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Steps to Establishing Standard Practice Parameters

Infant Videofluoroscopic Swallow Study

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- ETW2016, Changes in Infant Oropharyngeal Swallow Physiology Throughout the Videofluoroscopic Swallow Exam (PI: McGrattan)
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STANDARD PRACTICE PARAMETERS

Evidence-based guidelines developed to assist practitioners in providing best patient care:

- Clinician Competencies
- Procedure Indications
- Specifications for Procedure Execution
- Specifications for Procedure Interpretation



'Ultimate judgement regarding the propriety of any specific procedure or course of action must be made by the practitioner in light of the circumstances presented.'
-ACR, 2014



Standardized Protocol: The use of a standardized exam protocol did not increase radiation exposure.

Pulse Rate: Swallow studies completed at less than 30 pulses per second inhibited clinicians ability to identify physiologic deficits and bolus airway entry (penetration/aspiration)

(Bonilha, 2013)

STANDARD PRACTICE PARAMETERS: VFSS

Paucity of standard practice parameters guiding the execution and interpretation of the VFSS in bottle-fed infants contributes to:

- Reduced Diagnostic Validity
- Reduced Diagnostic Reliability
- Reduced Translatable Yield
- Increased Radiation Exposure
- Fragmented Patient Care and Hand-off



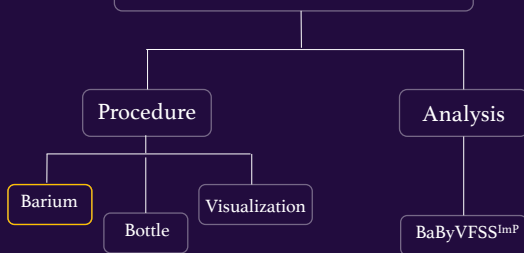
Videofluoroscopic Swallow Study (VFSS) Modified Barium Swallow Study (MBSS)

Videoradiographic examination of swallow function using barium contrast to evaluate the:

- Timing and integrity of oropharyngeal swallowing physiology.
 - Effect of these physiologic processes on bolus flow.
- Identify the therapeutic effect of targeted dysphagia regimens.



Videofluoroscopic Swallow Study



CONTRAST AGENTS

Barium has unique physical and chemical properties that distinguish it from infant formula and breast milk:

- Viscosity
- Density
- Yield Stress
- Temperature
- Taste
- pH

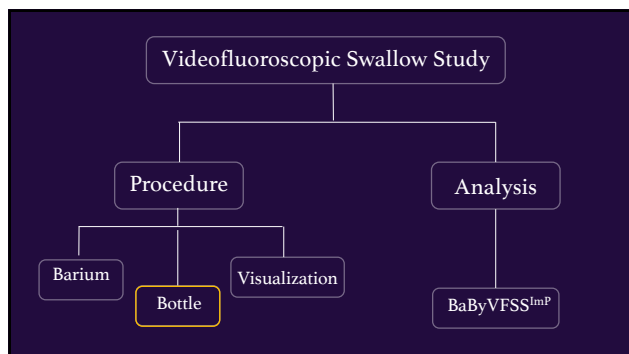
Varibar® Barium



Barium does not need to be a direct correlate to the infants milk; by using standardized contrast within each viscosity category clinicians can extrapolate.

(Stuart, 2009) (Cichero, 2011)





BOTTLE NIPPLE

Purpose of the VFSS is not just to identify physiologic deficits, but also, to identify the effect of targeted therapeutic interventions:

- Viscosity
- Flow Rate

Variability in flow rates of hospital, single-use nipples limits the ability to provide a standard milk flow rate across exams.

Limited nipple options among single-use and many other commercially available nipples limits the ability to test isolated therapeutic treatment effects.

(Matthew, 1989) (Matthew, 1991) (Pados, 2013) 

EFFECT OF BOTTLE NIPPLE ON BARIUM FLOW RATE DURING THE VIDEOFLUOROSCOPIC SWALLOW STUDY

Specific Aim 1: Identify the nipple that enables thin barium contrast to be expressed at the same rate as formula.

Specific Aim 2: Identify the nipple that enables nectar barium contrast to be expressed at the same rate as formula.



METHODS

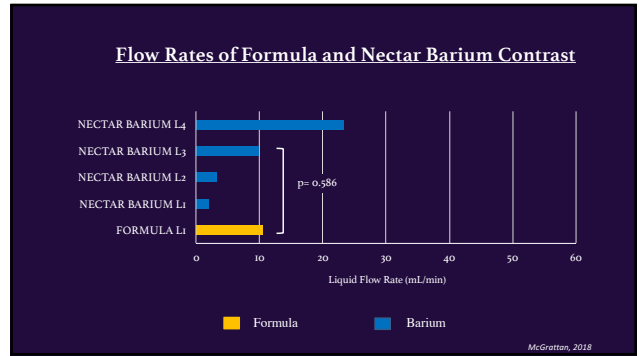
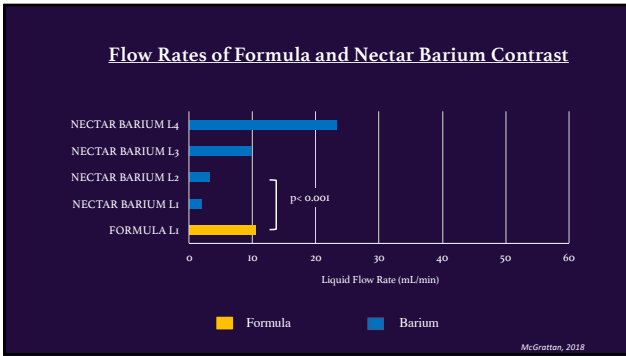
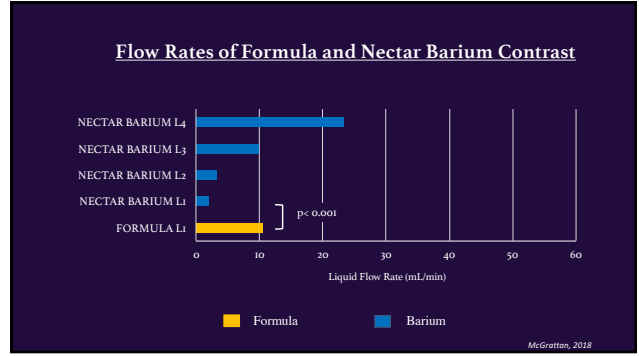
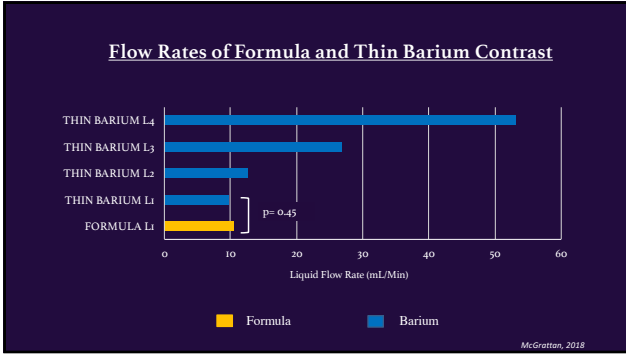
Flow rates of 4 commercially available bottle nipples were calculated during the expression of Simlac Advanced Formula[®], Thin Varibar[®] Barium, and Nectar Varibar[®] Barium through a pulsated pressure pump (Ameda[®]):

- Dr. Brown's[®] Level 1
- Dr. Brown's[®] Level 2
- Dr. Brown's[®] Level 3
- Dr. Brown's[®] Level 4



Differences in flow rates across conditions were tested using ANOVA with post hoc Dunnett's testing to identify the nipple that enabled thin and nectar barium contrast to flow at the same rates as formula from a Dr. Brown's[®] Level 1 nipple.

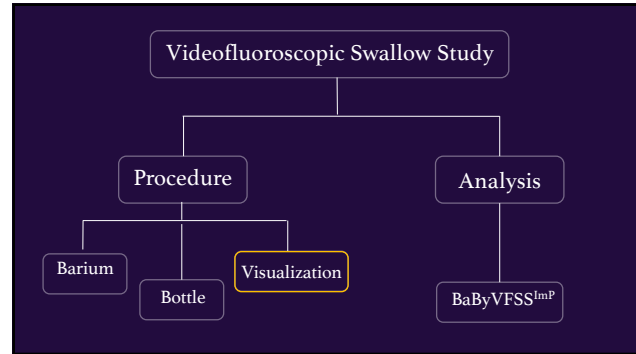
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Conclusions

- Standardization of bottle nipple for thin and nectar barium contrast provisions is necessary to improve diagnostic validity, reliability, and evaluate treatment effect.
- Infants appropriate to initiate the exam on a Dr. Brown's Level 1 bottle nipple should be provided nectar liquids via Dr. Brown's level 3 nipple to test the effect of nectar liquids.
- Future investigations testing flow rate equivalents of preemie nipples are warranted to refine the procedure guidelines.

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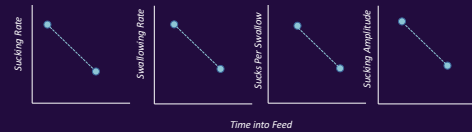
BACKGROUND

- Videofluoroscopic swallow study is considered by many as the gold standard among instrumental oropharyngeal swallow assessments.
- Fluoroscopic visualization exposes infants to harmful ionizing radiation.
- Clinicians make determinations about deficits based on a sample of fluoroscopically observed swallows.



BACKGROUND

Clinical evidence suggests feeding performance changes throughout the course of a bottle-feed:



Kornig, 1990
Lung, 2011
Pollitt, 1980



BACKGROUND

- If physiologic changes also occur in oropharyngeal swallow physiology, the timing that swallows are fluoroscopically sampled has the potential to greatly influence the exam's diagnostic accuracy.
- The aim of this pilot investigation was to identify the stability of oropharyngeal swallow physiology and airway protection throughout the VFSS exam.

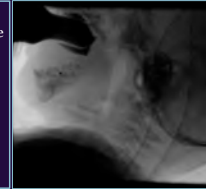


METHODS

Videofluoroscopic Swallow Study Procedure

Fluoroscopic visualization of 5 thin liquid swallows at four time points (min:sec):

- 00:00
- 00:30
- 01:30
- 02:30



* No attempts to provide compensatory interventions or remove bottle from oral cavity

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VFSS scored frame-by-frame by two SLP's with $\geq 80\%$ reliability in scoring characteristics of oropharyngeal swallow physiology and bolus flow:

- Number of Sucks per Swallow
- Oral Bolus Containment Prior to Swallow
- Bolus Location at Initiation of Swallow
- Timing of Initiation of Pharyngeal Swallow
- Bolus Airway Entry

Differences in swallow attributes between time points were tested using student t-test and Rao-Scott Chi-Square test with clustering to account for multiple data points within subjects.

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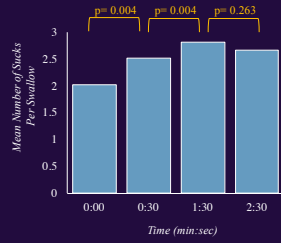
Characteristics	Study Sample (N=30)
Sex	
Male	18 (60%)
Female	12 (40%)
Postmenstrual Age	55.7 (5.04)
VFSS Indication	
Cough/Choke with Feeds	11 (37%)
Chronic Respiratory Morbidity	5 (17%)
Insufficient Milk Ingestion	5 (17%)
Follow-up From Previously Documented Impairment	3 (10%)
Cardiopulmonary Compromise with Feeds	2 (7%)
Fussiness with Feeds	2 (7%)
Post Surgical Swallowing Risk	2 (7%)

*Outcomes reported as N (percent) or mean (standard error).

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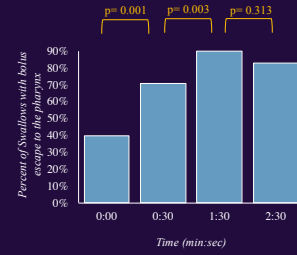


NUMBER OF SUCKS PER SWALLOW



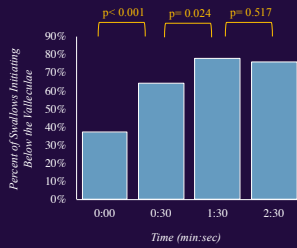
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ORAL BOLUS HOLD



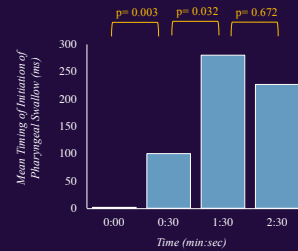
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INITIATION OF PHARYNGEAL SWALLOW

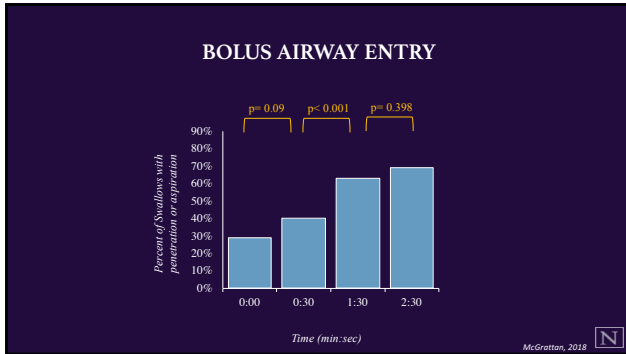


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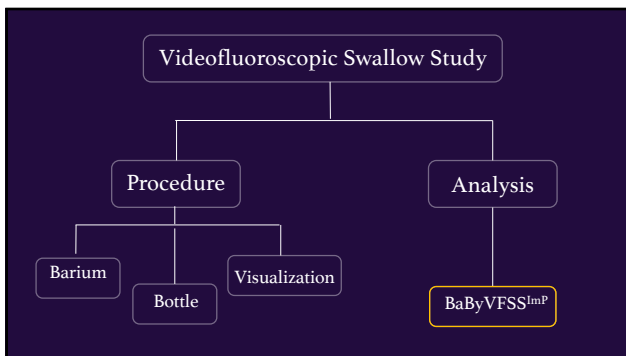
TIMING OF INITIATION OF PHARYNGEAL SWALLOW



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- ### CONCLUSIONS
- Oropharyngeal swallowing physiology exhibits temporal changes throughout the videofluoroscopic exam.
 - The timing that swallows are fluoroscopically visualized may impact diagnostic validity.
 - Future investigations examining the underlying mechanisms responsible for these changes are necessary to identify targets for swallowing interventions.



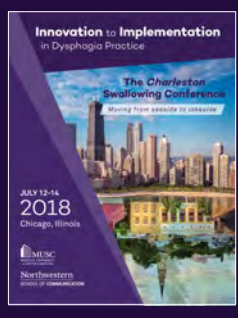
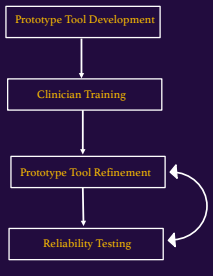


Standardization of Videofluoroscopic Swallow Studies for Bottle-Fed Children
NIDCD R01DC01290

Co-PI: Bonnie Martin-Harris, Medical University of South Carolina
Co-PI: Maureen Leflor-Greif, Johns Hopkins University



View Program



Find out more at...
SCSC.northwestern.edu