at the beginning, I did not train with doing any of the intracapsular techniques, and so my learning curve to get to that point would probably maybe not have me have those same levels of benefit for a while, because obviously as you're starting out with new procedures, there's always a little bit of that learning curve.

In terms of how we're talking about comparing these, tracking your own data is a wonderful thing to do, and also recommended and encouraged in terms of knowing what your own complication rates are in terms of bleeding, and the different types of bleeding that we see afterwards.

Dr. Alyssa Smith:

So who should be admitted after surgery and who can be a same-day discharge?

Dr. Sarah Bowe:

Generally speaking, the guidelines also factor into this as well. But basically, the similar population that you were kind of recommended to consider getting a sleep study on, many of those also are going to be patients that you want to keep in the hospital. So certainly any pediatric patients under two, your patients that have obesity, patients that have syndromes such as Down syndrome, craniofacial abnormalities, or neuromuscular disorders. If you have patients that have uncontrolled or severe asthma, as well as any patients that have severe sleep apnea, it's generally recommended to keep them. Some of this, realistically speaking on a practice level, maybe different depending on the institution that you're in and the insurances that you're dealing with, whether that's a good thing or a bad thing.

So I do know that sometimes, because there's so many kids that do have severe sleep apnea, and that there may be a little bit of wiggle room in terms of who's admitting what level of severity of sleep apnea, does a kid who's 12 years old and 11.0 really need to be admitted? So, again, that's where we have the guidelines, but some of these different kind of personal and practice related factors will influence how things go.

Dr. Alyssa Smith:

And then what are some post operative complications that we should be aware of?

Dr. Sarah Bowe:

Sure. And again, these are all things that also should come up in your informed discussion with the parents thinking about surgery. I'll basically probably kind of direct this to tonsillectomy and adenoidectomy because going through the complications of like every other possible surgery would take a while. But in terms of tonsillectomy and adenoidectomy, the biggest risk that I usually kind of bring up is the risk of bleeding postoperatively. And that's because it's fairly common. The reads generally quoted in the literature about maybe like three to 5% in terms of that secondary bleed rate. And so there's kind of two different classifications of bleeding that we usually talk about, there's primary bleeding and secondary bleeding, primary bleeding which is bleeding, that happens within the first 24 hours of surgery.

And that's generally felt to be a little bit more technique related, as opposed to secondary bleeding. And that happens usually on average somewhere around the seven to 10 day mark postoperatively, but can happen up to basically two weeks out. And so usually, I bring that up with the parents. Personally, since I finished fellowship, my primary bleed rate is 0%. So fortunately I think my technique's okay at the moment. And my secondary bleed rate is actually about 1.5% at the moment. So every day I honestly keep waiting for a kid to come in, because I feel like I'm due for it by the numbers.

So I think having that information is important, but I still usually paint a picture more for the family of that three to 5% because I tell them it's not the majority, but it doesn't mean it's not common, and that we don't see it often, because we do so many of these. And so I really try to get them to understand that it's not something that is .3% and we're not seeing it frequently. And then other things that I usually bring up is certainly kind of long term changes to the voice or swallowing are very rare. I do

specifically address kind of nasal air escape in terms of... I usually describe it as that and not say velopharyngeal insufficiency, because that usually just gets funny looks.

But basically, those are very rare. I usually bring up injury to the teeth, the lips and the gums, because certainly we're going in and out with instruments, and those are definitely kind of big important. Complications that can happen, again, not usually common, but can be pretty severe in terms of the oral commissure burns that have happened to other providers. So I usually bring that up. And then for the kids that we're keeping, the reason really why we're keeping them is not to make sure they're eating and drinking okay, it's to make sure that they don't go into post obstructive pulmonary edema. So basically by relieving that pressure that they're trying to breathe against, that all of a sudden, their lungs don't just suddenly flooded with fluid.

And so I have not had that happen, but one of my colleagues had that happen in the PACU. And so it certainly can be a very scary thing when it does happen. And so that's what I mentioned, particularly for the patients that we're keeping, I don't specifically highlight that as much for the mild sleep apnea patient.

Dr. Alyssa Smith:

And then thinking about success with surgery, how do you counsel parents on the chance of success?

Dr. Sarah Bowe:

In terms of success again, it varies depending on the many factors that go into it. I think that generally speaking for the patients that are younger or otherwise healthy, have big tonsils and adenoids, I don't necessarily give specific numbers but I say, "The large majority of my patients do very well and we follow along after to make sure that everything's going to get better." And then in terms of when there's multiple kind of confounding risk factors, usually I gauge it more in we're going to do this first step, to see where we're at, and then we're going to reevaluate.

And so I think sometimes from this standpoint, because there's so much involved, sometimes the percentages, I had a staff that once said, "Percentages are great, but if the patient's on the other side of that percentage, that's the only thing that matters to them." So from the standpoint that it gives us a little bit of guidance, but every patient is so individualized that sometimes the percentages I think can help, but sometimes I think they can hurt too. So I think there's times to use them and times to sometimes individualize it a little more.

Dr. Alyssa Smith:

And so moving on to follow up, what does follow up look like?

Dr. Sarah Bowe:

So in our practice, and actually some of the other places that I trained a lot the semblance of time, again, for the patients that have maybe just kind of mild to moderate sleep apnea, otherwise healthy, I feel like I've said this over and over again, that same being in intro. But we actually started having our nurses do a six-week follow up by phone call. And if they are doing well, back to their normal selves but better from a sleep standpoint, eating and drinking fine, not having any problems, snoring is resolved, they're sleeping through the night, and they're just great, we actually review that nursing phone call and offer the family an appointment but most of them turn it down.

Because they're like, "If I don't have to come in for no real reason, I'm good with it." So we started doing that for some of our more very straightforward cases. And then otherwise, for any of the

severe sleep apnea patients or any other risk factor patients, usually I'll see them back at six weeks, just to kind of touch base, see how things are initially going, and then usually order a repeat sleep study around three months, and then use that to gauge what next steps will be.

Dr. Alyssa Smith:

And finally touching a little bit on the natural history of this disorder, what could we expect to happen if no treatment was pursued?

Dr. Sarah Bowe:

Yeah. So again, it probably varies a little bit in terms of the severity. We do know that many kids with mild to moderate are probably going to outgrow this, just as they get bigger, and their tonsils and adenoids kind of shrink up naturally a little bit over time. But we do know that there can be severe consequences from a cardiovascular standpoint especially, and we know that there can be pulmonary hypertension. And even in kids that have severe sleep apnea, there are studies showing that that can have even like a more kind of immediate impact in terms of having hypertension in general, and even having some kind of pulmonary hypertension type changes.

And so over the long course of that, for that to go untreated, it certainly can then cause ramifications in terms of cardiac function. We also know that, again, sleep is just incredibly important for our neurocognitive selves and our behavior. And that's something that then if that's also impacting school and learning and other things of that nature, can even have ramifications in terms of their future. And we even know that disruptions in sleep can just, in general, affect mood and mental health conditions as well. And so, really being able to improve sleep just has so many benefits, and some of that likewise can relate to metabolic disturbances as well.

Certainly the ability to lose weight and other things is also impacted by sleep. For the patients that have obesity, if they're not sleeping well, they're also not going to be able to have good metabolic control, and so that can also create a feudal cycle. And then on the flip side, we've been talking about obesity, but if we go back to that infant that maybe was having some of these obstructive sleep related symptoms to laryngomalacia, the breathing issues can in those patients sometimes cause increased metabolic needs. And so therefore, there can be kind of growth failure and other things. Because of that we know that healthiness can have just broad reaching benefits for our patients beyond just parents finally being able to sleep for the first time.

Dr. Alyssa Smith:

Dr. Bowe, thanks again, for joining us. Is there anything else you'd like to add?

Dr. Sarah Bowe:

Yep, no, I keep shouting out to the academy for their guidelines. But again, I think that they help and I think they're helpful to know for some of the things that I mentioned in terms of the impact of everyone outside of medicine that affects medicine. So certainly as people are in their different practice settings and dealing with their different insurance companies, they're aware of the documents that are put out by our academy. And ideally, those are helping us to be able to take care of patients the way we want to. And so I think it's helpful to be involved from that standpoint so that we can try to impact patient care as much as we can.

Dr. Alyssa Smith:

So in summary, sleep disordered breathing is characterized by an abnormal respiratory pattern during sleep. It includes snoring, mouth breathing and pauses in breathing. On the other hand, obstructive sleep apnea requires a polysomnography for diagnosis. An Apnea-Hypopnea Index or AHI greater than one is diagnostic for obstructive sleep apnea in children. Patients with sleep disordered breathing can present with nighttime symptoms including snoring, apneic pauses, gasping, restless sleep, frequent arousals throughout the night and bedwetting, as well as daytime symptoms including behavioral problems such as hyperactivity or difficulty concentrating.

A polysomnography is indicated in patients where there is a discordance between tonsil size on physical exam and the reported severity of sleep disordered breathing on history. In addition, those patients with specific comorbidities such as obesity, Down syndrome, craniofacial abnormalities, or neuromuscular disorders should also undergo a sleep study. Some non surgical treatment options include CPAP, BiPAP, nasal steroid spray and montelukast. In general, adenotonsillectomy is the first line surgical treatment for patients meeting criteria for surgery. Post operative in patient, overnight monitoring after tonsillectomy is indicated for patients who are two years or younger, or have severe OSA.

The most common post operative complication after adenotonsillectomy, is oropharyngeal bleeding. The risk of a secondary bleed is highest around seven to 10 days after surgery, and occurs in about three to 5% of patients. Other complications are more rare but include post obstructive pulmonary edema, long term changes to voice and swallowing, velopharyngeal insufficiency, interoperative injury to the teeth, lips or gums, including oral commissure burns.

I'll now move on to the question portion of this podcast. As a reminder, I will ask a question, pause for a few seconds and then give the answer. The first question is what are the AHI diagnostic criteria for mild, moderate and severe sleep apnea in children? The AHI diagnostic criteria are different for children compared with adults for obstructive sleep apnea. In children, mild sleep apnea is defined as an AHI greater than one but less than or equal to five. Moderate sleep apnea is an AHI greater than five, but less than or equal to 10. Severe sleep apnea is an AHI greater than 10.

The second question is who should be admitted for inpatient observation after a tonsillectomy? After tonsillectomy, patients who are at increased risk for developing post obstructive pulmonary edema should be admitted. This includes patients who are two years older, younger, and those with severe obstructive sleep apnea. So those with an AHI greater than 10 are in oxygen saturation [inaudible 00:53:48] of less than 80%.

The third question is what are some complications of untreated sleep apnea in children? There is evidence that pediatric patients can develop pulmonary hypertension or even systemic hypertension with long standing, untreated sleep apnea. There can also be growth or metabolic disturbance as well as neuro cognitive and behavioral difficulties. Thanks for joining and we'll see you next time.