

# Reflux, it keeps coming up!

But should the baby be up?

A review and discussion of GER management in NICU

## Occupational Therapy

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# Anecdotal, Clinical Experience, Evidence Informed?

- What, if anything, do you feel helps the management of GER(D) in the NICU infant?
- When do you think it would be appropriate to: elevate HOB; discharge home on a wedge?
- Do you think there is a causative or temporal relationship between reflux and apnea in prems?
- Do you think the literature offers adequate evidence to inform your management of GER(D) in the NICU?

# Objectives

- To generate a discussion around the management of GER(D) in the NICU population
  - Review causes for GER(D) in NICU babies
  - Review of past and present strategies to manage GER(D)
  - Present the current literature/evidence of reflux management practices
  - Specifically discuss HOB elevation and the use of wedges
  - Open Forum: “What should we be doing?”

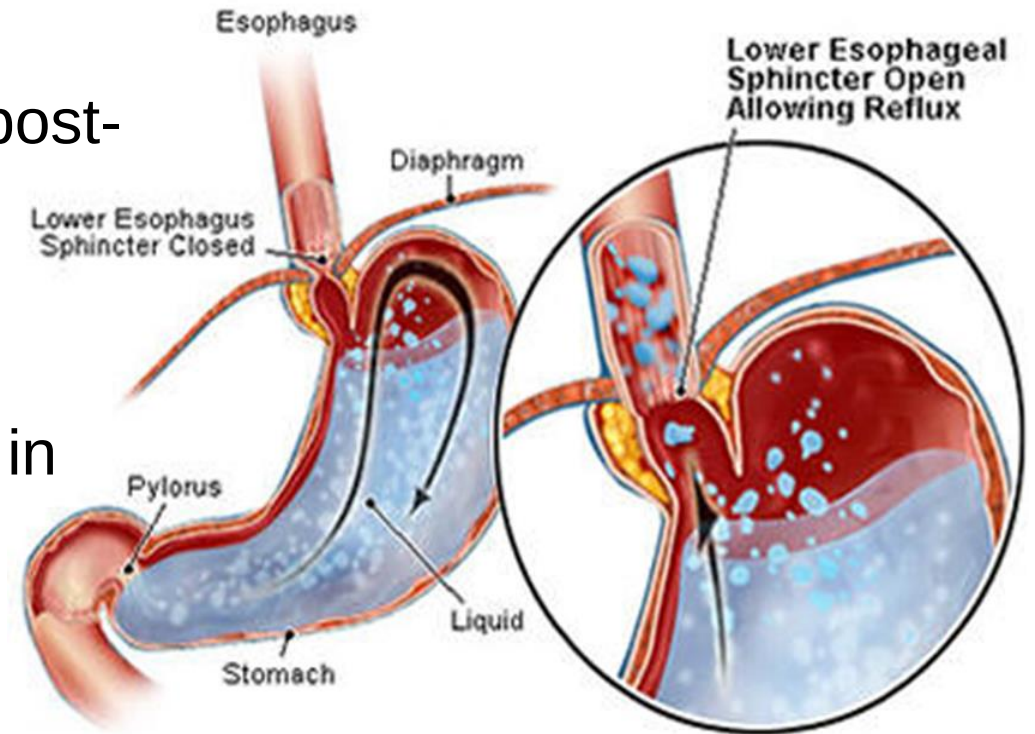
# Pre-terms & GER

- **GER is normal in infancy**
  - Up to 70% of healthy 3-4 month infants reflux and ~25% “reflux frequently”
  - Frequency and relative amount decreases with age and is rare after 18 mos
- **Incidence of GER in preterms is variably reported and difficult to diagnose:**
  - Reports range from 22% to 70%+
  - Symptoms are non-specific & diagnostic testing invasive (pH probe/MLI)
- **Preterm GER is multifactorial and make them ill-equipped to limit reflux:**
  - Immature or impaired anatomic and physiologic
- **Primarily: Transient Lower Esophageal Sphincter Relaxation (TLESR)**

# Preterm GER is multifactorial

## Preemie characteristics:

- **Short LES**
  - Not functionally complete until 45 days post-term
- **Immature esophageal motility** –
  - theoretical maturation by 31 weeks
  - altered or immature peristalsis common in prems
- **High volume liquid feedings**



# Preterm GER is multifactorial

- **Delayed gastric emptying/GI immaturity**
  - quickens with age but not at same rate of increasing TFI
  - volume in stomach
- **Increased intra-abdominal pressure**
  - WOB, BPD, laryngomalacia
- **Presence of OG/NG**
  - ? greater LES relaxation, decreased gastric emptying, or ability of LES to close
- **Prem-specific meds**

# THUS, reflux in preterms is normal, so why do we want to manage it?

- Unpleasant for baby
- Loss of sleep
- Manage A,B,D's
- Decrease risk of oral aversion
- Decrease risk of aspiration
- Improve weight gain
- Make medical team and family feel better
- Meet criteria for discharge



# Management strategies to date...

- NNS for gastric emptying
- Thickening feeds
- Hydrolysed protein formulas
- Holding baby upright
- Post-feeding positioning
- Elevate HOB/Wedges
- Decrease TFI
- Smaller more frequent feeding
- Open barrel syringes
- Decrease tube feeding rate



- NJ feeds (trans-pyloric)
- Medications (pro-kinetic, surface agents, acid suppression)
- Education & reassurance to parents

# In the literature<sup>1</sup>...

- Vast disagreement regarding GERD symptoms, diagnosis and effectiveness & safety in treatment, and weight of evidence in the literature (n=1275)
- Beliefs do not seem to be driven by degree of evidence in neonatal literature
- Study concludes:
  - **lack of a standard of care for the management of GERD in prems**

<sup>1</sup> Pediatric Specialists' Beliefs about Gastroesophageal Reflux Disease in Premature Infants  
(Golski et al., *Pediatrics* 2010)

# Reflux, acidity and clinical impressions

- Slocum et al., (*J Perinatology*, 2009) looked at 36 infants to compare respiratory stability and reflux pre-feed and post-feed. (23-27 weeks gestation; eval at 34-48 weeks).
- Frequency, height and pH of GER altered by feedings in prems but ABDs **not** more prevalent after feeding

Table 2

Rates of reflux events before and after feeding, median (range)

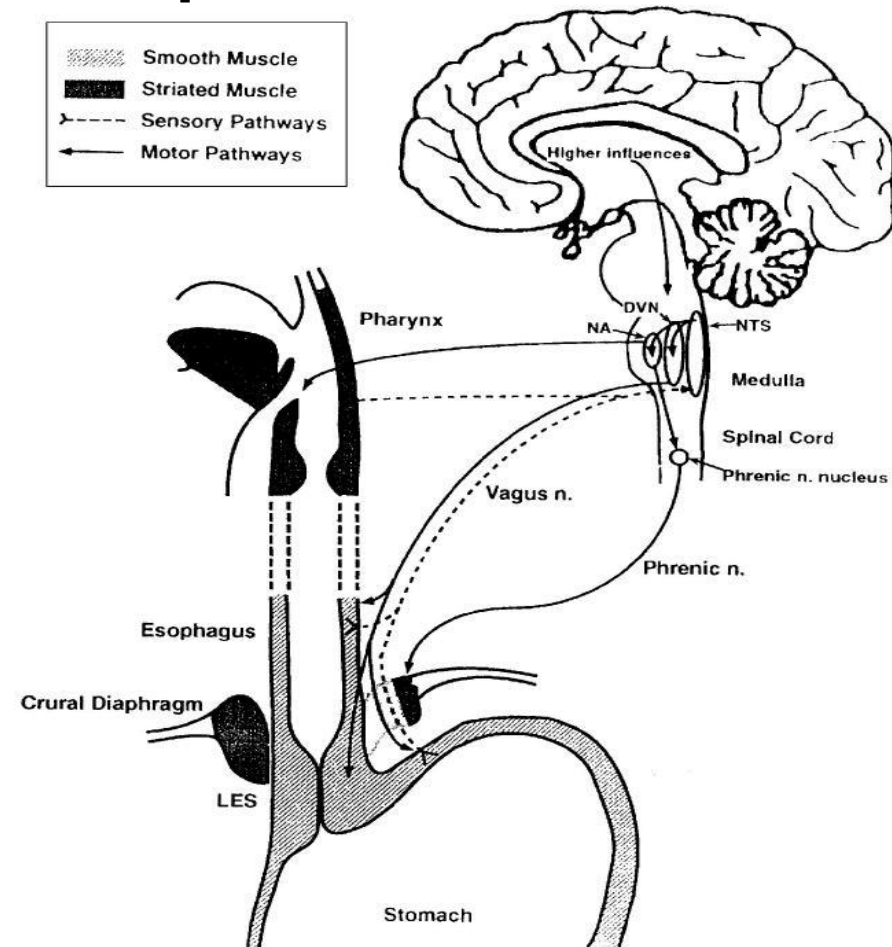
|                 | Total GER<br>(events per<br>hour) | Acidic GER<br>(events per<br>hour) | Non-acidic<br>GER<br>(events per<br>hour) | Median height<br>of<br>GER (cm) |
|-----------------|-----------------------------------|------------------------------------|-------------------------------------------|---------------------------------|
| Before<br>feed  | 2 (0–11)                          | 2 (0–11)                           | 0 (0–4)                                   | 6 (3–9)                         |
| After<br>feed   | 4 (0–16)                          | 0 (0–10)                           | 4 (0–11)                                  | 6.75 (3.75–9)                   |
| <i>P</i> -value | 0.012                             | <0.001                             | <0.001                                    | 0.025                           |

**Do we interpret post-feed ‘events’ and behaviours differently from those occurring at other times?**

# GER Relationship to Apnea

- Whether apnea of prematurity can be precipitated by reflux, and whether treatment of reflux can ameliorate apnea, remains controversial.  
Eric C. Eichenwald, MD. Reflux and Apnea: Real or Reflex.
- There are a variety of physiological protective responses that may provide a plausible link between GER and apnea of prematurity BUT “evidence for a temporal, let alone causal relationship, between GER & AOP is unconvincing”

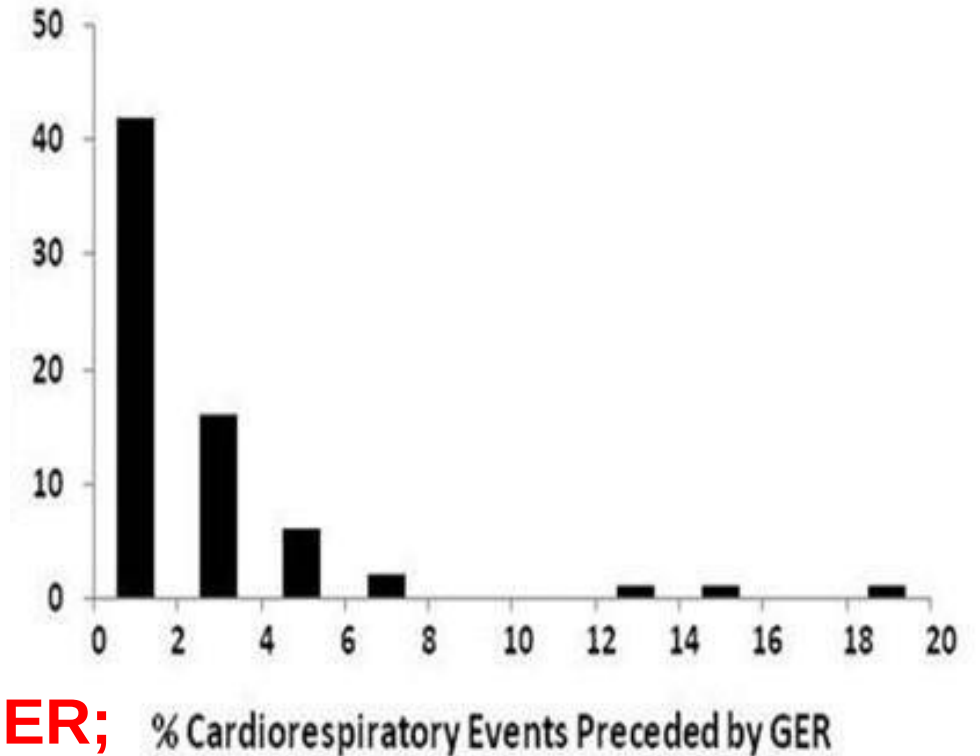
Poets *Neonatology* 2013; 103-4



Mittal RK, et al. *Gastro*, 1995;109,

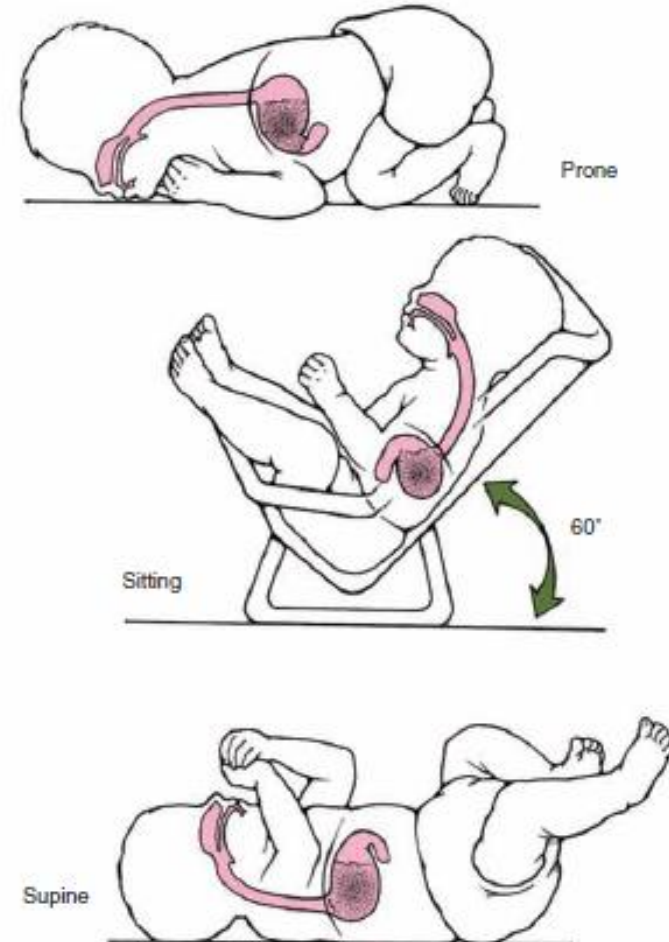
# GER Relationship to Apnea

- 12hr pH & MII of 71 prems to capture GER
- # of apnea or brady within 30 seconds of GER
- **Results:** 12957 cardio-resp events (CrE) & 4164 GER episodes
- <3% of all CrE were preceded by GER
- GER did not increase duration or severity
- GER associated with shorter desat events
- **In fact:** >9% of all GER events were preceded by a CrE
- Apnea has been associated with TLESR
- **It is possible that CrE actually trigger GER; not the other way around.**



# Physiological Responses to Positioning

- Fewest occurrences of GER in **P**rone, **L**eft-Side, **R**ight-Side, **S**upine
- Mean esophageal exposure to acid & non-acid GER was lower in **P** and **LS** than in **RS** and **S**.
- **LS** had lowest esophageal acid exposure (0.8%) in first 75 mins post-feed and **P** showed the lowest esophageal acid exposure (5.1%) in late post-feeding period.
- Semi-supine positioning exacerbates GER
- **Placing premies in left lateral position then prone post-feeding can limit GER**



From: Orenstein, S., Hyman, P., & Feldman, M. (2002). Gastroesophageal reflux. *Gastroenterology and Hepatology*. Vol 4. Philadelphia: Current Medicine. Copyright 1997 by Current Medicine. Reprinted with kind permission from Springer Science+Business Media B.V.

# Body Positioning & Medical Therapy for Infantile GER Symptoms<sup>2</sup>

- Randomized sham-controlled study to assess influence of body positioning and medical therapies on frequency of GER and symptoms; inclusion criteria included SAP\*
- 4 groups : PPI+LLP, PPI+HE, AA+LLP, AA+HE (N=51)
- Baseline and results measured by combined pH-impedence, physiol.monitoring, 8 hour video, direct nursing observation, gastric emptying breath test, I-GER-Q questionnaire

# Body Positioning & Medical Therapy for Infantile GER Symptoms<sup>2</sup>

- **Results:**
  - LLP, regardless of medication, significantly reduced vomiting and total GER episodes
  - Reduction in total GER and/or esophageal acid exposure did not result in a significant improvement in symptoms other than vomiting
  - Parental reports scored decreased symptoms in all groups (!)
- **Concerns:** SIDS risks, SAP design, lack of placebo, etc.

<sup>2</sup>Loots et al., JPGN, 2014

# Medication Management

- 1) Acid suppression (H2RA's: Raniditine & PPI's: Omeprazole)
- 2) Prokinetic meds (Domperidone)

**Potential side effects:** depending on drug and dose, risk of respiratory infections, NEC, suppressed vitamin or mineral absorption, bacterial overgrowth in gut, cardiac and neurologic complications

- 25% of all ELBW infants in the USA are discharged on pro-motility and/or antacid therapy; indications were feeding intolerance & recurrent A,B,D's
- **However, true frequency of peptic esophagitis or pulmonary disease due to GERD is unknown**
- **There is no evidence for a temporal or causative relationship between reflux and apnea**

# Feeding Strategies: Timing and Location

- Frequent feeds with small volumes may help to decrease GER
- Continuous drip feeding reduces vomiting and reflux symptoms
- Trans-pyloric tube feeding reduces both apnea and bradycardia when compared with gastric feeds – possibly by by-passing the stomach but possibly by decreasing gastric distension



Misra et al., *Acta Paed* (2007); Malcolm et al., *J Perinatology* (2009)

# Meta-analysis & Reviews

- Craig et al., **Cochrane Review** (2004) – Infants 0-24 months
  - Thickening feed ↓ reflux symptoms; elevating HOB makes no difference; metoclopramide ↓ reflux symptoms
- Martin et al., **UpToDate** (2013)
  - No proven temporal relationship between GER and apnea
  - Elevation of HOB is not a proven therapy in term & older infants
  - **SL** and **P** positioning has favourable influence on gastric emptying and reducing GER episodes in prems
  - No recommendation for GER WHICH supercedes the current SIDS recommendations for supine sleeping
  - H2 receptor antagonists, PPIs and pro-kinetic agents are not conclusively effective in improving GER symptoms and have associated risks

# Evidence-Based Practice in the Literature

- **NASPHGAN and ESPGHAN 2009 Joint Recommendations**
  - Evaluation of the best available evidence (600+ articles) to develop an international consensus regarding clinical practice guidelines for the dx and management of GER and GERD in the pediatric population (age 0-19)
- **Section 7.6 relates to the premature infant:**
  - (1) Most studies do not support reflux as cause of pathologic apnea in premature infants,
  - (2) The relative risks, benefits and indications for GERD therapy are unclear in prems

# NASPHGAN and ESPGHAN 2009 Joint Recommendations

## Section 5.1 discusses lifestyle changes:

- (1) The risk of SIDS outweighs the benefit of prone or lateral sleep position for GER; in most infants from birth to 12 months, supine positioning during sleep is recommended;
- (2) The amount of reflux in infants positioned in supine with head elevated is equal to or greater than in infants supine and flat;
- (3) Placing infants in the semi-supine position, as in an infant car seat exacerbates GERD;

# NASPHGAN and ESPGHAN 2009 Joint Recommendations

- (4) Formula thickened with rice cereal was more effective in decreasing the frequency of regurgitation than upright positioning after feeds\*.
- (5) There is evidence that measured reflux is reduced by positioning infant in prone particularly after feed, but prone is only acceptable if baby is observed and awake.
- (6) Prone sleep can only be considered in infants when risk of death from GERD outweighs the risk of SIDS\*.

\* Thoughts: Increased complexity with prems or former prems who may be at a greater risk of SIDS or NEC

# Summary of GER(D) Literature

- **Causes:** GER is primarily related to TLESR and almost always outgrown
- **Symptoms/Diagnosis:** Not well-defined, no clear criteria, or difficult to Dx
- **Relation to A,B,D's:** There is no evidence of causal or temporal relationship between reflux and apnea (may be the reverse)
- **Management:**
  - There is a lack of standard of care for management of GERD in prems
  - The relative risks, benefits and indications for GERD therapy are unclear in prems
- **Thickening:** rice cereal is effective in older infants but not proven effective in prems (↑ risk of NEC)

# Summary of GER(D) Literature

- **Feeding Strategies:**

- Trans-pyloric, slowing rate of tube feeds or continuous appear to have some effect on reducing GER(D)

- **Positioning:**

- Left lateral and prone positions may decrease the incidence of reflux but risk of SIDS (when unmonitored and post-discharge) almost always outweighs these benefits
- Post-feed prone positioning when supervised and awake may be helpful
- Reflux in infants positioned supine with head elevated is  $\geq$  infants supine and flat

# Post-Discharge Positioning Concerns

- BC Centre for Ability review (meta-analysis)
  - The Use of Positioning to Reduce GERD in Young Children (age 0-5).  
Prepared by: BC Centre for Ability North Shore, Early Intervention Therapy Team (EIT); Lisa Kang (SW), Helen Royall (SLP), Jude Rushton (PT), Terry Meyer (OT), Kim Weselak (SLP), Susan Bonney, Regional Coordinator.
- Community therapists asking questions wrt the effectiveness of wedges, practicalities of night-time use, appropriate angles, when to re-assess, how to wean, and the risk of SIDS.

# Wedges... “the aim”

Despite a lack of evidence wedges or elevating the HOB have seem to had surface validity as a management idea

Wedges were typically recommended:

- in 10 - 30 degrees
- placed on top of mattress with baby placed on “back to sleep”
- NOT to be used with any rolls or loose blankets
- Instead of “risky” traditional alternatives
- **BUT...use is based on beliefs, not evidence!**



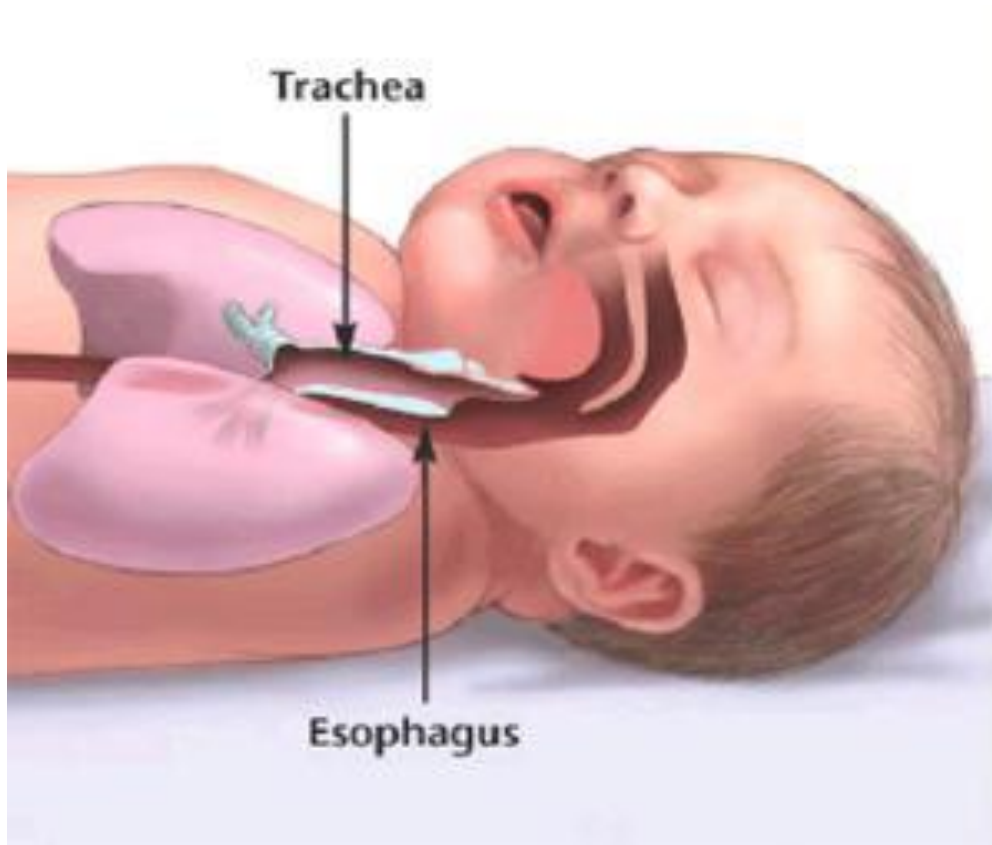
# Wedges... “the reality”

## Cons:

- Raising the HOB & use of wedges facilitates the “belief” that they work
- Impossible to maintain a safe position (rolls placed in the crib)
- Delays motor development and milestone acquisition
- Difficult to wean use at home
- Often delays discharge
- Community management
- Costly (\$90 - \$140)
- SIDS risk
- Lack of evidence



Supine, Flat, and Back to Sleep Positioning  
provide “anatomical airway protection”



# Discussion:

## Should we rethink our approach to GER(D) management in premature infants?

In light of:

- Evidence
- Maturation
- Medications
- ABD's
- Positioning
- Education
- Reassuring parents (tips & tricks)
- SIDS risk



# Positioning: Suggestions from OT

- In NICU/hospital there is an environmental or institutional tendency for infants to be in bed and for every spit up and discomfort to be observed and tracked.
- Head of bed elevation is so ingrained in NICU practice it may be difficult to challenge, but ongoing discussion and practice change is necessary.
- **Proposal: Aim to position all infants with HOB flat and without wedges for discharge home.**

# Positioning: When should we wedge or should we?

- For monitored infants who are not approaching discharge, positioning **Left Lateral or Prone** after feeding is appropriate provided there is a transition to **Supine** prior to discharge home and to model “safe sleep” practices to parents
- Infants with GERD as well as esophageal dysmotility/dysfunction (e.g. post-TEF repair) are the only infant's discharging home with a wedge from BC Women's NICU.
- Suggestion: **Any other consideration for wedge should be assessed case-by-case with that infant trialed on equal periods with and without HOB elevated and objective documentation of the desired outcome to support its efficacy.**
- How do we plan to manage or wean wedge use in the community and into the future?

# Questions, Feedback, & Contact...



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