

# INITIATION AND MANAGEMENT OF POSITIVE AIRWAY PRESSURE IN CHILDREN & ADOLESCENTS

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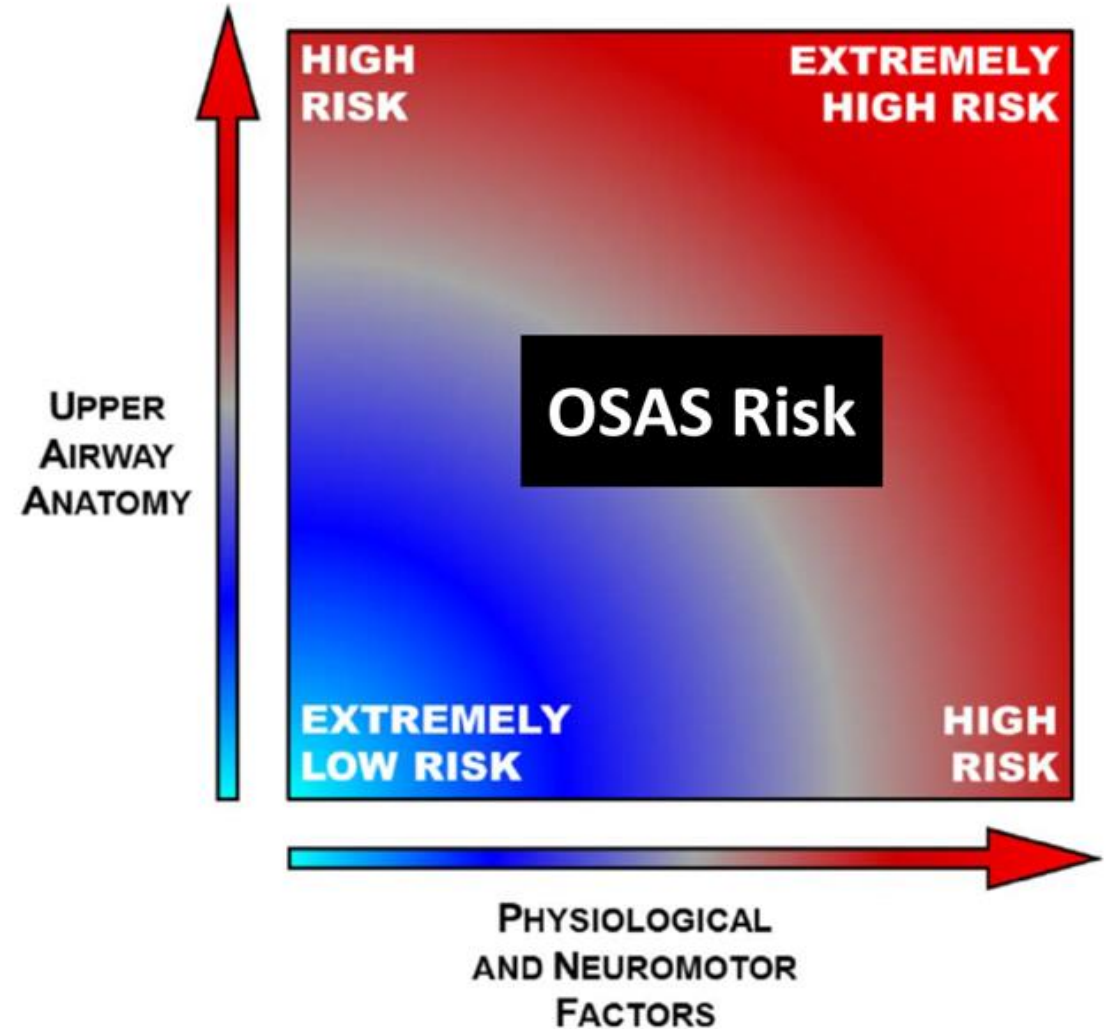
# Financial Disclosures

I have no relevant financial disclosures.



# Obstructive Sleep Apnea

- Disorder of breathing during sleep that causes:
  - Intermittent upper airway obstruction
  - Disruption gas exchange and sleep patterns
- Anatomic and neuromotor contributions
- Affects 1-5% of children (3-12% have snoring)
- Higher prevalence in infants and children with certain conditions (T21 has up to 85% prevalence)
- Affects boys and girls equally



# OSA in Infants

- Infants are particularly at risk for OSA
  - Smaller airways
  - Immature respiratory centers
  - Highly compliant chest wall
  - More REM sleep
- Some infants are at increased risk for OSA and historically have gone undiagnosed
  - Craniofacial abnormalities
  - Hypotonia
  - Certain genetic conditions (e.g., Down syndrome, Prader-Willi)
  - Airway abnormalities
  - Prematurity
- OSA in infants has been associated with failure to thrive, developmental deficits, and death.

# OSA in Children & Teens: History and Physical Exam

## • History:

- Family history may be contributory
- Mouth breathing at night
- Snoring, snorting, gasping
- Frequent night wakings
- Neck hyperextension or sleeping in odd positions

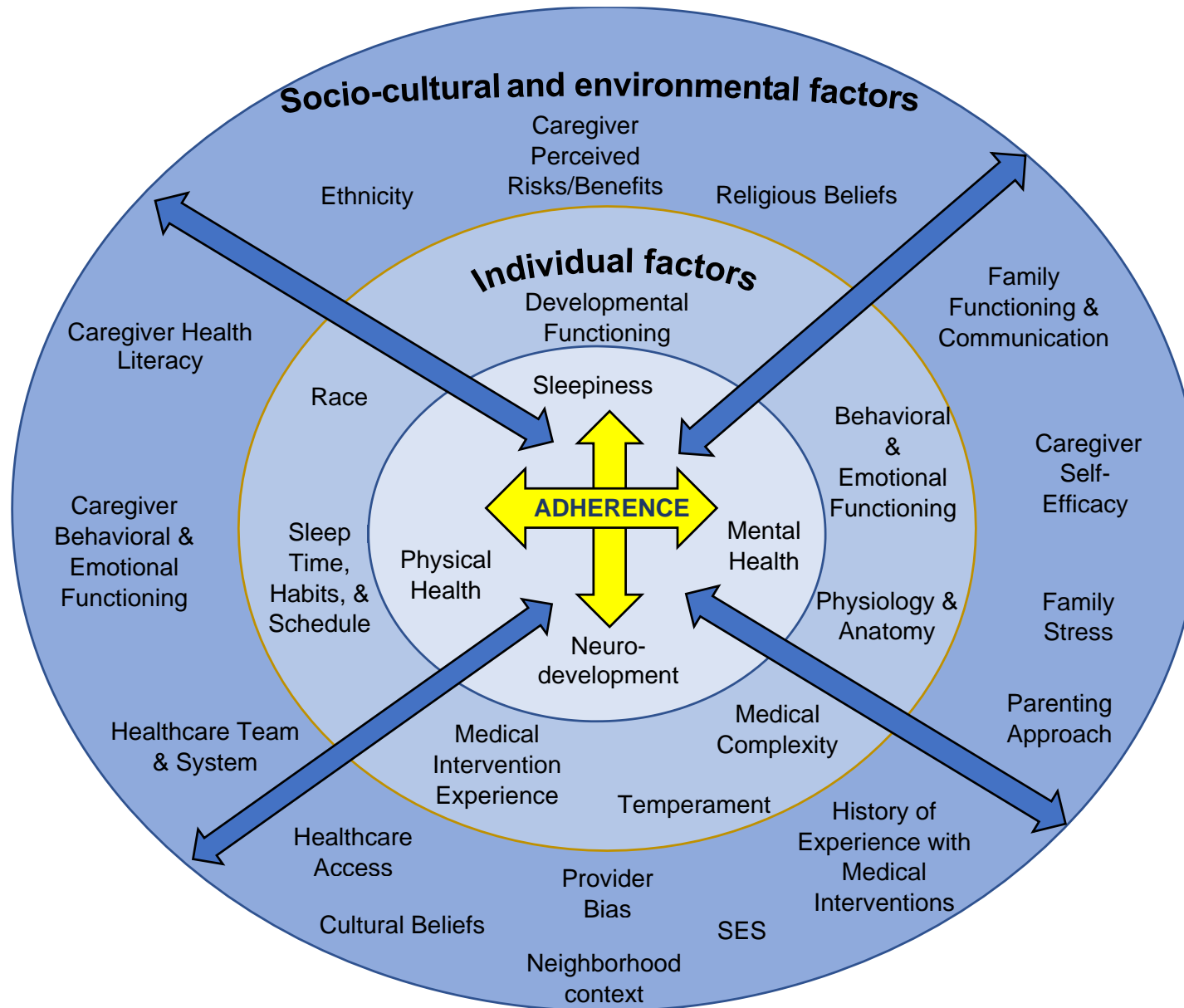
## Exam:

- Large Tonsils and/or Adenoids (x-ray)
- Craniofacial features: midface hypoplasia, choanal narrowing, mandibular hypoplasia, adenoid facies
- Noisy breathing
- Hypotonia
- Mouth breathing
- High arched palate
- Obesity

# Positive Airway Pressure

- PAP is the second-line treatment for sleep-disordered breathing in infants and children.
  - Can also be a bridge while awaiting surgery, especially in infants (e.g., mandibular distraction, supraglottoplasty )
  - CPAP, BLPAP, or AutoPAP (usually used in 10-year-old and up)
- Increased prescription of PAP due to identification of populations that are at high risk and at earlier ages.
  - Trisomy 21, Prader-Willi, craniofacial abnormalities, neuromuscular disorders, obesity, and residual OSAS following surgery.
- Adherence is challenging, especially in the pediatric population.
  - 30-80% depending on the study and population

# Biosocioecological Framework



Adapted from: Xanthopoulos, Williamson, Tapia. Positive airway pressure for the treatment of the childhood obstructive sleep apnea syndrome. *Pediatric Pulmonology*, 2022 Aug;57(8):1897-1903. doi: 10.1002/ppul.25318.

# Special considerations in infants

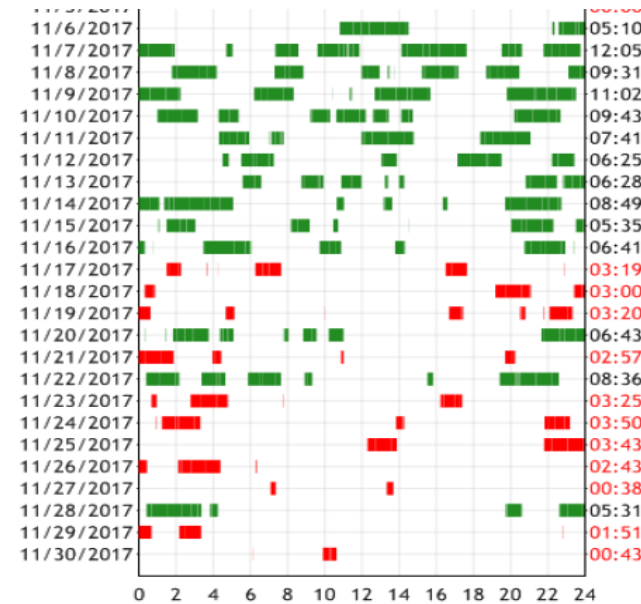
- Head size, shape, and equipment fit
  - Nasal interface, headgear
- No circadian rhythm
  - Sleep changes dramatically in the first year
  - Feeding schedule
- Growth
- Stress of a newborn with serious medical condition(s)
  - Medically complex infants with multiple medical concerns
  - New family member (1<sup>st</sup> born or sibling)
  - Post-NICU or Post-hospitalization often associated with respiratory distress, illness, or event
- Mom is postpartum

# Unique Challenges for Infants Using CPAP & Side Effects

- Comorbidities
  - Reflux
  - NG tube feedings
- Too young to report side effects such as nasal congestion/dryness
- Skin may be more sensitive
  - Some patients may use an adhesive border to protect skin
- May not have a good “alternative” mask
  - RAM Cannula
  - Ill-fitting mask can cause eye-irritation
- Prolonged use may make them more susceptible to midface hypoplasia

# When Should Infants Wear PAP?

- Infants sleep a lot
- Infant sleep can be unpredictable and is evolving
- If started in the hospital, may be using CPAP around the clock
- Different families have different abilities/expectations
- Different providers have different expectations
- Plan needs to be individualized like with older patients



2-month-old with severe OSA on CPAP



6-month-old

# Special considerations of toddlers and young children (1-3 years)

- Unique developmental stage
  - Self-awareness
  - Language development and/or delay
  - Personality development
  - “No!” and/or “I do it!” stage
- Other sleep problems that can feel more important and are potential barriers
  - Transition from crib to bed
  - Child falling asleep in caregiver’s bed and being transitioned to own bed
  - Child getting up and coming in caregiver’s bed during the night
  - Other behavioral sleep concerns such as many curtain calls, night wakings

# Considerations for Older Children & Teens

- Balance of autonomy and independence with support
- Bedtime and wake time shifts
- Sleepovers or social pressures
- Hair Styles
- Unique risk- car accidents

# Cultural Considerations

- Beliefs about Sleep
- Sleeping Arrangements
- Beliefs about Use of Medical Interventions
  - Sabbath
- Parenting Beliefs

# Overarching Principles of Introducing PAP in Infants, Children, & Teens

- Wearing PAP is a skill that can be taught and learned
  - Practice
  - Patience
  - Persistence
  - Positivity/Playful
  - Consistency
  - Creativity

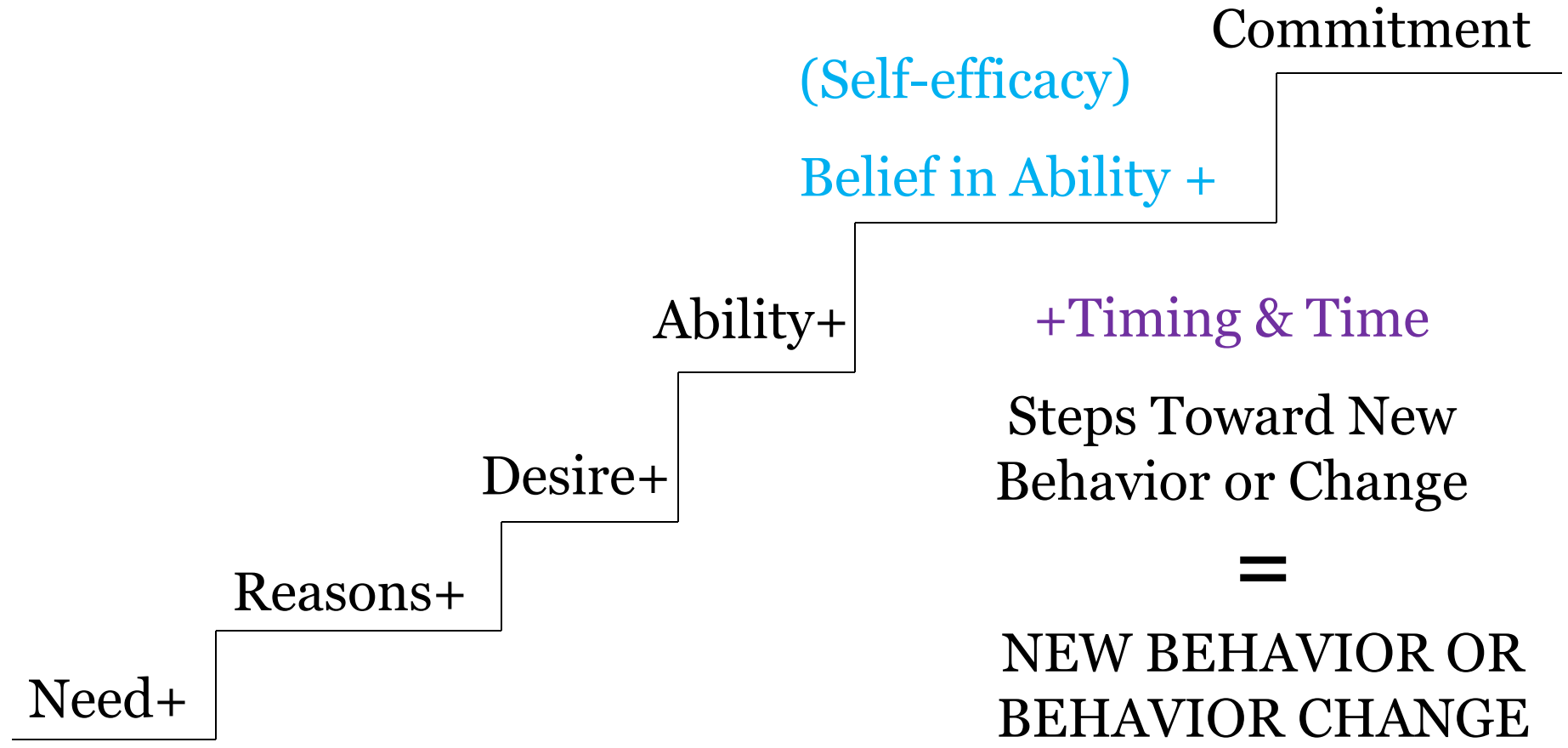
# Clinical Management & Initial Visit

- Medical Team
  - Review PSG, OSA, rationale for PAP
- Nurse and/or RT
  - Mask Fit
  - Check equipment
- Psychologist
  - Behavioral health and family assessment
  - Develops behavioral implementation plan
    - Desensitization
    - Positive parenting & Reward system
  - May include in vivo use and role modeling
- Social Work
  - Resources

# Follow Up

- 1 Week: Phone follow up by a team member
  - Depending on progress and/or concerns, continued phone follow up
- 1-2 Months: Follow up visit with NP
  - Can include RT
  - Can include psychologist
  - Can include social worker
  - Further follow up with NP negotiated with family, progress, and adherence
- Titration Polysomnography
  - 3-6 Months: Polysomnography (Baseline vs. Titration) in infants & titration in children and teens (helpful if they are able to sleep at least for a little while at home with PAP)
- 6-12 Months: Follow up with sleep physician at least once per year or sooner when deemed necessary

# What Does It Take to Learn a Behavior or Change a Behavior?



# EVERYTHING TAKES LONGER THAN YOU THINK



*[Signature]*  
@garyvee

# Cognitive-Behavioral Interventions

- Sleep hygiene
  - Consistent bedtime routine and bedtime: Visual schedules can be helpful
  - Choose a consistent place for the child to sleep, especially if he/she wakes and changes locations during the night
- Anticipatory guidance
  - Ex: If falling asleep and then putting PAP on, what happens as they get older.
- Desensitization and implementation plan: Meeting family where they are
  - Daytime play and exposure practice with positive parenting and praise
  - Make it appealing with imagination and play! Make it a game!
    - De-medicalize it: decorate the machine/headgear, name the machine
  - Falling asleep with it on is first major goal, sleeping with it all night is a separate distant goal
    - Reward system for those developmentally closer to 3 years old and older
- Motivational Interviewing
- A social story can be helpful in some cases and when developmentally appropriate

## Desensitization Tasks

"Desensitization" is a word that describes helping your child get used to PAP or positive airway pressure. We recommend a gradual, step-by-step approach that involves daily practice and should *continue every day* until your child is comfortable using CPAP with pressure and has learned to fall asleep with his/her CPAP mask while the CPAP pressure is on. If you are having trouble with any particular step, please contact us as soon as you can so that we can help you overcome any challenges and help your child be successful using PAP.

Please start at the step marked by the sleep team. Each day, you will work with your child during the day **twice per day** when possible for at least 15 minutes and up to 30 minutes each time ("session") to help him/her get used to their mask and pressure. As your child gets more comfortable with daytime practice, you will work with your child to wear the mask and machine during the day and at bedtime too.

Before starting your practice session make sure that you have sufficient time and that you do not expect any interruptions for approximately 30 minutes.

Start each session with these steps:

1. Begin an activity that is calming and enjoyable for your child. This could be watching a movie, watching iPad/tablet, reading a book, singing a song, playing an interactive game, etc. Anything distracting and enjoyable for your child.
2. Pay close attention to your child's behavior. When you notice your child following directions or engaging in any appropriate/cooperative behavior (e.g., sitting still while mask is placed on face) provide verbal praise and other forms of positive attention that will reinforce your child's behaviors (e.g., clapping, cheers, high fives). Only provide positive attention when your child is doing what you request.
3. Remind your child that only the caregiver (mom, dad, nurse, grandma) takes the mask off.

Then you will find the step on the **task list** where you begin today. If it is the first day, start where the sleep center has marked the task. If you have already started, begin where you ended yesterday. If you think your child can jump ahead a step or two, feel free to modify based on your experience with your child. If your child is having difficulty with the task and is refusing, resisting or showing any signs of noncompliance (e.g., screaming, crying, fussing):

1. Ignore all crying, yelling. Stay calm and positive.
2. Gently guide his/her hands away from the mask and say "hands down".
3. Repeat the same task until your child is cooperative

You may want to set a timer and let your child know that when the timer beeps, they can stop each attempt and remove the mask. Then reset the time for the next attempt in that session. If the timer has not beeped, then remind the child that the timer has not beeped, so they need to put the interface back on until it does beep. You can make a game of it, calling it "beat the timer!"

During each task, the child should be praised (clapping, saying "great job", smiling, etc). Other behaviors not related to PAP should be ignored.

## TASK LIST

\_\_\_ The child and parent play together with the mask and machine. The parent puts the PAP on a stuffed animal, on themselves, on a sibling. The caregiver can also gently let the child feel the air blowing out of the hose.

\_\_\_ The mask (not attached to the hose/headgear) is placed in position on the child's face for set time interval (below). Repeat several times, giving a break between each attempt, during the 15 minute session.

\_\_\_ 5 s

\_\_\_ 10 s

\_\_\_ 30 s

\_\_\_ 1 minute

\_\_\_ The mask is placed in position on the face and is connected to the headgear (hose) on both sides placed in position for set time interval (see below) Repeat several times, giving a break between each attempt, during the 15 minute session.

\_\_\_ 5 s

\_\_\_ 10 s

\_\_\_ 30 s

\_\_\_ 1 minute

\_\_\_ 5 minutes

\_\_\_ 10 Minutes

\_\_\_ 15 minutes

\_\_\_ The mask (attached to hose and both sides of the headgear) is placed in position on the face and the air is turned on for set time interval (see below). Encourage you child to breath normally through his/her nose. Repeat several times, giving a break between each attempt, during the 15 minute session.

\_\_\_ 5 s

\_\_\_ 10 s

\_\_\_ 30 s

\_\_\_ 1 minute

\_\_\_ The child lies down on the bed or couch while the mask (attached to hose and both sides of the headgear) is placed in position on the face and the air is turned on for set time interval (see below). Repeat several times, giving a break between each attempt, during the 15 minute session.

\_\_\_ 5 minutes

\_\_\_ 10 Minutes

\_\_\_ 15 minutes

\_\_\_ Add PAP to bedtime routine. Have child try to fall asleep while the mask (**attached to hose and both sides of the headgear**) is placed in position on the face and the air is turned on for 15 min.

Continue nightly until child is able to fall asleep with PAP. If child cannot fall asleep with PAP, do 15 min practice, take it off, and then wait until the child falls asleep to place PAP on.

Continue daytime practice and bedtime practice until child is able to fall asleep with PAP on and sleep with it the majority of the night. Replace PAP at night if it falls off/ is removed.

# Reward Systems



- Token Economy/Point System
- CPAP Fairy/Wizard/Imaginary Creature
- Morning Surprise Bag

Month: .....

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
✓	✓		✓	✓		✓

# Example Social Story

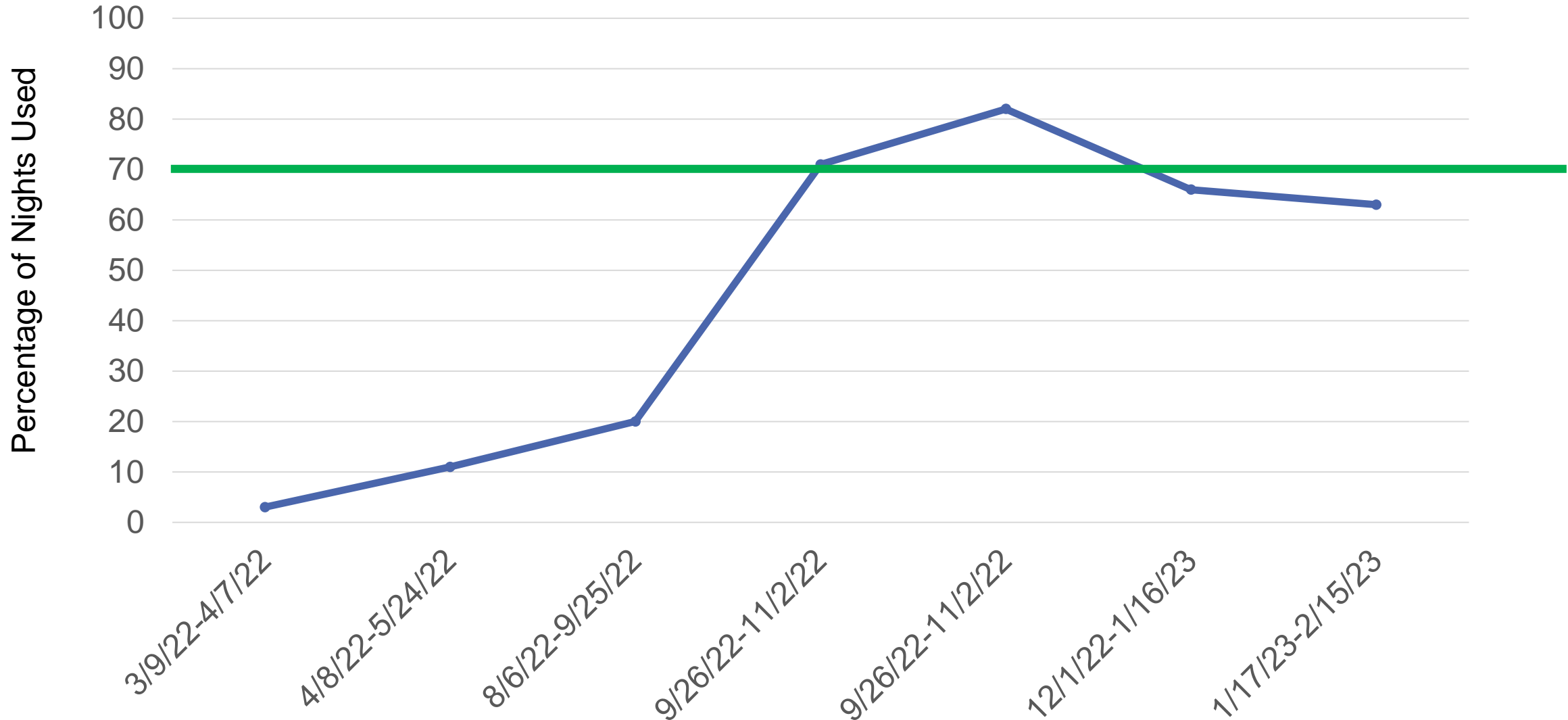
## Case Example

- 25-month-old boy
- Cerebellar malformation with hemispheres fused across the midline
- Cortical visual impairment
- Type 1 Diabetes Mellitus
- Hypotonia
- PSG on 3/7/2022, Severe OSA
  - OAHl of 14.7 events/hour
  - SpO<sub>2</sub> nadir=78%
  - Slept for 20 min of TST with SpO<sub>2</sub> less than 90%
  - Prescribed BPAP: 8/4 cm H<sub>2</sub>O, Rate 12, T<sub>i</sub>max=0.5 sec, T<sub>i</sub>min=1.0 sec, Rise time=150 msec
- Typical night
  - Good routine, falling asleep independently by 8 PM
  - Needs to be woken every 2-3 hours to check blood sugars
  - Lamp was on all night so the caregivers could see to provide medical care
  - Sometimes needs to eat so wakings vary in length
  - Wakes for the day at 4 AM
  - Naps 8 AM and 12 or 4-5 PM for 20 minutes each time

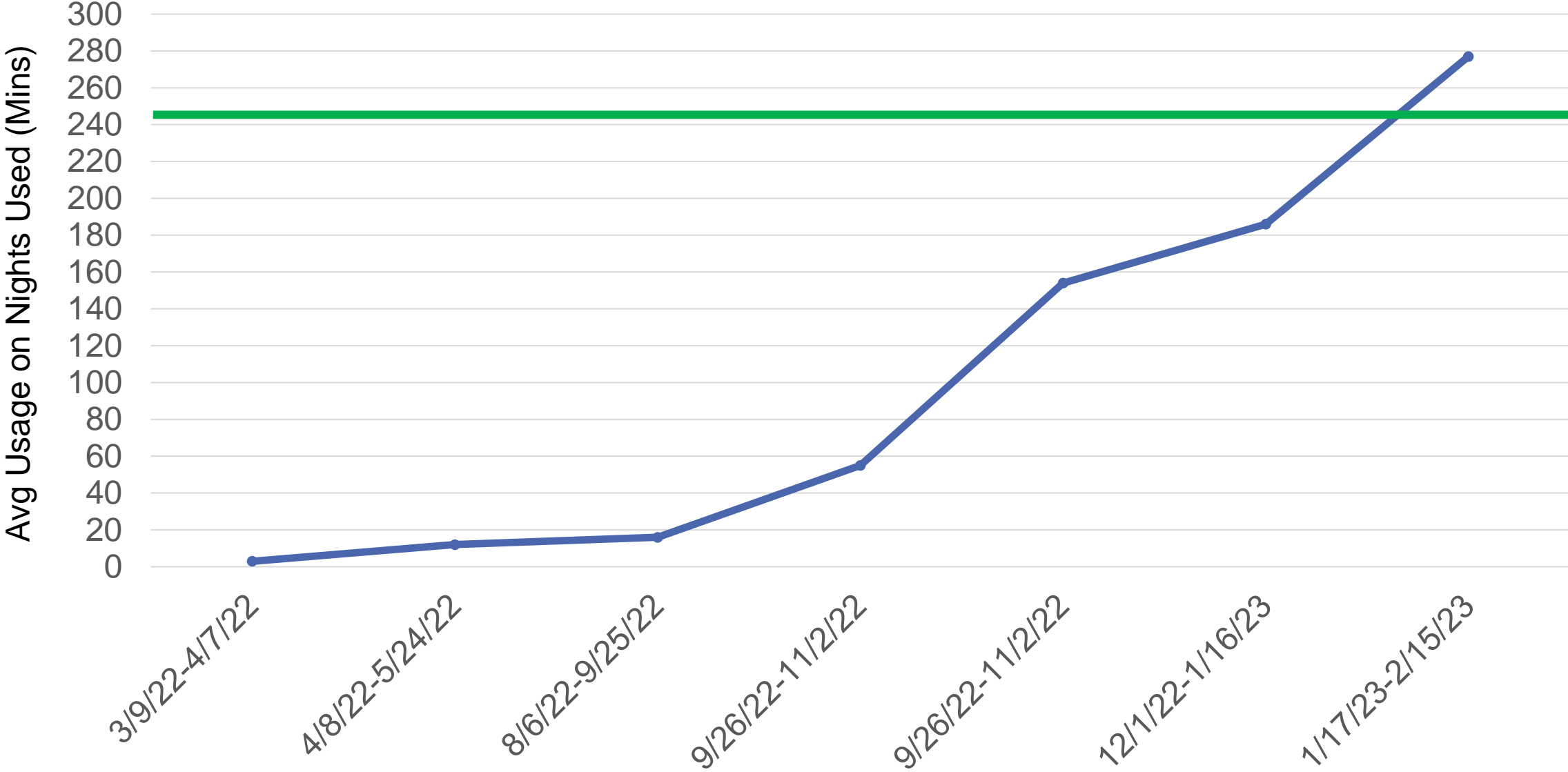
# Considerations & Interventions

- Visual Impairments
  - May impact sleep quantity
- Insufficient Sleep
- Caregivers providing multiple medical interventions 24/7
- No home nursing
- Desensitization
  - First, touch it to his hand, then lower arm, then upper arm, then cheek, then nose.
- Sleep Hygiene
  - Exposure to bright light, sunlight, if possible, around 6 AM each morning. As the evening progresses and closer to bedtime, should be exposed to less light.
  - Had a lamp on in bedroom all night long so, change to a dim night light that plugs in to the outlet instead of a lamp in the bedroom.
  - Blackout curtains in bedroom.
  - Consistent nap times.
- Increasing self-efficacy in parents

# Percentage of Nights Used



# Avg Usage on Nights Used (Mins)

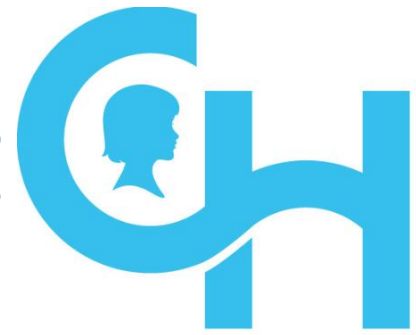


# Summary

- Medical, technical, developmental, cultural and behavioral factors need to be considered in the context of the child and family.
- Desensitization and mask fit are important but not the only factors when initiating PAP.
- Close follow up is important in pediatric patients.
- PAP implementation and maintenance of use is not linear.
- Practice, patience, persistence, positivity, playful, consistency, and creativity + **Time!**

# Thank You!

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