# Feeding Infants with Congenital Heart Defects

# Incidence of feeding difficulty in the US

**40,000** babies/year with congenital heart defects

(9 per 1000 live births)

**10,000** babies/year have heart surgery

**84 to 100%** have feeding difficulties after surgery

Good news!! All babies will improve with good practice and support from their parents.

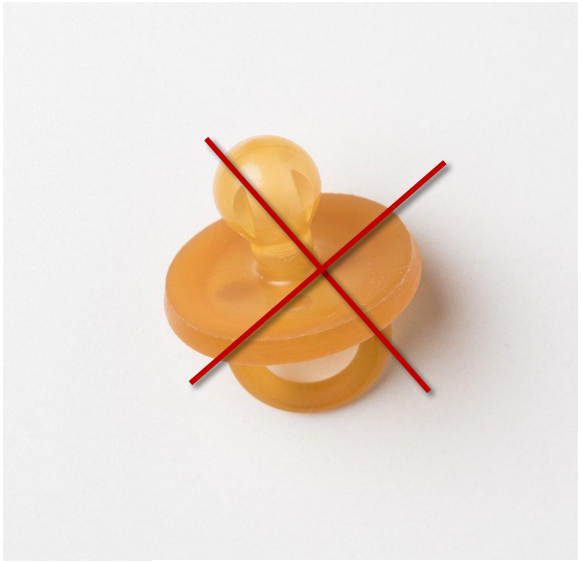
# Practice makes perfect

- Each feeding or oral experience is a learning experience. Make sure all stimulation is positive
- If possible, attempt both bottle and breast feeding prior to surgery
- Use pacifier to establish non-nutritive sucking and oral motor strength
- Tip: offer pacifier to lips first. Once baby roots for nipple, then allow into mouth. Never force a pacifier into a baby's mouth

# Why is pacifier so important?

- Non-nutritive suck is #1 self soothing technique for babies, also helps with managing pain after surgery
- Encourages awake and alert state
- Improves vital stability
- Increases oral muscle tone and coordination
- Helps with digestion
- Encourages swallowing of oral secretions
- Leads to faster transition to all oral feeds

# Oral Stimulation Modalities

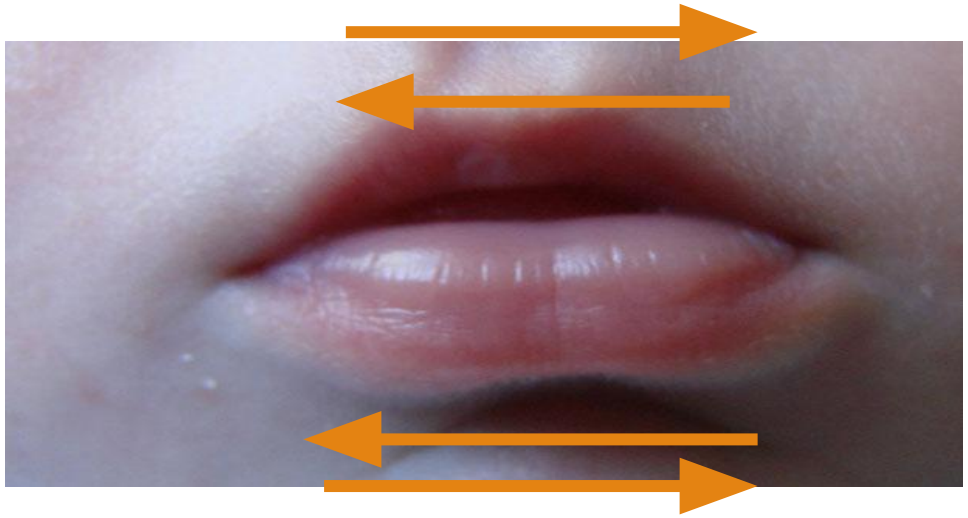


Using pacifier with flat or bulbous shapes will teach the tongue and lips different motor plans, which can negatively impact oral feedings.

# Facial Stimulation

<u>Cheek Stimulation</u>
Using index finger and thumb, stroke both cheeks simultaneously starting away from the mouth and moving towards the mouth in the following pattern

<u>Lip Stimulation</u>
Using index finger, make full contact with skin above upper and below lower lip and move right to left without losing contact with skin



# Is your baby ready for oral feeding?

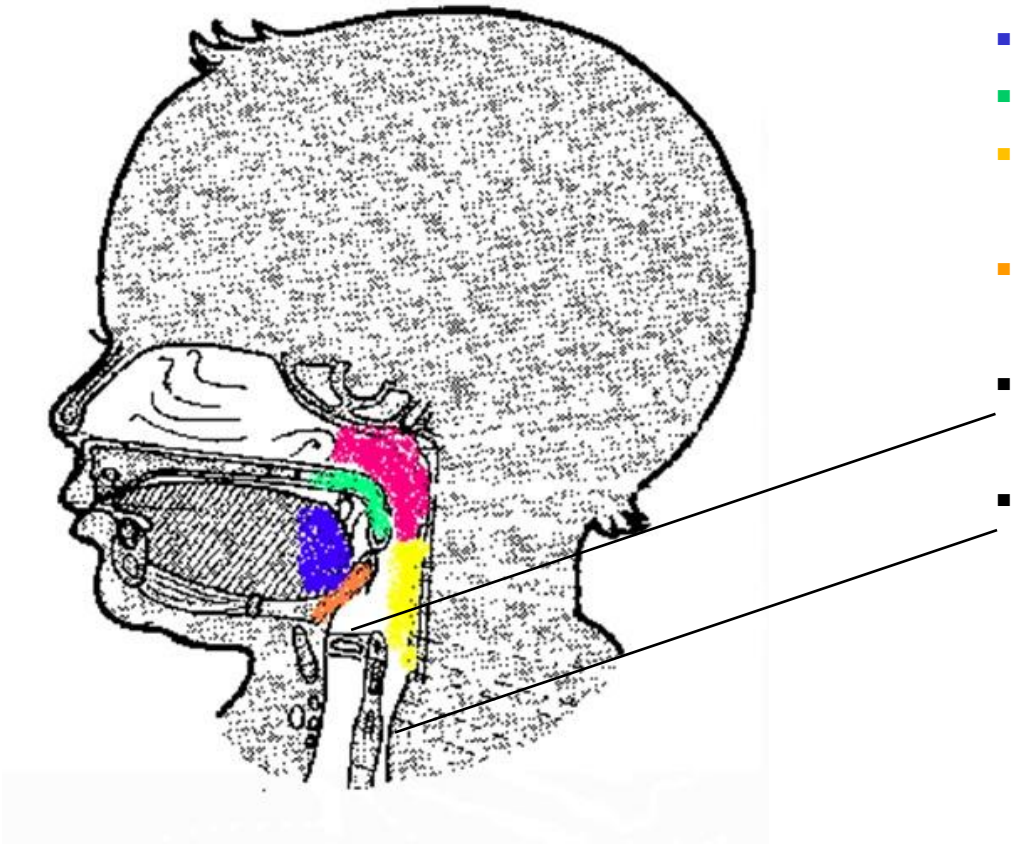
Criteria for initiating oral feeding:

- Able to latch and suck on pacifier
- Good control and swallowing of their oral secretions
- Able to maintain an alert state
- Stable vitals, supplemental oxygen by nasal cannula decreased
- Able to coordinate sucking and breathing

Oral feeding is more challenging than sucking without nutrition:

- Demands coordination of suck, swallow, breathing
- Feeding a labor-intensive, cardiovascular activity… equivalent to running on a treadmill.
- 26 muscles and 6 cranial nerves are used complete one swallow that takes one second!

# Mechanics of Swallow



- Tongue elevates
- Soft palate elevates and retracts
- Posterior pharyngeal wall squeezes to propel liquid down
- Epiglottis folds down to close off airway and prevent aspiration
- Vocal cords adduct to prevent milk from entering airway
- Esophageal sphincter must relax to allow milk to flow

# Feeding Difficulties

- Poor sucking, oral weakness, loss of liquid
- Limited endurance
- Oral hypersensitivity
- Coughing and choking
- Slow feeding
- Increase work of breathing, nasal flaring, retractions
- Congestion
- Poor hunger cycle, reflux
- Stress cues (yawning, gagging, sneezing, tremors, arching, stiff extremities, gaze aversion)

# Special Considerations in CHD Population

- Type of CHD
- Duration/frequency of intubation
- Genetic disorder
- Recurrent laryngeal/vagus nerve injury
- Neurological insult
- Birth weight/ gestation
- ECMO
- Medications

# Complications secondary to CHD

- Swallowing is a neurological process inhibited with babies with CHD
- Feeding risk classification (*risk for RLN injury)

| Low Risk<br>Acyanotic | Medium Risk<br>Cyanotic | High Risk<br>Obstructive |
|---|---|---|
| PDA* | Tricuspid atresia | Aortic stenosis* |
| ASD | TAPVR | HLHS* |
| VSD | TOF | Coarctation of the aorta* |
| AV canal defect | Truncus arteriosis* | Mitral stenosis |
| DORV | TGA | Interrupted aortic arch* |
| | Pulmonary atresia | Pulmonary valve stenosis |

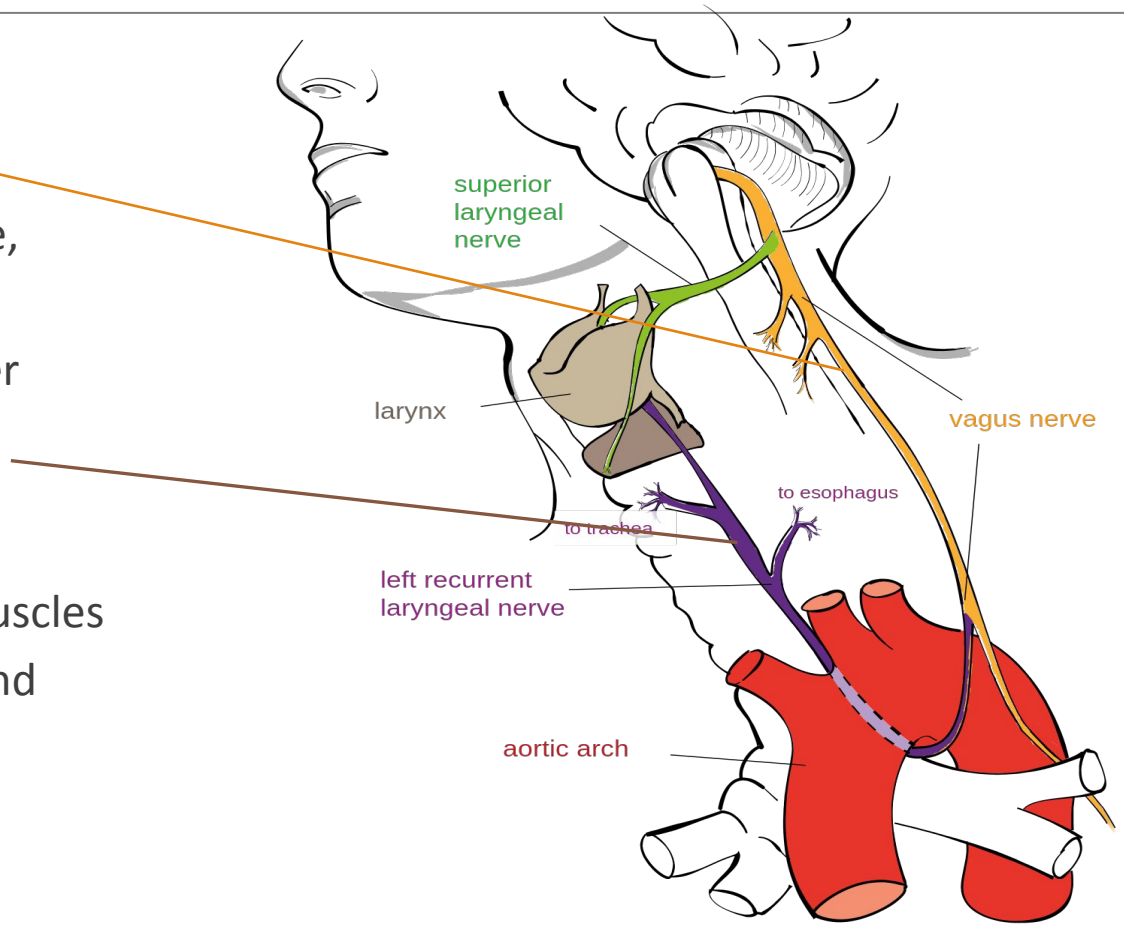
# Duration of Intubation

- Intubation can delay initiation of enteral feeds
  - Increase risk for necrotizing enterocolitis
- Longer periods of sedation
- Oral weakness or aversions
- Palatal malformations

# Nerve Injuries

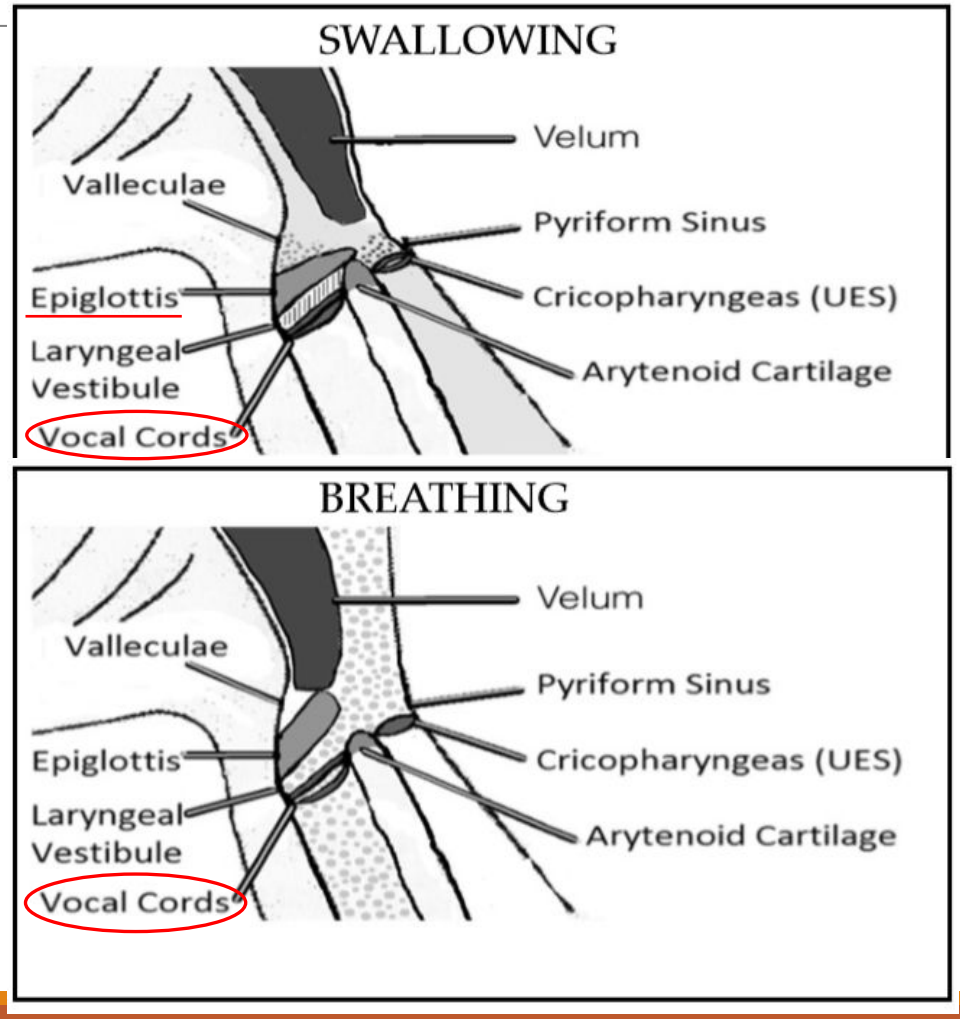
- Vagus Nerve
  - responsible for regulation of heart rate, **peristalsis**, speech
  - Innervates upper esophageal sphincter

- Recurrent Laryngeal Nerve
  - Innervates posterior cricoarytenoid muscles (responsible for opening L vocal cord) and **sensation** to the larynx



# How does vocal cord injury effect swallow?

- Vocal cord is the 2nd structure to protect the lungs during a swallow (first is epiglottis)
- Motor impairment – weak cry, decreased ability to close and protect airway
- Sensory impairment – numbness, inability to feel liquid, gurgling vocal quality



# Medication side effects

- Nausea
- Vomiting
- Anorexia
- Loss of taste sensation
- Dizziness
- Oral discomfort (Dry mouth, sores)
- Heartburn
- ACE cough
- Slow motility

# Feeding Interventions

- Elevated sidelying
- External pacing
- Specialty nipple
- Cheek support
- Frequent burping
- Chin support
- Environment

# Elevated Sidelying

When to use?

- If baby is overwhelmed
- Loss of liquid
- Gulping, choking or coughing

Why?

- Gravity will allow milk to fall to the side versus back of throat

Technique:

- Slight elevation
- Chin tucked
- Head in neutral (chin aligned with breastbone)

# External Pacing

When to use?

- If baby is overwhelmed
- Loss of liquid
- Gulping, choking or coughing

Why?

- Tipping the bottle down allows the infant to swallow the liquid so he can take a breath. This allows the infant to drive the feeding, helping him to get into a rhythm of sucking, swallowing, and breathing.

Technique:

- Tip bottle down to eliminate milk from nipple based on baby's cues, usually every 4-5 sucks

# Specialty Nipple

When to use?

- If baby is overwhelmed
- Loss of liquid
- Gulping, choking or coughing

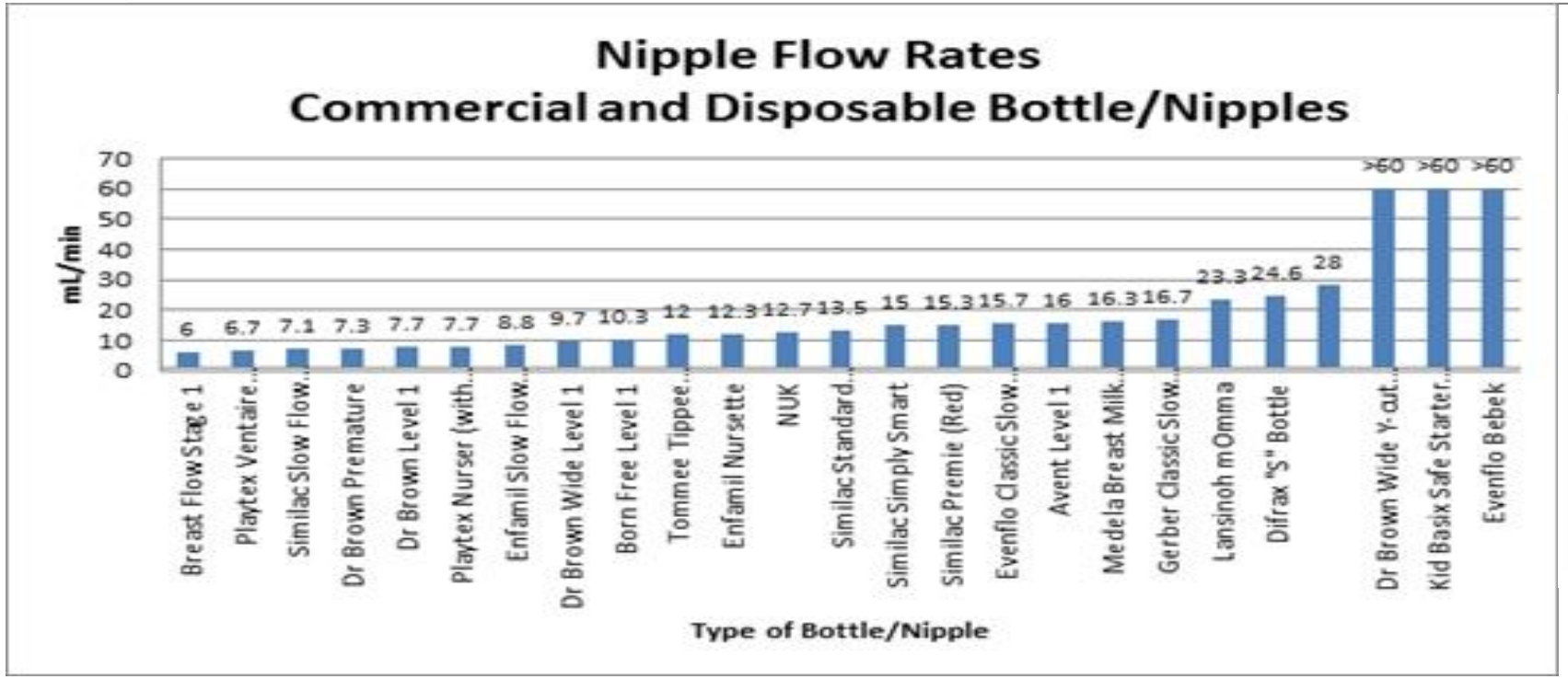

Why?

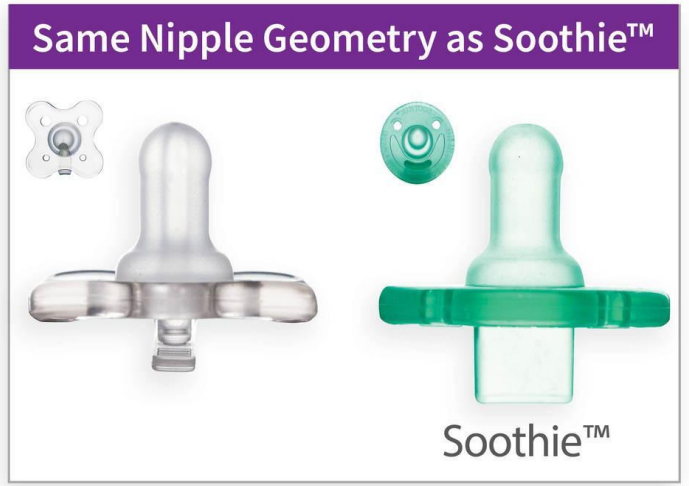
- Consistent flow rate as baby is learning coordination
- Slower flow rates can allow baby to regulate breathing and swallowing

Technique:

- Dr. Browns bottle system is typically utilized at CHP.
- All commercial bottle systems have various flow rates. Once a good system is identified continue with that bottle for consistency.

# Interventions: Specialty Nipple



# Cheek Support

When to use?

- Baby with poor lip seal
- Milk leaking from corner of mouth
- Loss of latch

Why?

- Support is needed to help form lip seal around nipple to create suction. Otherwise, it's like drinking out of a straw with a hole in the side - you get some milk, but it's not efficient.

Technique:

- Support is only needed on one side

# Frequent Burping

When to use?

- Infants who have slowed down eating
- If they’re too sleepy or have disengaged
- Discomfort, restless, squirming
- If baby becomes disorganized or fatigued

Why?

- Burping allows the infant to eliminate air, allowing for more milk and increasing hunger.  It can also re- alert the infant
- Can offer pacifier if baby becomes disorganized to re-set coordination

Technique:

- Support infant with base of hand on abdomen and trunk while moving the body gently and lightly patting or rubbing the infant's back.

# Chin Support

When to use?

- Infants with poor tongue stripping of nipple, small chin, or wide jaw excursion
- Smacking noise, increased air intake, inefficient eating (sucking a lot and not getting much)

Why?

- Infants with small chins benefit from this slight forward pressure to pull chin forward.
- Infants with a wide, excessive jaw movements may require chin support for initial latch and then you can let go

Technique:

- Gentle pressure on the infant's chin to ensure effective latch/tongue. Ensure boney surface and not soft tissue of throat

# Environment

- Calm, quiet setting
  - Overstimulating environment can cause baby to become disorganized with feeding coordination
- Swaddle with hands together
  - Providing support to larger muscle groups can allow baby to focus on oral motor control
- Minimize movements and noxious alerting techniques
  - Obnoxious stimulation can cause baby to “shut down” to protect themselves.

# Techniques to Avoid

Squeeze of chin and both cheeks

Head extended back

Twisting

Tapping

Pulling

Higher flow rates, soft nipples

# What caregiver techniques to recommend?

| Feeding Difficulty | Modified Sidelying | External Pacing | Cheek Support (unilateral) | Chin Support | Frequent Burping | Specialty Nipple |
|---|---|---|---|---|---|---|
| **Liquid Loss: Poor coordination of SSB pattern*** | ✓ | ✓ | | | | ✓ |
| **Liquid Loss: Poor lip seal** | | | ✓ | | | ✓ |
| **Liquid Loss: Too high of flow rate** | ✓ | ✓ | | | | ✓ |
| **Liquid loss: Small chin** | | | | ✓ | | ✓ |
| **Fatigue: Stopped sucking**** | | | | | ✓ | |

*Suck, swallow, breath pattern (SSB)

**Feeding should be stopped if infant disengages/completely fatigued

# Feeding Support at Children's Hospital of Pittsburgh

- Feeding Team involvement
  - Speech therapy
  - Occupational therapy
  - Nutrition
  - Lactation support
- Family Involvement is key and imperative
  - Home bottle system
  - Educating family on techniques and reading baby's cues
- Feeding pathways after discharge
  - Early intervention – at home therapy
  - Feeding and Swallowing Clinic – outpatient at CHP
    - (412) 692-3333 to make appointment